

UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, March 10th, 2020

Attending: Eric Rutherford, Wok Sing Yang, Amy Hortop, Susan Montgomery, Saadet Albayrak, Fred Terry, Dale Karr, Christian Lastoskie, Ed Durfee, Emmanuelle Marquis, Gretchen Keppel-Aleks. **Supporting Staff:** Betsy Dodge, Alyiah Al-Bonijim

Call to Order: 1:39PM

Adjourned: 2:27PM

AGENDA

1. 02.25.20 Meeting Minutes: APPROVED
2. Request for Approval for Sequential Master of Engineering/B.S.E. Programs with Materials Science and Engineering [*Emmanuelle Marquis Presented*]: The four ISD SUGS programs were approved, the effective term is Fall 2020. They will be double counting six credits with the potential for more
3. Faculty Committee Guidelines for CoE Curriculum Committee [*Betsy Dodge presented*]: Committee Reviewed and added these guidelines to the CC website.
4. Joint LSA/CoE Curriculum Committee Meeting [*Betsy Dodge presented*]: A head count was conducted and missing members were emailed. Agenda items were also gathered.

CARF SUMMARIES

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN.GRADE REQ. FOR ENF. PREPREQ	APPROVED	NOTES & REVISIONS	TABLED
24	NERS	481	DELETION		FA 2020		X		
27	NERS	580	DELETION		FA 2020		X		
30	NERS	585	DELETION		FA 2020		X		

33	NERS	579	MOD	Change of course number, removal of cross-listing, and removal of enforced prerequisites	FA 2020		X	Conditionally approved with CARF created for deletion of NERS 579 and CARF created for new NERS 585 course
36	ENGR	988	NEW	No changes to enforced prerequisites	FA 2020		X	Conditionally approved with grading basis changed from P/F to S/U
39	CHE	580	MOD	Course will just be offered as ENGR 580, which was previously the crosslisted department	FA 2020		X	
42	EER	610	NEW	Change to enforced prerequisites	FA 2020		X	Conditionally approved with grading basis changed from P/F to S/U

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College of Engineering
Curriculum Committee Meeting
Tuesday, March 10th, 2020

Attending:

Call to Order:

Adjourned:

AGENDA

1. 02.25.20 Meeting Minutes
2. Request for Approval for Sequential Master of Engineering/B.S.E. Programs with Materials Science and Engineering [*Emmanuelle Marquis Presenting*]
3. Faculty Committee Guidelines for CoE Curriculum Committee
4. Joint LSA/CoE Curriculum Committee Meeting

CARF SUMMARIES

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30	NERS	585	DELETION		FA 2020				
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36	ENGR	988	NEW	No changes to enforced prerequisites	FA 2020				
39	CHE	580	MOD	Course will just be offered as ENGR 580, which was previously the cross-listed department	FA 2020				
42	EER	610	NEW	Change to enforced prerequisites	FA 2020				

UNIVERSITY OF MICHIGAN
College of Engineering
Curriculum Committee Meeting
Tuesday, February 25, 2020

Attending: Ed Durfee, Eric Rutherford, Won Sik Yang, Gretchen Keppel-Aleks, Emmanuelle Maquaris, Susan Montgomery, Saadet Albayrak, Dale Karr, Ken Powell, Christina Rice, Yavuz Bozer, Leung Tsang. Supporting Staff; Betsy Dodge, Alyiah Al-Bonijim. Guests; Bryan Enochs, Kerri Wakefield, Matthew Faunce

Call to Order: 1:36

Adjourned: 2:45

AGENDA

1. 2.11.20 Meeting Minutes: APPROVED
2. Modification of AEROSP Undergraduate Curriculum [*Ken Powell presented*]: CONDITIONALLY APPROVED. Based on edits needed for numerous CARFS. Dale Karr reported that this will go faculty meeting as information item only. This modification has a Fall 2020 effective term.
3. CoE Dual Degree Admissions Policy Proposal [*Kerri Wakefield and Bryan Enochs presented*]: Members discussed admissions policies with regards to GPA and deadlines. Dale Karr and Susan Montgomery agreed this was not a CC decision.
4. LSA Proposal to Increase Credit Requirement for CoE/LSA MDDP's [*Matthew Faunce presented*]: LSA's request to increase number of credits from 128 to 150. No objections from members, said changes were reasonable
5. Email Voting Protocol [*D.Karr, time allowing*]: Committee members felt it was necessary for entire committee to exchange comments during email vote. Ken Powell suggested using Google docs. Dale Karr suggested a session or time frame to share comments.

CARF SUMMARIES

PAGE	SUBJECT	COURSE #	ACTION	SUMMARY	EFFECTIVE TERM	MIN. GRADE REQ. FOR ENF. PREPREQ	APPROVED	NOTES & REVISIONS	TABLED
12	AEROSP	200	NEW	No changes to enforced prerequisites	FA 2020		X		
24	AEROSP	201	MOD	Enforced prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	
28	AEROSP	215	MOD	Enforced prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	

33	AEROSP	225	MOD	Enforced prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	
38	AEROSP	285	Deletion		FA 2020		X		
41	AEROSP	315	MOD	Enforced prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	
45	AEROSP	325	MOD	Enforced prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	
50	AEROSP	335	MOD	Enforced Prerequisites removed	FA 2020		X	Change prerequisites from enforced to advisory	
50	AEROSP	350	NEW	Enforced Prerequisites removed	FA 2020		X		
55	AEROSP	567	NEW	Enforced prerequisites removed	FA 2020		X	Change course credit type to include Undergraduate Engineering and change instructor consent	
70	MECHENG	516	NEW	Change to class title	FA 2020		X		
73	CHE	296	NEW	New special topics course	FA 2020		X	Conditionally approved pending title change of CHE 496 and CARF submission	
76	NERS	320	MOD	Course description and title updated	FA 2020		X	Include changes to sample schedule	

MEMORANDUM

TO: Dale Karr, Chair, College of Engineering Curriculum Committee

FROM: Diann Brei, Chair Integrative Systems + Design
Chinedum Okwudire, Associate Chair Integrative Systems +Design
Emmanuelle Marquis, Curriculum Chair, Materials Science and Engineering

DATE:

RE: Request for Approval for Sequential Master of Engineering/B.S.E. Programs with Materials Science and Engineering

The Integrative Systems + Design (ISD) Division plans to admit Materials Science and Engineering (MS&E) undergraduate students with greater than 3.2 GPA as the Sequential Undergraduate/ Graduate Study (SUGS) students in the following four ISD Master of Engineering (MEng) programs:

- Automotive Engineering (AUTO)
- Energy Systems Engineering (ESE)
- Global Automotive and Manufacturing Engineering (GAME)
- Systems Engineering + Design (SE+D)

The template for SUGS programs as approved by the College of Engineering in 1996 and the revision of 1999 will be followed. MS&E undergraduate students who have completed 80 or more credits of course work should begin advising with an ISD graduate coordinator, and can apply to one of the four ISD MEng programs during the first term of their senior year. Students will be reviewed and consider for admissions following the standard ISD admission process and criteria.

Students must meet all requirements for both MS&E BSE and ISD Master of Engineering degrees. The MS&E undergraduate Science and Technical Electives (STE) and general electives (GE) courses which fulfill the undergraduate degree requirements can be “doubled counted” up to 9 credit hours in the curriculum of one of the four ISD programs as delineated in the appendix. Future courses can be double counted once approved through the ISD course approval process.

A maximum of 15 credit hours taken outside the ISD MEng career may be allowed toward the MEng degree. This includes credits that are double counted, transferred from the U-M undergraduate program, and transferred from outside of U-M. All double-counted and transfer courses must have grades of "B" or above and be able to fit into the MEng degree requirements.

Students should consult with MS&E undergraduate advisor as well as the ISD graduate coordinator and submit a SUGS/MEng Plan of Study, which lists courses that will be double-counted as well as the courses that are selected to fulfill curriculum requirements in an ISD program.

The following pages include:

Appendix 1A, 2A, 3A, and 4A includes the curriculum for each of the four ISD Master of Engineering programs.

- Each program curriculum shows the course number, course title, number of credits and where course fits in the program curriculum.
- The third column of each program curriculum indicates if the course satisfies a **Materials Science and Engineering BSE elective requirement:**
 - *STE = Science & Technical elective*
 - *GE = General elective*

Appendices 1B, 2B, 3B, and 4B include a sample BSE/Master of Engineering schedule with a complete sample plan of study for a SUGS student to fulfill all Materials Science & Engineering BSE and Master of Engineering degree requirements within a ten-term period.

- Courses are grouped by degree requirement.
- Double-counted or transferrable courses are denoted in the second column (DC/T).
- Credit hours are shown by term and totaled for each degree requirement, each term, and for the overall degree.

Appendices by Program:

(BSE) Materials Science & Engineering and Master of Engineering in Automotive Engineering

- [Appendix 1A](#): Master of Engineering in Automotive Engineering Curriculum (AUTO) (**Pages 3-4**)
- [Appendix 1B](#): (BSE) Materials Science & Engineering / (AUTO) Master of Engineering in Automotive Engineering Sample Schedule (**Page 5**)

(BSE) Materials Science & Engineering and Master of Engineering in Energy Systems Engineering

- [Appendix 2A](#): Master of Engineering in Energy Systems Engineering Curriculum (ESE) (**Pages 6-7**)
- [Appendix 2B](#): (BSE) Materials Science & Engineering / (ESE) Master of Engineering in Energy Systems Engineering Sample Schedule (**Page 8**)

(BSE) Materials Science & Engineering and Master of Engineering in Global Automotive and Manufacturing Engineering

- [Appendix 3A](#): Master of Engineering in Global Automotive and Manufacturing Engineering Curriculum (GAME) (**Pages 9-11**)
- [Appendix 3B](#): (BSE) Materials Science & Engineering / (GAME) Master of Engineering in Global Automotive and Manufacturing Engineering Sample Schedule (**Page 12**)

(BSE) Materials Science & Engineering and Master of Engineering in Systems Engineering + Design

- [Appendix 4A](#): Master of Engineering in Systems Engineering + Design Curriculum (SE+D) (**Pages 13-14**)
- [Appendix 4B](#): (BSE) Materials Science & Engineering / (SE+D) Master of Engineering in Systems Engineering + Design Sample Schedule (**Page 15**)

Appendix 1A: Master of Engineering in Automotive Engineering Curriculum (AUTO)

The Master of Engineering in Automotive Engineering requires 30 credit-hours of course work:

- At least 24 credit-hours must be letter-graded (A-E) coursework. (Check with specific program for any exceptions.)
- 503 Projects/Practicums are graded Satisfactory/Unsatisfactory
- At least 24 credit-hours must be in courses 500-level or above. (Check with specific program for any exceptions.)
- No more than 6 credit-hours can be transferred from another institution. (Required approval by program committee).
- A minimum grade point average of 3.0/4.0 (i.e., a “B” average) is required for graduation.
- Complete all of the courses on the approved POS within five years from the date of first enrollment.

Course list below shows **course number**, **course title** and where the course fits in the Automotive Engineering Curriculum.

The third column indicates if the course satisfies a **Materials Science and Engineering BSE elective requirement**:

- **STE** = Science & Technical elective (should not be taken as required MSE Selective or elective)
- **GE** = General elective (should not be taken as required MSE Selective or elective)

A. Engineering Core (9 credits) (Courses must be taken in at least 2 of the 3 areas.)

1. Powertrain			
MECHENG 438	Internal Combustion Engines OR	GE, STE	4
MECHENG 538	Advanced Internal Combustion Engines	GE, STE	3
AUTO 563	Dynamics and Controls of Automatic Transmissions	GE, STE	3
MECHENG 566	Hybrid Electric Vehicles	GE, STE	3
2. Structures and Dynamics			
ISD 599B	Modeling and Analysis of Vehicle Systems	GE, STE	3
MECHENG 458	Automotive Engineering OR	GE, STE	3
MECHENG 542	Vehicle Dynamics	GE, STE	3
AUTO/MECHENG 513	Automotive Body Structures	GE, STE	3
3. Electrical Systems and Software			
EECS 418	Power Electronics	GE, STE	4
EECS 419	Electric Machinery and Drives	GE, STE	4
EECS 461	Embedded Control Systems	GE, STE	4

B. Engineering Electives (9 credits) (At least 6 credits must come from a selected specialty area)

1. Powertrain			
MATSCI 577	Failure Analysis	GE, STE	3
MECHENG 438	Internal Combustion Engines OR	GE, STE	4
MECHENG 538	Advanced Internal Combustion Engines	GE, STE	3
MECHENG 566	Hybrid Electric Vehicles	GE, STE	3
MECHENG 432	Combustion OR	GE, STE	3
MECHENG 532	Advanced Combustion	GE, STE	3
AUTO 533	Advanced Energy Solutions	GE, STE	3
AUTO 563	Dynamics and Control of Automatic Transmissions	GE, STE	3
CHE 696	Fuel Cells and Fuel Processors		3
2. Dynamics and Control			
MECHENG 440	Intermediate Dynamics and Vibrations OR	GE, STE	3
MECHENG 540	Intermediate Dynamics	GE, STE	3
MECHENG 458	Automotive Engineering OR	GE, STE	3

MECHENG 542	Vehicle Dynamics	GE, STE	3
MECHENG 560	Modeling Dynamic Systems	GE, STE	3
AUTO 563	Dynamics and Control of Automatic Transmissions	GE, STE	3
MECHENG 568	Vehicle Control Systems	GE, STE	3
MECHENG 569	Control of Advanced Powertrain Systems	GE, STE	3
MECHENG 565	Battery Systems and Control	GE, STE	3
EECS 460	Control Systems Analysis and Design OR	GE, STE	4
MECHENG 461	Automatic Control	GE, STE	3
EECS/MECHENG 561	Digital Control Systems	GE, STE	3
EECS 560/ MECHENG 564	Linear Systems Theory	GE, STE	4
EECS 565	Linear Feedback Control Systems	GE, STE	3
EECS 568	Mobile Robotics: Methods and Algorithms	GE, STE	4
ME 599/CEE 599/ ROB 599/ISD 599G	Dynamics and Control of Connected Vehicles	GE, STE	3
3. Noise, Vibration and Harshness			
MECHENG 440	Intermediate Dynamics and Vibrations OR	GE, STE	4
MECHENG 540	Intermediate Dynamics	GE, STE	3
MECHENG 524	Advanced Engineering Acoustics	GE, STE	3
MECHENG 541	Mechanical Vibrations	GE, STE	3
4. Materials			
MATSCI 420	Mechanical Behavior of Materials		3
MATSCI 514	Composite Materials	GE, STE	3
MATSCI 577	Failure Analysis	GE, STE	3
MATSCI 593	Elements of ICME (Integrated Computational Materials Engineering)	GE, STE	3
MECHENG 517	Mechanics of Polymers I	GE, STE	3
MECHENG 571	Energy Generation and Storage Using Modern Materials	GE, STE	3
5. Electronics and Software			
EECS 418	Power Electronics	GE, STE	4
EECS 419	Electric Machinery and Drives	GE, STE	4
EECS 442	Computer Vision	GE, STE	4
EECS 461	Embedded Control Systems	GE, STE	4
EECS 498	Grid Integration of Alternative Energy Sources	GE, STE	3
MECHENG 552	Mechatronics	GE, STE	4

C. Management and Human Factors (6 credits)

IOE 437	Automotive Human Factors	GE, STE	3
IOE 461/ MFG 461	Quality Engineering Principles and Analysis	GE, STE	3
IOE 533/MFG 535	Human Motor Behavior and Engineering Systems	GE, STE	3
IOE 561/ISD 523	Risk Analysis I	GE, STE	3
ISD 520	Introduction to Systems Engineering	GE	3
ISD 599D	Systems Architecting, Concept Development & Embodiment Design	GE, STE	3
ISD 559F	Vehicle Crashworthiness and Occupant Protection	GE, STE	3
MFG 599	Designing in Quality		3

D. Automotive Engineering - Seminar and Capstone Project (6 credits)

AUTO 501	Integrated Vehicle Systems Design	GE, STE	3
AUTO 503	Automotive Engineering Project	GE, STE	3

Appendix 1B: Sample Schedule (BSE) Materials Science & Engineering / (AUTO) Master of Engineering in Automotive Engineering

A complete plan of study for a SUGS student to fulfill all (BSE) Materials Science & Engineering and Master of Engineering in Automotive Engineering degree requirements within a ten-term period. Courses are grouped by degree requirement. Double-counted or transferrable courses are denoted (DC/T). Credit hours are shown by term and totaled for each degree requirement, each term, and for the overall degree.

Sample Schedule B.S.E. (Materials Science & Engineering)/MEng (Automotive Engineering)													
BSE (Materials Science & Engineering)				Undergraduate Terms								Graduate Terms	
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Engineering Core (52-55 hrs.)													
MATH 115, 116, 215, and 216+		16	4	4	4	4							
ENGR 100		4	4										
ENGR 101		4		4									
CHE 125/126 and 130 or CHE 210 and 211		5	5										
PHYS 140 with Lab 141		5		5									
PHYS 240 with Lab 241		5			5								
Intellectual Breadth		16	3	4				3		6			
Science and Technical electives (STE) (=>13 hrs.)													
MECHENG 211: intro solid mech. (required)		4			4								
MECHENG 240: intro dynamics vib. (elective)		4				4							
STATS 412 (required math elective)		3				3							
MECHENG 311 (elective)		3					3						
MS&E Core (45 hrs.)													
MATSCIE 220/250: Intro to MSE		4			4								
MATSCIE 242: Physics of materials		4				4							
MATSCIE 330: Thermodynamics of Materials		4					4						
MATSCIE 335: Kinetics		4						4					
MATSCIE 350: Structures		4					4						
MATSCIE 360: Lab I		3					3						
MATSCIE 365: Lab II		3						3					
MATSCIE 420: Mechanical Properties of Materials		3					3						
MATSCIE 481: Sustainable Design		3							3				
MATSCIE 482: Process Design		3								3			
MATSCIE 514 (selective): Composites		3						3					
MATSCIE 470 (selective): Physical Metallurgy		3							3				
MATSCIE 454 (selective): Computational Materials		3							3				
MATSCIE 412: Polymers (elective)		3						3					
General Electives (<=13 hours)													
MECHENG 440: Intermediate Dynamics (Noise, vib. Harsh.)	DC	4							4				
MECHENG 542: Vehicle Dynamics (Struct. & Dyn)	DC	3								3			
IOE 202: Operations Modeling (elective)		2							2				
STATS/DATASCI 413: Applied Regression Analysis (elective)		3								3			
Total BSE Program Credits		128	16	17	17	15	17	16	15	15	0	0	
MEng (Automotive Engineering Program)				Undergraduate Terms								Graduate Terms	
Course	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Engineering Core (9 hrs.)													
AUTO 563: Dynamics & Control Autom. Trans. (Powertrain)		3										3	
MECHENG 542: Vehicle Dynamics (Struct. & Dyn)	DC	3								3			
AUTO/MECHENG 513: Auto. Body Struct. (Struct. & Dyn)		3										3	
Engineering Electives (9 hrs.)													
AUTO 533: Advanced Energy Solutions (Powertrain)		3										3	
MECHENG 440: Intermediate Dynamics (Noise, vib. Harsh.)	DC	4							4				
MECHENG 541: Mechanical Vibrations (Noise, vib. Harsh.)		3										3	
Management + Human Factors (6 hrs.)													
AUTO 512: Lean Program Engineering		3										3	
ISD 520: Introduction to Systems Engineering		3										3	
Seminars + Capstone (6 hrs.)													
AUTO 501: Integrated Vehicle Systems Design		3										3	
AUTO 503: Automotive Engineering Project		3										3	
Total MEng Program Credits		31	0	0	0	0	0	0	4	3	12	12	

Appendix 2A: Master of Engineering in Energy Systems Engineering Curriculum (ESE)

The Master of Engineering in Energy Systems Engineering requires 30 credit-hours of course work:

- At least 24 credit-hours must be letter-graded (A-E) coursework. (Check with specific program for any exceptions.)
- 503 Projects/Practicums are graded Satisfactory/Unsatisfactory
- At least 24 credit-hours must be in courses 500-level or above. (Check with specific program for any exceptions.)
- No more than 6 credit-hours can be transferred from another institution. (Required approval by program committee).
- A minimum grade point average of 3.0/4.0 (i.e., a “B” average) is required for graduation.
- Complete all of the courses on the approved POS within five years from the date of first enrollment

Course list below shows **course number, course title, credits hours** and where course fits in the Energy Systems Engineering Curriculum.

The third column of each program curriculum indicates if the course satisfies a **Materials Science and Engineering BSE elective requirement:**

- **STE** = Science & Technical elective (should not be taken as required MSE Selective or elective)
- **GE** = General elective (should not be taken as required MSE Selective or elective)

A. Engineering Core and Energy Systems Seminar (12 credits)

Three of the four courses are required (12 credits total). Through these courses, students are exposed to different energy technologies, and advanced energy systems.

Select the following three required core courses:			
ESENG 505/ME 571	Energy Technologies	GE, STE	3
AUTO 533/ME 433	Advanced Energy Solutions	GE, STE	3
ESENG 501	Seminars on Energy Systems, Technology and Policy		3
And, select a fourth course to fulfill 12 credit hour core requirements:			
MECHENG 589	Ecological Sustainability in Design and Manufacturing	GE, STE	3
See graduate coordinator for complete list of other approved courses.			

B. Energy Analysis (6 credits)

Students take 6 credits (two courses) in this area to highlight the breadth of energy systems. The courses are from varied areas: finance, natural resources, public policy, and a wide scope of different engineering courses. To obtain a full list of approved courses, see graduate coordinator.

CEE 564/ESENG 599	Greenhouse Gas Control	GE, STE	3
CEE 567/ESENG 567	Energy Infrastructure Systems	GE, STE	3
EAS 574/PPOL 519	Sustainable Energy Systems	GE	3
IOE 434	Human Error and Complex System Failures	GE, STE	3
MATSCI 454	Computational Tools for Material Science	GE, STE	3
MECHENG 565	Battery Systems and Control	GE, STE	3

C. Energy Systems Specialty (9 credits)

These courses are designed to give students depth within one of three concentrations: Energy Generation, Distribution and Usage; Transportation Power; and Sustainable Chemical Conversion. Students must take three courses in this group (9 credits). Choose two from same area; one may come from another area. To obtain a full list of approved courses, see graduate coordinator.

1. Energy Distribution, Generation and Usage (example courses below)			
AUTO 501	Integrated Vehicles Systems Design	GE, STE	3
CEE 567/ESENG 567	Energy Infrastructure Systems	GE, STE	3
CHE 696	Fuel Cells & Fuel Processors		3

MATSCI 454	Computational Tools for Material Science	GE, STE	3
MECHENG 565	Battery Systems & Control	GE, STE	3
MECHENG 566	Modeling Analysis and Control of Hybrid Electric Vehicles	GE, STE	3
2. Transportation Power (example courses below)			
AUTO 563	Dynamics & Controls of Automatic Transmissions	GE, STE	3
CEE 567/ESENG 567	Energy Infrastructure Systems	GE, STE	3
MECHENG 438	Internal Combustion Engines	GE, STE	3
MECHENG 489	Sustainable Engineering & Design	GE, STE	3
MECHENG 569	Advanced Powertrain Controls	GE, STE	3
3. Sustainable Chemical Conversion (example courses below)			
CEE 564/ESENG 599	Greenhouse Gas Control	GE, STE	3
CHE 696	Fuel Cells & Fuel Processors		3
ENGR 521	Clean Technology Entrepreneurship	GE	3
EAS 574/PPOL 519	Sustainable Energy Systems	GE	3

D. Energy Systems Capstone Project (3 credits)

ESENG 503	Energy Systems Engineering Project		3
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Appendix 2B. Sample Schedule (BSE) Materials Science & Engineering/(ESE) Master of Engineering in Energy Systems Engineering

The following table shows a complete plan of study for a SUGS student to fulfill all (BSE) Materials Science & Engineering BSE and Master of Engineering in Energy Systems Engineering degree requirements within a ten-term period. Courses are grouped by degree requirement. - Double-counted or transferrable courses are denoted in the second column (DC/T). - Credit hours are shown by term and totaled for each degree requirement, each term, and for the overall degree.

Sample Schedule B.S.E. (Materials Science & Engineering)/MEng (Energy Systems Engineering)												
BSE (Materials Science & Engineering)			Undergraduate Terms								Graduate Terms	
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10
Engineering Core (52-55 hrs.)												
MATH 115, 116, 215, and 216+		16	4	4	4	4						
ENGR 100		4	4									
ENGR 101		4		4								
CHE 125/126 and 130 or CHE 210 and 211		5	5									
PHYS 140 with Lab 141		5		5								
PHYS 240 with Lab 241		5			5							
Intellectual Breadth		16	3	4				3		6		
<i>Engineering Core Subtotal</i>		55										
Science and Technical electives (STE) (=>13 hrs.)												
MECHENG 211: intro solid mech. (required)		4			4							
STATS 412 (required math elective)		3				3						
CEE 265: Sustainable Engineering Principles (elective)		3				3						
STATS/DATASCI 413: Applied Regression Analysis (elective)		3						3				
<i>Related Program Subtotal</i>		13										
MS&E Core (45 hrs.)												
MATSCIE 220/250: Intro to MSE		4			4							
MATSCIE 242: Physics of materials		4				4						
MATSCIE 330: Thermodynamics of Materials		4					4					
MATSCIE 335: Kinetics		4						4				
MATSCIE 350: Structures		4					4					
MATSCIE 360: Lab I		3						3				
MATSCIE 365: Lab II		3							3			
MATSCIE 420: Mechanical Properties of Materials		3						3				
MATSCIE 481: Sustainable Design		3								3		
MATSCIE 482: Process Design		3									3	
MATSCIE 514 (selective): Composites		3							3			
MATSCIE 470 (selective): Physical Metallurgy		3								3		
MATSCIE 454 (selective): Computational Materials		3									3	
MATSCIE 412: Polymers (elective)		3							3			
<i>MS&E Core Subtotal</i>		47										
General Electives (<=13 hours)												
AUTO 533/ME 433: Advanced Energy Solutions (elective)	DC	3								3		
ESENG 505/ME 571: Energy Technologies (elective)	DC	3									3	
ENG 355: Intermediate Multidisciplinary Engineering Project (elective)		4								4		
MSE490: Independent research (elective)		3									3	
<i>Electives Subtotal</i>		13										
Total BSE Program Credits		128	16	17	17	14	17	16	16	15	0	0
MEng (Energy Systems Engineering)												
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10
Engineering Core and Energy Systems Seminar (12 hrs. from Group A)												
ESENG 505/ME 571: Energy Technologies	DC	3								3		
AUTO 533/ME 433: Advanced Energy Solutions	DC	3									3	
ESENG 501: Seminars on Energy Systems, Technology and Policy		3										3
MECHENG 589: Ecological Sustainability in Design and Manufacturing		3										3
<i>Core Subtotal</i>		12										
Energy Analysis (6 hrs. from Group B)												
CEE 564/ESENG 599: Greenhouse Gas Control		3										3
EAS 574/PPOL 519: Sustainable Energy Systems		3										3
<i>Energy Subtotal</i>		6										
Specialty Elective (9 hrs. from Group C)												
AUTO 501: Integrated Vehicles Systems Design		3										3
ENGR 521: Clean Technology Entrepreneurship		3										3
CEE 567/ESENG 567: Energy Infrastructure Systems		3										3
<i>Specialty. Subtotal</i>		9										
Capstone (3 hrs. from Group D)												
ESENG 503: Energy Systems Engineering Project		3										3
<i>Capstone Subtotal</i>		3										
Total MEng Program Credits		30	0	0	0	0	0	0	0	3	3	12

Appendix 3A: Master of Engineering in Global Automotive and Manufacturing Engineering Curriculum (GAME)

The Master of Engineering in Global Automotive and Manufacturing Engineering requires 30 credit-hours of course work:

- At least 24 credit-hours must be letter-graded (A-E) coursework. (Check with specific program for any exceptions.)
- 503 Projects/Practicums are graded Satisfactory/Unsatisfactory
- At least 24 credit-hours must be in courses 500-level or above. (Check with specific program for any exceptions.)
- No more than 6 credit-hours can be transferred from another institution. (Required approval by program committee).
- A minimum grade point average of 3.0/4.0 (i.e., a “B” average) is required for graduation.
- Complete all of the courses on the approved POS within five years from the date of first enrollment

Course list below shows **course number**, **course title**, **credits hours** and where course fits in the Global Automotive and Manufacturing Engineering Curriculum.

The third column of each program curriculum indicates if the course satisfies a **Materials Science and Engineering BSE elective requirement**:

- **STE** = Science & Technical elective (should not be taken as required MSE Selective or elective)
- **GE** = General elective (should not be taken as required MSE Selective or elective)

A. Systems Integration (9 credits) (AUTO 501, ISD 520, and MFG 502/MECHENG 483 are required)

AUTO 501	Integrated Vehicle System Design (DL)	GE, STE	3
ISD 520	Systems Engineering (DL)	GE, STE	3
MFG 502/MECHENG 483	Manufacturing Systems Design (DL)	GE, STE	3

B. Engineering Core (6 credits) Select a minimum of 6 credit-hours from the list of Engineering Core courses.

DESCI 501	Analytical Product Design	GE, STE	3
EECS 569/MFG 564	Production Systems Eng. (DL)	GE, STE	3
IOE 461/MFG 461	Quality Engineering Principles and Analysis (DL)	GE, STE	3
ISD 599B	Modeling and Analysis of Vehicle Systems (DL)	GE, STE	3
ISD 599D	System Architecting, Concept Development and Embodiment	GE, STE	3
MECHENG 452/MFG 452/ISD 528	Design for Manufacturability (DL) (ISD 528 Advanced Design for Mfg is considered 500 level)	STE	3
MECHENG 587/MFG 587	Global Manufacturing (DL)	STE	3
MECHENG 555/MFG 555	Design Optimization (DL)	STE	3
MECHENG 566/AUTO 566	Modeling, Analysis and Control of Veh Sys	GE, STE	3
MFG 599B	Design in Quality: Design for Six Sigma (DL)		3

C. Business Integration (3 credits)

ACC 501	Principles of Financial Accounting	GE	3
ACC 551	Managerial Accounting	GE	
BE 501	Applied Microeconomics	GE	3
ENGR 410	Patents Fundamentals for Engineers – inconsistently offered	GE	
ENGR 520	Entrepreneurial Business Fundamentals for Scientists and Engineers	GE	3
ENGR 521	Clean Tech Entrepreneurship	GE	1.5
ES 512	Business Basics for Graduates		3
FIN 551	Financial Management and Policy	GE	3

IOE 440/MFG 440	Operations Analysis & Management (If counting IOE 440/MFG 440, can't count MFG 605)	GE, STE	3
IOE 452/MFG 455	Corporate Finance	GE, STE	3
IOE 533/MFG 535	Human Factors in Engineering Systems I	GE, STE	3
IOE 543/MFG 543	Scheduling	GE, STE	3
ISD 599C	Development and Verification of System Design (DL)	GE	3
ISD 599D	System Architecting, Concept Development and Embodiment Design (DL)	GE	3
MKT 501	Marketing Management	GE	3
MO 501	Human Behavior and Organization	GE	3
STRAT 566	Systems Thinking for Sustainable Development and Enterprise - Organizational Behavior	GE	3
STRAT 601	Corporate Strategy - Organizational Behavior	GE	3
TO 501	Applied Business Statistics	GE	3
TO 551	Introduction to Operations	GE	3
TO 605/MFG 605	Manufacturing and Supply Operations (If counting MFG 605/TO 605, can't count IOE 440)	GE, STE	3

D. Specialties (9 credits) A minimum of 6 credit-hours must come from a selected specialty, an additional 3 credit-hours may come from the selected specialty, any other specialty, or from the engineering core courses.

1. Advanced Powertrains			
AUTO 533/MECHENG 433	Advanced Energy Solutions (DL)	GE, STE	3
AUTO 563	Dynamics and Control of Automatic Transmissions (DL)	GE, STE	3
CEE 567	Energy Infrastructure Systems (DL)	GE, STE	3
CHE 696	Fuel Cells and Fuel Processors (DL)		3
EECS 419	Electric Machinery and Drive	GE, STE	4
ESENG 505/MECHENG 571/CHE696	Energy Generation and Storage Using Modern Materials (DL)	GE, STE	3
MATSCI 454	Computational Tools for Material Science	GE, STE	3
MATSCI 470	Physical Metallurgy	GE, STE	3
MATSCI 514/MFG 514	Composite Materials (DL)	GE, STE	3
MATSCI 593	Elements of ICME (integrated Computational Materials Engineering)	GE, STE	3
MECHENG 438	Internal Combustion Engines (DL)	GE, STE	4
MECHENG 538	Advanced Internal Combustion Engines	GE, STE	3
MECHENG 566/AUTO 566	Modeling, Analysis, and Control of Hybrid Electric Vehicles (DL)	GE, STE	3
2. Advanced Vehicle Manufacturing			
EECS 569/MFG 564	Production Systems Engineering (DL)	GE, STE	3
IOE 547/MFG 547	Supply Chain Management	GE	3
MECHENG 482/MFG 492	Machining Processes (DL Winter Odd Years)	GE, STE	3
MATSCI 454	Computational Tools for Material Science	GE, STE	3
MATSCI 520	Advanced Mechanical Properties	GE, STE	3
MATSCI 577	Failure Analysis	GE, STE	3
MECHENG 487/MFG 488	Welding	GE, STE	3
MECHENG 584/MFG 584	Advanced Mechatronics for Manufacturing	GE, STE	3
MECHENG 586/MFG 591	Laser Materials Processing	GE, STE	3
MECHENG 587/MFG 587	Global Manufacturing (DL)	GE, STE	3
MECHENG 588/MFG 588	Assembly for Design and Manufacturing (DL)	GE, STE	3
MECHENG 589	Sustainable Design of Technological Systems (DL)	GE, STE	3
MECHENG 599	Metals Processing		3

NAVARCH 514/MFG 515	Fatigue of Structures (DL)	GE, STE	3
3. Chassis and Advanced Materials			
ESENG 505/MECHENG 571/CHE696	Energy Generation and Storage Using Modern Materials (DL)	GE, STE	3
MATSCI 454	Computational Tools for Material Science	GE, STE	3
MATSCI 470	Physical Metallurgy	GE, STE	3
MATSCI 514/MFG 514	Composite Materials (DL)	GE, STE	3
MATSCI 520	Advanced Mechanical Properties	GE, STE	3
MATSCI 577	Failure Analysis	GE, STE	3
MATSCI 593	Elements of ICME (integrated Computational Materials Engineering)	GE, STE	3
MECHENG 513/AUTO 513/MFG 513	Automotive Body Structures (DL)	GE, STE	3
MECHENG 505	Finite Element Methods in Mechanical Engineering	GE, STE	3
MECHENG 542	Vehicle Dynamics (DL)	GE, STE	3
MECHENG 555/MFG 555	Design Optimization (DL)	GE, STE	3
NAVARCH 514/MFG 515	Fatigue of Structures (DL)	GE, STE	3
MECHENG 517	Mechanics Polymers	GE, STE	3
4. Electrification			
AUTO 533/MECHENG 433	Advanced Energy Solutions (DL)	GE, STE	3
CHE 696	Fuel Cells and Fuel Processors (DL)		3
EECS 414	Introduction to MEMS	GE, STE	4
EECS 514	Advanced MEMS	GE, STE	4
EECS 515	Integrated Microsystems	GE, STE	4
MECHENG 552/MFG 552	Mechatronic Systems Design	GE, STE	3
MECHENG 553/MFG 553	Microelectromechanical Systems	GE, STE	3
MECHENG 565	Battery Systems and Control (DL)	GE, STE	3
MECHENG 566/AUTO 566	Modeling, Analysis, and Control of Hybrid Electric Vehicles (DL).	GE, STE	3
5. Intelligent Vehicle Systems and Design			
EECS 414	Introduction to MEMS (DL)	GE, STE	4
EECS 455	Digital Communication Signals and Systems	GE, STE	4
EECS 514	Advanced MEMS	GE, STE	4
EECS 515	Integrated Microsystems	GE, STE	4
ISD 599A	Software Systems Engineering	GE, STE	3
ISD 599D	System Architecting and System Embodiment (DL)	GE, STE	3
ISD 599F	Vehicle Crashworthiness and Occupant Protection (DL)	GE, STE	3
MECHENG 489	Sustainable Engineering in Design (DL)	GE, STE	3
MECHENG 552/MFG 552	Mechatronic Systems Design	GE, STE	3
MECHENG 553/MFG 553	Microelectromechanical Systems	GE, STE	3
MECHENG 599/ROB 500/NA 599	Self-Driving Cars: Perception & Control	GE, STE	3
6. Vehicle Performance and Controls			
AUTO 563	Dynamics and Control of Automatic Transmissions (DL)	GE, STE	3
EECS 460	Control Systems Analysis and Design	GE, STE	4
ISD 599B	Modeling and Analysis of Vehicle Systems (DL) (section 003 on campus, section 883 online)	GE, STE	3
ISD 599F	Vehicle Crashworthiness and Occupant Protection	GE, STE	3
ME 599/CEE 599/ROB 599/ISD 599G	Dynamics and Control of Connected Vehicles (DL)	GE, STE	3

MECHENG 440	Intermediate Dynamics and Vibrations OR	GE, STE	4
MECHENG 540	Intermediate Dynamics	GE, STE	3
MECHENG 461	Automatic Control	GE, STE	3
MECHENG 513/AUTO 513/MFG 513	Automotive Body Structures (DL)	GE, STE	3
MECHENG 541	Mechanical Vibration	GE, STE	3
MECHENG 542	Vehicle Dynamics (DL)	GE, STE	3
MECHENG 560/MFG 562	Modeling Dynamic Systems	GE, STE	3
MECHENG 564	Linear Systems Theory	GE, STE	4
MECHENG 566/AUTO 566	Modeling, Analysis, and Control of Hybrid Electric Vehicles (DL).	GE, STE	3
MECHENG 569	Control of Advanced Powertrain Systems (DL F17, F19)	GE, STE	3
MECHENG 599/ROB 599/NA 599	Self-Driving Cars: Perception & Control	GE, STE	3

CEE 564 Greenhouse Gas Control 3 credits (DL) may be used as the third course in any of the above specialties.

E. Project Requirement (3 credits): Specialty defines project identification.

AUTO 503	Automotive Engineering Project (DL) OR		3
MFG 503	Manufacturing Project (DL)		3

Appendix 3B: Sample Schedule (BSE) Materials Science & Engineering/(GAME) Master of Engineering in Global Automotive and Manufacturing)

The following table shows a complete plan of study for a SUGS student to fulfill all (BSE) Materials Science & Engineering and Master of Engineering in Global Automotive and Manufacturing Engineering degree requirements within a ten-term period. Courses are grouped by degree requirement. Double-counted or transferrable courses are denoted in the second column (DC/T). Credit hours are shown by term and totaled for each degree requirement, each term, and for the overall degree.

Sample Schedule B.S.E. (Materials Science & Engineering)/MEng (Global Automotive and Manufacturing Engineering)													
BSE (Materials Science & Engineering)				Undergraduate Terms								Graduate Terms	
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Engineering Core (52-55 hrs.)													
MATH 115, 116, 215, and 216+		16	4	4	4	4							
ENGR 100		4	4										
ENGR 101		4		4									
CHE 125/126 and 130 or CHE 210 and 211		5	5										
PHYS 140 with Lab 141		5		5									
PHYS 240 with Lab 241		5			5								
Intellectual Breadth		16	3	4				3		6			
<i>Engineering Core Subtotal</i>		55											
Science and Technical electives (STE) (=>13 hrs.)													
MECHENG 211: intro solid mech. (required)		4			4								
STATS 412 (required math elective)		3				3							
MECHENG 250: Design and Manufacturing I (elective)		4				4							
IOE 366: Linear Statistical Models (elective)		3					3						
<i>Related Program Subtotal</i>		14											
MS&E Core (45 hrs.)													
MATSCIE 220/250: Intro to MSE		4			4								
MATSCIE 242: Physics of materials		4				4							
MATSCIE 330: Thermodynamics of Materials		4					4						
MATSCIE 335: Kinetics		4						4					
MATSCIE 350: Structures		4					4						
MATSCIE 360: Lab I		3						3					
MATSCIE 365: Lab II		3							3				
MATSCIE 420: Mechanical Properties of Materials		3					3						
MATSCIE 481: Sustainable Design		3							3				
MATSCIE 482: Process Design		3								3			
MATSCIE 514 (selective): Composites		3								3			
MATSCIE 470 (selective): Physical Metallurgy		3							3				
MATSCIE 454 (selective): Computational Materials		3								3			
MATSCIE 412: Polymers (elective)		3						3					
<i>MS&E Core Subtotal</i>		47											
General Electives (<=13 hours)													
MECHENG 571: Energy Gen. & Storage Using Modern Materials (elective)	DC	3							3				
MECHENG 586/MFG 591: Laser Materials Processing (elective)	DC	3								3			
CEE 265: Sustainable Engineering Principles (elective)		3						3					
MSE490: Independent project (elective)		3								3			
<i>Electives Subtotal</i>		12											
Total BSE Program Credits		128	16	17	17	15	17	16	15	15	0	0	
MEng (GAME)													
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Systems Integration (9 hrs. from Group A)													
AUTO 501		3									3		
ISD 520		3										3	
MFG 502/MECHENG 483		3									3		
<i>Sys Integ Subtotal</i>		9											
Engineering Core (6 hrs. from Group B)													
EECS 569		3									3	3	
IOE 461/MFG 461		3									3	3	
<i>Eng Core Subtotal</i>		6											
Business Integration (3 hrs. from Group C)													
MFG 605/TO 605		3									3		
<i>Business Subtotal</i>		3											
Specialties (9 hrs. from Group D)													
AUTO 533/MECHENG 433: Advanced Energy Solutions		3										3	
MECHENG 571: Energy Generation and Storage Using Modern Materials	DC	3							3				
MECHENG 589 Sustainable Design of Technological Systems	DC	3								3			
<i>Specialty Subtotal</i>		9											
Project Requirement (3 hrs. from Group E)													
MFG 503: Manufacturing Project		3										3	
<i>Project Subtotal</i>		3											
Total MEng Program Credits		30	0	0	0	0	0	0	3	3	12	12	

Appendix 4A: Master of Engineering in Systems Engineering + Design Curriculum (SE+D)

The Systems Engineering and Design MEng degree requires 30 credit hours of course work with:

- At least 24 credit-hours must be letter-graded (A-E) coursework. (Check with specific program for any exceptions.)
- 503 Projects/Practicums are graded Satisfactory/Unsatisfactory
- At least 24 credit-hours must be in courses 500-level or above. (Check with specific program for any exceptions.)
- No more than 6 credit-hours can be transferred from another institution. (Required approval by program committee).
- A minimum grade point average of 3.0/4.0 (i.e., a “B” average) is required for graduation.
- Complete all of the courses on the approved POS within five years from the date of first enrollment

Course list below shows **course number**, **course title**, **credits hours** and where course fits in the Systems Engineering + Design Curriculum.

The third column of each program curriculum indicates if the course satisfies a **Materials Science and Engineering BSE elective requirement**:

- **STE** = Science & Technical elective (should not be taken as required MSE Selective or elective)
- **GE** = General elective (should not be taken as required MSE Selective or elective)

A. Systems Engineering Core (9 credits)

ISD 520	Introduction to Systems Engineering	GE	3
ISD 599-02	Development and Verification of System Design Requirements		3
ISD 599-01	System Architecture, Embodiment, and Optimization		3

B. Systems Engineering Electives (3 credits)

IOE 561/ISD 523	Risk Management	GE	3
ISD 599A	Software Systems Engineering	GE, STE	3
MFG 599B	Design for Six Sigma	GE, STE	3

Note: Systems Engineering Electives also may be taken as part of the Systems Engineering Concentration Area (section C).

C. Concentration Area Electives (9 credits, including one design-focused elective)

Select 3 credits from Design-focused electives listed below:			
MATSCI 454	Computational Tools for Material Science		3
MECHENG/MFG 555	Design Optimization	GE, STE	3
DESCI 501	Analytical Product Design	GE, STE	3
MFG 502	Manufacturing Systems Design	GE, STE	3
NAVARCH 570	Marine Design	GE, STE	3
NERS 561	Nuclear Core Design	GE, STE	3
EECS 561	Design of Digital Control Systems	GE, STE	3
AUTO 501	Integrated Vehicle Design	GE, STE	3
CEE 480	Design of Environmental engineering Systems	GE, STE	3
AEROSP 483	Space Systems Design	GE, STE	3
AEROSP 588	Multidisciplinary Design Optimization	GE, STE	3
Select 6 credits from either Systems Engineering Electives (B) or other Concentration areas. Contact Graduate Coordinator for a full list of courses in Concentration areas (e.g. Software Engineering, Automotive Engineering, Manufacturing Systems, Energy Systems, Aerospace Systems, etc.)			

D. Practicum Courses (9 credits)

EITHER	9-credit practicum		9
OR	6-credit Practicum and 3-credits for a Fundamentals Course - IOE 461 Quality Engineering Principles and Analysis		9
OR	6-credit Practicum with an additional 3-credits from a student's Concentration Area or any Systems Engineering Elective		9

Appendix 4B: Sample Schedule (BSE) Materials Science & Engineering/(SE+D) Master of Engineering in Systems Engineering + Design

The following table shows a complete plan of study for a SUGS student to fulfill all (BSE) Materials Science & Engineering and Master of Engineering in Systems Engineering + Design degree requirements within a ten-term period. Courses are grouped by degree requirement. Double-counted or transferrable courses are denoted in the second column (DC/T). Credit hours are shown by term and totaled for each degree requirement, each term, and for the overall degree.

Sample Schedule B.S.E. (Materials Science & Engineering)/MEng (Systems Engineering + Design)													
BSE (Materials Science & Engineering)			Undergraduate Terms								Graduate Terms		
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Engineering Core (52-55 hrs.)													
MATH 115, 116, 215, and 216+		16	4	4	4	4							
ENGR 100		4	4										
ENGR 101		4		4									
CHE 125/126 and 130 or CHE 210 and 211		5	5										
PHYS 140 with Lab 141		5		5									
PHYS 240 with Lab 241		5			5								
Intellectual Breadth		16	3	4				3		6			
Engineering Core Subtotal		55											
Science and Technical electives (STE) (=>13 hrs.)													
MECHENG 211: intro solid mech. (required)		4			4								
STATS 412 (required math elective)		3				3							
MECHENG 250: Design and Manufacturing I (elective)		4				4							
IOE 366. Linear Statistical Models (elective)		3					3						
Related Program Subtotal		14											
MS&E Core (45 hrs.)													
MATSCIE 220/250: Intro to MSE		4			4								
MATSCIE 242: Physics of materials		4				4							
MATSCIE 330: Thermodynamics of Materials		4					4						
MATSCIE 335: Kinetics		4						4					
MATSCIE 350: Structures		4					4						
MATSCIE 360: Lab I		3					3						
MATSCIE 365: Lab II		3						3					
MATSCIE 420: Mechanical Properties of Materials		3					3						
MATSCIE 481: Sustainable Design		3							3				
MATSCIE 482: Process Design		3								3			
MATSCIE 514 (selective): Composites		3								3			
MATSCIE 470 (selective): Physical Metallurgy		3							3				
MATSCIE 454 (selective): Computational Materials		3							3				
MATSCIE 412: Polymers (elective)		3						3					
MS&E Core Subtotal		47											
General Electives (<=13 hours)													
MFG 599B: Design for Six Sigma (elective)	DC	3							3				
CEE 480: Design of Environmental engineering Systems (elective)	DC	3								3			
CEE 265: Sustainable Engineering Principles (elective)		3						3					
MSE490: Independent project (elective)		3								3			
Electives Subtotal		12											
Total BSE Program Credits		128	16	17	17	15	17	16	12	18	0	0	
MEng (SE+D)													
Course Number	DC/T	Hrs.	1	2	3	4	5	6	7	8	9	10	
Systems Engineering Core (9 hrs. from Group A)													
ISD 520: Introduction to Systems Engineering		3									3		
ISD 599-02: Dev. Verification of System Design Requirements		3										3	
ISD 599-01: System Architecture, Embodiment, and Optimization		3									3		
Core Subtotal		9											
Systems Engineering Electives (3 hrs. from Group B)													
MFG 599B: Design for Six Sigma	DC	3							3				
Electives Subtotal		3											
Concentration Area Electives (9 hrs. from Group C)													
DESCI 501: Analytical Product Design		3									3		
CEE 480: Design of Environmental Engineering Systems	DC	3								3			
MFG 502. Manufacturing Systems Design		3										3	
Concentration Subtotal		9											
Practicum and Fundamentals (9 hrs. from Group D)													
Practicum		3									3		
Practicum		3										3	
IOE 461: Quality Engineering Principles and Analysis		3										3	
Practicum Subtotal		9											
Total MEng Program Credits		30	0	0	0	0	0	0	0	3	3	12	12

Faculty Committee Guidelines for CoE Curriculum Committee

Per Kathleen Grimes, the December faculty meeting revealed that we need to more carefully define how the Curriculum Committee participates in the faculty meetings. Here are the **new guidelines**:

- 1) Only items that require a vote will appear on the agenda
- 2) There will be a maximum of 3 items allowed
- 3) Materials for informational items should still be submitted along with materials for items to be voted on, but they are only for faculty review and will not be presented or discussed at the meeting
- 4) If slides are used, a maximum of 3 slides per item will be allowed.

Joint LSA/CoE Curriculum Committee Meeting

- Meeting will be held on April 14, 2020 in the Michigan Union on central campus
- The meeting is from 3-5 pm, snacks and drinks will be provided
- LSA is requesting a final head count by March 24th, please let us know today if you will be attending. Also please consider any one else that should come to the table to discuss agenda items.
- LSA will also like to have any agenda items that our committee would like to be addressed.



Course Approval Request Form

Office of the Registrar, University of Michigan

1210 ISA Building

500 S. State Street

Ann Arbor, MI 48109-1382

Phone: 734.763.2113

Fax: 734.936.3148

ro.curriculum@umich.edu

ro.umich.edu

CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 Modification of Existing Course

Date of Submission: 2020-02-19

Effective Term: Fall 2020

- Deletion of Existing Course

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	NO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input type="checkbox"/>	Dept (Home): Nuclear Engin & Radiolog Sci Subject: NERS Catalog: 481	Dept (Home): Subject: Catalog:												
<input type="checkbox"/>	<input type="checkbox"/> Course is Cross-Listed with Other Departments	<input type="checkbox"/> Course is Cross-Listed with Other Departments												
<input type="checkbox"/>	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 25%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number				<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 25%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number			
Department	Subject	Catalog Number												
Department	Subject	Catalog Number												
<input type="checkbox"/>	Course Title (full title) Engineering Principles of Radiation Imaging	Course Title (full title)												
<input type="checkbox"/>	Abbreviated Title (20 char)	Abbreviated Title (20 char)												
<input type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) n/a													
<input type="checkbox"/>	Full Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:												
<input type="checkbox"/>	Course Credit Type Undergraduate Student													
<input type="checkbox"/>	Repeatability <input type="checkbox"/> Course is Repeatable for Credit Maximum number of repeatable credits:													
	<input type="checkbox"/> Course is Y graded <input type="checkbox"/> Can be taken more than once in the same term													

Subject: Nuclear Engin & Radiolog Sci		Catalog: 481	
<input type="checkbox"/>	Grading Basis		
	<input checked="" type="checkbox"/> Graded (A – E)		
	<input type="checkbox"/> Credit/No Credit		
	<input type="checkbox"/> Satisfactory/Unsatisfactory	Add Consent	Drop Consent
	<input type="checkbox"/> Pass/Fail	<input type="checkbox"/> Department Consent	<input type="checkbox"/> Department Consent
<input type="checkbox"/> Business Administration	<input type="checkbox"/> Instructor Consent	<input type="checkbox"/> Instructor Consent	
Grading	<input checked="" type="checkbox"/> No Consent	<input checked="" type="checkbox"/> No Consent	
<input type="checkbox"/> Not for Credit			
<input type="checkbox"/> Not for Degree Credit			
<input type="checkbox"/> Degree Credit Only			

CURRENT LISTING	REQUESTED LISTING
<input type="checkbox"/> Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
<input type="checkbox"/> Enforced Prerequisite (254 char)	Enforced Prerequisite (254 char)
<input type="checkbox"/> Minimum grade requirement:	Minimum grade requirement:
<input type="checkbox"/> Credit Exclusions	Credit Exclusions
<input type="checkbox"/> Course Components <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study	<input checked="" type="checkbox"/> Graded Component <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
	Terms Typically Offered <input type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Spring/Summer
Cognizant Faculty Member Name: Kim Kearfott	
Cognizant Faculty Member Title: Professor	

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Michelle Sonderman

Email: mlwhit@umich.edu

Phone: 734-936-3130

Curriculum Committee Member:	Print:	Date:
Curriculum Committee Chair: <i>Won Sik Yang</i>	Print: <i>Won Sik Yang</i>	Date: <i>2/19/20</i>
Home Department Chair: <i>[Signature]</i>	Print: <i>Todd R Allen</i>	Date: <i>79 Feb 2020</i>
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:**Requested:**Course Description

n/a

Course DescriptionClass Length

Full term

Class LengthContact hours (lecture):Contact hours (lecture):Contact hours (recitation)Contact hours (recitation)Contact hours (lab)Contact hours (lab)**Additional Info:**Submitted by:

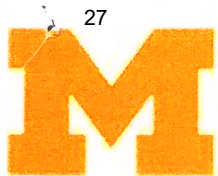
Home dept

Describe how this course fits with the degree requirements:ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:Supporting statement:

We no longer have faculty able/interested in teaching this course.



Course Approval Request Form
Office of the Registrar, University of Michigan

1210 ISA Building
500 S. State Street
Ann Arbor, MI 48109-1382
Phone: 734.763.2113
Fax: 734.936.3148
ro.curriculum@umich.edu
ro.umich.edu

CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 Modification of Existing Course
 Deletion of Existing Course

Date of Submission: 2020-02-18
Effective Term: Fall 2020

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input type="checkbox"/>	Dept (Home): Nuclear Engin & Radiolog Sci Subject: NERS Catalog: 580	Dept (Home): Subject: Catalog:												
<input type="checkbox"/>	<input type="checkbox"/> Course is Cross-Listed with Other Departments	<input type="checkbox"/> Course is Cross-Listed with Other Departments												
<input type="checkbox"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Department</th> <th style="width: 20%;">Subject</th> <th style="width: 60%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 20%;">Department</th> <th style="width: 20%;">Subject</th> <th style="width: 60%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number			
Department	Subject	Catalog Number												
Department	Subject	Catalog Number												
<input type="checkbox"/>	Course Title (full title) Computation Projects in Radiation Imaging	Course Title (full title)												
<input type="checkbox"/>	Abbreviated Title (20 char)	Abbreviated Title (20 char)												
<input type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) n/a													
<input type="checkbox"/>	Full Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:												
<input type="checkbox"/>	Course Credit Type Undergraduate Student, Rackham Graduate Student													
<input type="checkbox"/>	Repeatability <input type="checkbox"/> Course is Repeatable for Credit <input type="checkbox"/> Course is Y graded Maximum number of repeatable credits: <input type="checkbox"/> Can be taken more than once in the same term													

Subject: Nuclear Engin & Radiolog Sci Catalog: 580

<input type="checkbox"/>	Grading Basis	Add Consent	Drop Consent
	<input checked="" type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only	<input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	<input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent

CURRENT LISTING

REQUESTED LISTING

<input type="checkbox"/>	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
<input type="checkbox"/>	Enforced Prerequisite (254 char)	Enforced Prerequisite (254 char)
<input type="checkbox"/>	Minimum grade requirement:	Minimum grade requirement:
<input type="checkbox"/>	Credit Exclusions	Credit Exclusions
<input type="checkbox"/>	Course Components <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study	Graded Component <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Terms Typically Offered

Fall

Winter

Spring

Summer

Spring/Summer

Cognizant Faculty Member Name: Kim Kearfott

Cognizant Faculty Member Title: Professor

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Michelle Sonderman

Email: mlwhit@umich.edu

Phone: 734-936-3130

Curriculum Committee Member:	Print:	Date:
Curriculum Committee Chair: <i>Won Sik Yang</i>	Print: <i>Won Sik Yang</i>	Date: <i>2/19/20</i>
Home Department Chair: <i>[Signature]</i>	Print: <i>TODD R ALLEN</i>	Date: <i>2/19/20</i>
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:Course Description

n/a

Class Length

Full term

Contact hours (lecture):Contact hours (recitation)Contact hours (lab)**Requested:**Course DescriptionClass LengthContact hours (lecture):Contact hours (recitation)Contact hours (lab)**Additional Info:**Submitted by:

Home dept

Describe how this course fits with the degree requirements:

n/a

ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:Supporting statement:

We no longer have faculty able/interested in teaching this course.



Course Approval Request Form

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CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
- Modification of Existing Course
- Deletion of Existing Course

Date of Submission: 2020-02-19
 Effective Term: Fall 2020

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input type="checkbox"/>	Dept (Home): Nuclear Engin & Radiolog Sci Subject: NERS Catalog: 585	Dept (Home): Subject: Catalog:												
<input type="checkbox"/>	<input type="checkbox"/> Course is Cross-Listed with Other Departments	<input type="checkbox"/> Course is Cross-Listed with Other Departments												
<input type="checkbox"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 50%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 50%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number			
Department	Subject	Catalog Number												
Department	Subject	Catalog Number												
<input type="checkbox"/>	Course Title (full title) Transportation of Radioactive Materials	Course Title (full title)												
<input type="checkbox"/>	Abbreviated Title (20 char) Trans Rad Materials	Abbreviated Title (20 char)												
<input type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) n/a													
<input type="checkbox"/>	Full Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:												
<input type="checkbox"/>	Course Credit Type Undergraduate Student, Rackham Graduate Student, Non-Rackham Graduate Student													
<input type="checkbox"/>	Repeatability <input type="checkbox"/> Course is Repeatable for Credit Maximum number of repeatable credits:													
<input type="checkbox"/>	<input type="checkbox"/> Course is Y graded <input type="checkbox"/> Can be taken more than once in the same term													

Subject: Nuclear Engin & Radiolog Sci		Catalog: 585	
<input type="checkbox"/>	Grading Basis <input checked="" type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only	Add Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	Drop Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent

CURRENT LISTING	REQUESTED LISTING
<input type="checkbox"/> Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
<input type="checkbox"/> Enforced Prerequisite (254 char)	Enforced Prerequisite (254 char)
<input type="checkbox"/> Minimum grade requirement:	Minimum grade requirement:
<input type="checkbox"/> Credit Exclusions	Credit Exclusions
<input type="checkbox"/> Course Components <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study	Graded Component <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> Terms Typically Offered <input type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Spring/Summer
Cognizant Faculty Member Name: Kim Kearfott	
Cognizant Faculty Member Title: Professor	

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Michelle Sonderman Email: mlwhit@umich.edu Phone: 734-936-3130

Curriculum Committee Member:	Print:	Date:
Curriculum Committee Chair: <i>Won Sik Yang</i>	Print: <i>Won Sik Yang</i>	Date: <i>2/19/20</i>
Home Department Chair: <i>[Signature]</i>	Print: <i>TODD R ALLEN</i>	Date: <i>19 FEB 2020</i>
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:**Requested:**Course Description

n/a

Course DescriptionClass Length

Full term

Class LengthContact hours (lecture):Contact hours (lecture):Contact hours (recitation)Contact hours (recitation)Contact hours (lab)Contact hours (lab)**Additional Info:**Submitted by:

Home dept

Describe how this course fits with the degree requirements:ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:Supporting statement:

No longer have faculty able/interested in teaching the course.



Course Approval Request Form
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CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 Modification of Existing Course
 Deletion of Existing Course

Date of Submission: 2020-02-28
Effective Term: Winter 2021

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input checked="" type="checkbox"/>	Dept (Home): Nuclear Engin & Radiolog Sci			Dept (Home): Nuclear Engin & Radiolog Sci		
	Subject: NERS			Subject: NERS		
	Catalog: 579			Catalog: 585		
	<input checked="" type="checkbox"/> Course is Cross-Listed with Other Departments			<input type="checkbox"/> Course is Cross-Listed with Other Departments		
<input checked="" type="checkbox"/>	Department	Subject	Catalog Number	Department	Subject	Catalog Number
	Environmental Health Sciences- EHS- 692					
	Biomedical Engineering- BIOMEDE- 0000000					
<input type="checkbox"/>	Course Title (full title) Physics of Medical Imaging			Course Title (full title) Physics of Medical Imaging		
<input type="checkbox"/>	Abbreviated Title (20 char) Phys Med Imaging			Abbreviated Title (20 char) Phys Med imaging		
	Course Description (Please limit to 50 words and attach separate sheet if necessary) Physics, equipment and techniques basic to producing medical diagnostic images by x-rays, fluroscopy, computerized tomography of x-ray images, mammography, ultrasound, and magnetic resonance imaging systems. Lectures and demonstrations.					
<input checked="" type="checkbox"/>	Full Term Credit Hours		Half Term Credit Hours			
	Undergraduate Min: 3	Graduate Min: 3	Undergraduate Min:	Graduate Min:		
	Undergraduate Max: 3	Graduate Max: 3	Undergraduate Max:	Graduate Max:		
	Course Credit Type Undergraduate Student, Rackham Graduate Student, Non-Rackham Graduate Student					
<input type="checkbox"/>	Repeatability					
	<input type="checkbox"/> Course is Repeatable for Credit		<input type="checkbox"/> Course is Y graded			
	Maximum number of repeatable credits:		<input type="checkbox"/> Can be taken more than once in the same term			

Subject: Nuclear Engin & Radiolog Sci Catalog: 579

Grading Basis

- Graded (A - E)
- Credit/No Credit
- Satisfactory/Unsatisfactory
- Pass/Fail
- Business Administration

Add Consent

- Department Consent
- Instructor Consent
- No Consent

Drop Consent

- Department Consent
- Instructor Consent
- No Consent

Grading

- Not for Credit
- Not for Degree Credit
- Degree Credit Only

CURRENT LISTING

REQUESTED LISTING

<input type="checkbox"/>	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)
<input checked="" type="checkbox"/>	Enforced Prerequisite (254 char) Physics 240 or 260; or graduate status Minimum grade requirement: C	Enforced Prerequisite (254 char)
<input type="checkbox"/>	Credit Exclusions	Credit Exclusions

Course Components	Graded Component	Terms Typically Offered
<input checked="" type="checkbox"/> Lecture	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Fall
<input type="checkbox"/> Seminar	<input type="checkbox"/>	<input checked="" type="checkbox"/> Winter
<input type="checkbox"/> Recitation	<input type="checkbox"/>	<input type="checkbox"/> Spring
<input type="checkbox"/> Lab	<input type="checkbox"/>	<input type="checkbox"/> Summer
<input type="checkbox"/> Discussion	<input type="checkbox"/>	<input type="checkbox"/> Spring/Summer
<input type="checkbox"/> Independent Study	<input type="checkbox"/>	

Cognizant Faculty Member Name: Kimberlee Kearfott

Cognizant Faculty Member Title: Professor

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Michelle Sonderman

Email: mlwhit@umich.edu

Phone: 734-936-3130

Curriculum Committee Member: Won Sik Yary Print: Won Sik Yary Date: 2/24/20

Curriculum Committee Chair: _____ Print: _____ Date: _____

Home Department Chair: Todd R. Allen Print: Todd R. Allen Date: 24 Feb 20

Cross-Listed Department Chair: Zhen Xu Print: Zhen Xu Date: 2/28/2020

Cross-Listed Department Chair: Dana Dolin Print: Dana Dolin Date: 3/5/2020

Cross-Listed Department Chair: _____ Print: _____ Date: _____



Current:

Course Description

Physics, equipment and techniques basic to producing medical diagnostic images by x-rays, fluroscopy, computerized tomography of x-ray images, mammography, ultrasound, and magnetic resonance imaging systems. Lectures and demonstrations.

Class Length

Full term

Contact hours (lecture):

2

Contact hours (recitation)

Contact hours (lab)

Requested:

Course Description

Physics, equipment and techniques basic to producing medical diagnostic images by x-rays, fluroscopy, computerized tomography of x-ray images, mammography, ultrasound, and magnetic resonance imaging systems. Lectures and demonstrations.

Class Length

Full term

Contact hours (lecture):

3

Contact hours (recitation)

Contact hours (lab)

Additional Info:

Submitted by:

Home dept

Describe how this course fits with the degree requirements:

Elective for NERS BSE and graduate programs

ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:

Supporting statement:

We are updating the the number to a more appropriate course number for our department.



Course Approval Request Form

Office of the Registrar, University of Michigan

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Fax: 734.936.3148

ro.curriculum@umich.edu

ro.umich.edu

CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 Modification of Existing Course
 Deletion of Existing Course

Date of Submission: 2020-02-19

Effective Term: Fall 2020

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input checked="" type="checkbox"/>	Dept (Home): Subject: Catalog:	Dept (Home): Engineering Subject: ENGR Catalog: 998
<input type="checkbox"/>	<input type="checkbox"/> Course is Cross-Listed with Other Departments	
	Department	Subject
<input checked="" type="checkbox"/>	Course Title (full title)	Course Title (full title) Curriculum Practical Project
<input checked="" type="checkbox"/>	Abbreviated Title (20 char)	Abbreviated Title (20 char) Curr Prac Proj
<input checked="" type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) Practical work experience related to graduate student's field of study in consultation with the student's department/program, cognizant faculty, and the Engineering Career Resource Center.	
<input checked="" type="checkbox"/>	Full Term Credit Hours	
	Undergraduate Min:	Graduate Min: 1
<input checked="" type="checkbox"/>	Half Term Credit Hours	
	Undergraduate Min:	Graduate Min:
<input checked="" type="checkbox"/>	Undergraduate Max:	Graduate Max: 1
	Undergraduate Max:	Graduate Max:
<input checked="" type="checkbox"/>	Course Credit Type Rackham Graduate Student, Non-Rackham Graduate Student	
<input checked="" type="checkbox"/>	Repeatability	
	<input checked="" type="checkbox"/> Course is Repeatable for Credit Maximum number of repeatable credits: 10	<input checked="" type="checkbox"/> Course is Y graded <input checked="" type="checkbox"/> Can be taken more than once in the same term

Current:**Requested:**Course DescriptionCourse Description

Practical work experience related to graduate student's field of study in consultation with the student's department/program, cognizant faculty, and the Engineering Career Resource Center.

Class LengthClass Length

Full term

Contact hours (lecture):Contact hours (lecture):Contact hours (recitation)Contact hours (recitation)Contact hours (lab)Contact hours (lab)**Additional Info:**Submitted by:

Home dept

Describe how this course fits with the degree requirements:ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:Supporting statement:

This course supports graduate-level domestic students and international students requiring CPT. Student's work experience must be related to their academic program. Students must have the approval of their department/program and the Engineering Career Resource Center.



Course Approval Request Form
Office of the Registrar, University of Michigan

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ro.curriculum@umich.edu
ro.umich.edu

CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 Modification of Existing Course
 Deletion of Existing Course

Date of Submission: 2020-02-28
Effective Term: Fall 2020

<input type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input checked="" type="checkbox"/>	Dept (Home): Chemical Engineering			Dept (Home): Engineering		
	Subject: CHE			Subject: ENGR		
	Catalog: 580			Catalog: 580		
	<input checked="" type="checkbox"/> Course is Cross-Listed with Other Departments			<input type="checkbox"/> Course is Cross-Listed with Other Departments		
	Department	Subject	Catalog Number	Department	Subject	Catalog Number
<input checked="" type="checkbox"/>	Engineering - ENGR - 580					
<input type="checkbox"/>	Course Title (full title) Teaching Engineering			Course Title (full title) Teaching Engineering		
<input type="checkbox"/>	Abbreviated Title (20 char) Teaching Engineering			Abbreviated Title (20 char) Teaching Engineering		
<input checked="" type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) Aimed at doctoral students from all engineering disciplines interested in teaching. Topics include educational philosophies, educational objectives, learning styles, collaborative and active learning, creativity, testing and grading, ABET requirements, diversity, equity and inclusion issues.					
<input type="checkbox"/>	Full Term Credit Hours			Half Term Credit Hours		
	Undergraduate Min: 3	Graduate Min: 3		Undergraduate Min:	Graduate Min:	
	Undergraduate Max: 3	Graduate Max: 3		Undergraduate Max:	Graduate Max:	
<input type="checkbox"/>	Course Credit Type Undergraduate Student, Rackham Graduate Student, Non-Rackham Graduate Student					
<input type="checkbox"/>	Repeatability <input type="checkbox"/> Course is Repeatable for Credit <input type="checkbox"/> Course is Y graded Maximum number of repeatable credits: _____ <input type="checkbox"/> Can be taken more than once in the same term					

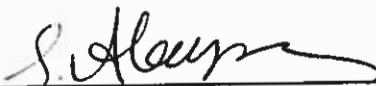


Subject: Chemical Engineering Catalog: 580

<input type="checkbox"/>	Grading Basis <input checked="" type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration	Add Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	Drop Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent
	Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only		

CURRENT LISTING		REQUESTED LISTING
<input type="checkbox"/>	Advisory Prerequisite (254 char) Doctoral candidate	Advisory Prerequisite (254 char) Doctoral candidate
<input type="checkbox"/>	Enforced Prerequisite (254 char) Candidate Minimum grade requirement: C-	Enforced Prerequisite (254 char) Candidate Minimum grade requirement: C-
<input type="checkbox"/>	Credit Exclusions	Credit Exclusions
<input type="checkbox"/>	Course Components <input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study	Graded Component <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
		Terms Typically Offered <input checked="" type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Spring/Summer
Cognizant Faculty Member Name: Cindy Finelli / Laura Hirshfield		Cognizant Faculty Member Title: Dir. of Engin. Ed Research, COE / Lecturer in ChE

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person: Barbara Mintz Email: bgmintz@umich.edu Phone: 734-647-9876

Curriculum Committee Member:		Print: Saadet Albayrak-Guralp	Date: 3/5/20
Curriculum Committee Chair:		Print:	Date:
Home Department Chair:		Print: Sharon Glotzer	Date: 3/9/20
Cross-Listed Department Chair:		Print: Mary-Ann Mycek	Date: 3/5/2020
Cross-Listed Department Chair:		Print:	Date:
Cross-Listed Department Chair:		Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:Course Description

Aimed at doctoral students from all engineering disciplines interested in teaching. Topics include educational philosophies, educational objectives, learning styles, collaborative and active learning, creativity, testing and grading, ABET requirements, gender and racial issues.

Class Length

Full term

Contact hours (lecture):

3

Contact hours (recitation)Contact hours (lab)**Requested:**Course Description

Aimed at doctoral students from all engineering disciplines interested in teaching. Topics include educational philosophies, educational objectives, learning styles, collaborative and active learning, creativity, testing and grading, ABET requirements, diversity, equity and inclusion issues.

Class Length

Full term

Contact hours (lecture):

3

Contact hours (recitation)Contact hours (lab)**Additional Info:**Submitted by:

Home dept

Describe how this course fits with the degree requirements:ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:Supporting statement:

This course is no longer being taught by exclusively ChE faculty, and the material is not ChE specific. Course will now just be offered as ENGR 580, which was previously the cross-listed department. Also a small course description update.



Course Approval Request Form

Office of the Registrar, University of Michigan

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CHECK APPROPRIATE BOXES FOR ALL CHANGES

Action Requested

- New Course
 - Modification of Existing Course
 - Deletion of Existing Course
- Date of Submission: 2020-03-09
Effective Term: Winter 2021

<input checked="" type="checkbox"/>	Course Offered <input checked="" type="checkbox"/> Indefinitely <input type="checkbox"/> One term only	RO USE ONLY Date Received: Date Completed: Completed By:
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CURRENT LISTING

REQUESTED LISTING

<input checked="" type="checkbox"/>	Dept (Home): Subject: Catalog:	Dept (Home): Engineering Education Research Subject: EER Catalog: 610												
<input type="checkbox"/>	<input type="checkbox"/> Course is Cross-Listed with Other Departments	<input type="checkbox"/> Course is Cross-Listed with Other Departments												
<input type="checkbox"/>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 50%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number				<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Department</th> <th style="width: 25%;">Subject</th> <th style="width: 50%;">Catalog Number</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Department	Subject	Catalog Number			
Department	Subject	Catalog Number												
Department	Subject	Catalog Number												
<input checked="" type="checkbox"/>	Course Title (full title)	Course Title (full title) Practicum - Immersive Learning Experience												
<input checked="" type="checkbox"/>	Abbreviated Title (20 char)	Abbreviated Title (20 char) EER Practicum												
<input checked="" type="checkbox"/>	Course Description (Please limit to 50 words and attach separate sheet if necessary) EER 610 enables students to develop a robust skill set in applying knowledge acquired from coursework to practical needs or real-world problems in engineering education. Two basic types of Immersive Learning Experiences are possible: (1) teaching apprenticeships and (2) internships.													
<input checked="" type="checkbox"/>	Full Term Credit Hours Undergraduate Min: Graduate Min: 3 Undergraduate Max: Graduate Max: 3	Half Term Credit Hours Undergraduate Min: Graduate Min: Undergraduate Max: Graduate Max:												
<input checked="" type="checkbox"/>	Course Credit Type Rackham Graduate Student													
<input type="checkbox"/>	Repeatability <input type="checkbox"/> Course is Repeatable for Credit Maximum number of repeatable credits:	<input type="checkbox"/> Course is Y graded <input type="checkbox"/> Can be taken more than once in the same term												

Subject:	Catalog:						
<input checked="" type="checkbox"/>	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"> Grading Basis <input type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input checked="" type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration </td> <td style="width: 33%;"> Add Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent </td> <td style="width: 33%;"> Drop Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent </td> </tr> <tr> <td> Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only </td> <td></td> <td></td> </tr> </table>	Grading Basis <input type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input checked="" type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration	Add Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	Drop Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only		
Grading Basis <input type="checkbox"/> Graded (A – E) <input type="checkbox"/> Credit/No Credit <input type="checkbox"/> Satisfactory/Unsatisfactory <input checked="" type="checkbox"/> Pass/Fail <input type="checkbox"/> Business Administration	Add Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent	Drop Consent <input type="checkbox"/> Department Consent <input type="checkbox"/> Instructor Consent <input checked="" type="checkbox"/> No Consent					
Grading <input type="checkbox"/> Not for Credit <input type="checkbox"/> Not for Degree Credit <input type="checkbox"/> Degree Credit Only							

	CURRENT LISTING	REQUESTED LISTING			
<input type="checkbox"/>	Advisory Prerequisite (254 char)	Advisory Prerequisite (254 char)			
<input checked="" type="checkbox"/>	Enforced Prerequisite (254 char) Minimum grade requirement:	Enforced Prerequisite (254 char) EER 601 and EER 602 Minimum grade requirement: C			
<input type="checkbox"/>	Credit Exclusions	Credit Exclusions			
<input checked="" type="checkbox"/>	<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"> Course Components <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study </td> <td style="width: 33%;"> Graded Component <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> </td> <td style="width: 33%;"> Terms Typically Offered <input checked="" type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Spring/Summer </td> </tr> </table>	Course Components <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Recitation <input type="checkbox"/> Lab <input type="checkbox"/> Discussion <input type="checkbox"/> Independent Study	Graded Component <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Terms Typically Offered <input checked="" type="checkbox"/> Fall <input checked="" type="checkbox"/> Winter <input type="checkbox"/> Spring <input type="checkbox"/> Summer <input type="checkbox"/> Spring/Summer	
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Cognizant Faculty Member Name: Mark Guzdial Cognizant Faculty Member Title:					

SIGNATURES ARE REQUIRED FROM ALL DEPARTMENTS INVOLVED (Please Print AND Sign Name)

Contact Person:	Email:	Phone:
Curriculum Committee Member:	Print:	Date:
Curriculum Committee Chair:	Print:	Date:
Home Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:
Cross-Listed Department Chair:	Print:	Date:

DEPARTMENTAL/COLLEGE USE ONLY

Current:

Requested:

Course Description

Course Description

EER 610 enables students to develop a robust skill set in applying knowledge acquired from coursework to practical needs or real-world problems in engineering education. Two basic types of Immersive Learning Experiences are possible: (1) teaching apprenticeships and (2) internships.

Class Length

Class Length

Full term

Contact hours (lecture):

Contact hours (lecture):

3

Contact hours (recitation)

Contact hours (recitation)

Contact hours (lab)

Contact hours (lab)

Additional Info:

Submitted by:

Home dept

Describe how this course fits with the degree requirements:

ABET departmental program outcomes for undergraduate courses:

Not ABET accredited

Special resources of facilities required for this course:

None

Supporting statement:

EER 610 was included in the proposal for the Engineering Education Research PhD. It's a unique aspect of our program, that we engage EER PhD students in an immersive learning experience and then have them reflect on the experience. It has never been taught before. It is a required course in the program.

EER610: Practicum - Immersive Learning Experience

COURSE SYLLABUS – FALL 2020

CLASS TIME:	TBD		
PRACTICUM LEAD:	Aileen Huang-Saad	OFFICE:	2228 LBME
EMAIL:	aileenhs@umich.edu	PHONE:	734.647.9737
OFFICE HOURS:	TBD (use office hours link to schedule)		

Course Description: EER 610 enables students to develop a robust skill set in applying knowledge acquired from coursework to practical needs or real-world problems in engineering education. Two basic types of Immersive Learning Experiences are possible: (1) teaching apprenticeships and (2) internships. Students preparing for faculty positions or other professional staff positions in academia will typically pursue the teaching apprenticeship, while students seeking post-graduate positions in administrative, policy, or outreach settings will typically complete an internship for their Immersive Learning Experience.

Learning Objectives/Outcomes: At the end of this course, students will be able to:

1. *Identify* practical applications of knowledge acquired from coursework
2. *Apply* knowledge acquired from coursework to practical needs or re-world problems in engineering education
3. *Self-evaluate* personal contributions to real-world problems in engineering education

Course Resources: The course will use Canvas (<https://umich.instructure.com/>) for its course website. The Canvas site will contain the following items, among others:

- Announcements
- Assignment details and location for uploads of deliverables

To access: Sign in with your UM ID and Kerberos password and select the EER 602 tab.

Course Roles: The success of this course is based on the involvement of several critical individuals. Their roles are as defined:

1. Student: EER student enrolled in EER 610
2. Practicum Lead: Instructor Responsible for EER 610
3. EER Advisor: EER faculty advisor for the EER student enrolled in EER 610
4. ILE Advisor: Advisor/Manager of EER student during ILE

Course Format and Assignments: This course is designed to offer EER students an opportunity to explore post graduate EER opportunities while reflecting on their experiences. The structure of the course extends over several months and requires proactive student and EER advisor planning.

Timing	Description	Assignment
Pre-Experience	Approximately 4-6 months before students anticipate pursuing their immersive learning experience (ILE), they must identify and propose an ILE. A successful ILE proposal requires support from the EER Advisor, an ILE Advisor, and the Practicum Lead	ILE Proposal.
Immersive Learning Experience (ILE)	During the ILE, students will complete (5) regular check-in reflections electronically prompted by the Practicum Lead. Emails will typically be sent on Mondays with responses due by midnight the following Sunday. Each check will generate approximately 1-2 pages of text.	Check-In Reflections (5)
EER 610 Course (3 credits)	This course will be scheduled for a 3 hour block and meet five times during the semester. The goal of the course is for each student to produce a 10-15 page double-spaced <i>portfolio</i> describing their experience and the lessons learned.	Portfolio Final Presentation:

Grading: This course is pass/fail. Grades are based on:

- ILE check-in reflections
- Reports from the ILE advisor
- Final Report
- Final Presentation

Detailed Schedule:

Class	Topic
1	Introductions/Review of Course Goals
2	Review of Check-in Reflections
3	Portfolio Outlines
4	Portfolio Sharing
5	Presentation to EER community

Religious Observance Policy: While the University of Michigan, as an institution, does not observe religious holidays, it is our policy to work with students to avoid negative consequences when religious obligations conflict with academic requirements. If you find that you must miss class, exams or assignments because of a religious observance, it is your obligation to let me know all of the days you will be absent within 2 weeks of the first absence and no later than the drop/add deadline of the term. With this guidance, you and possibly your team will be given the opportunity to make up the work without penalty, unless it interferes with course delivery. More information can be found at: http://www.crlt.umich.edu/gsis/p10_3

Student Health and Well-Being: Student health and wellbeing is of critical importance. Michigan offers significant resources to support our students. If you or someone you know is suffering from depression, feeling overwhelmed or in need of support, you can contact Counseling and Psychological Services (<https://caps.engin.umich.edu/>). Additional campus resources can be found at <http://umich.edu/~mhealth/>