UNIVERSITY OF MICHIGAN College of Engineering Curriculum Committee Meeting

Tuesday, March 31, 2015 – 1:30-3:00pm Room 1180 Duderstadt Center

PAGE #S

AGENDA

1. Proposal for revision of NAME Undergraduate Degree Program (second presentation) – Prof. Armin Troesch and Prof. Marc Perlin

2. CARF Summaries

SUBJECT	COURSE#	ACTION	SUMMARY	EFFECTIVE TERM	MINIMUM GRADE REQUIRED FOR ENFORCED PREPREC
BIOMEDE (MICROBIOLOGY	504 (504)	'Modification	Change to home unit, course description, prereqs, class type. Question: Level of Credit?	FT 2015	
CEE	370	Modification	Change to course number to 375, course title, level of credit, class type	WT 2016	
CEE(ENSCEN)	428(428)	Modification	Change to preregs	FT 2015	
CEE	543	Deletion	Last taught in 2000	FT 2015	
CEE CEE CEE	543	New Course		FT 2015	
CEE	555	New course		FT 2015	-
CEE	572	New course		FT 2015	
3 CHE	290	Modification	CARF marked as new crse, but really modification. Change to course description, prepreqs, and class type	FT 2015	Enforced prereq
CHE	460	Modification	Change to preregs	FT 2015	Enforced prereg
	490	Modification	Change to course description and preregs	FT 2015	Enforced prereq
9 CHE	496	Modification	Change to level of credit	FT 2015	
CHE CHE IOE(MATH)	552(542)	Modification	Deletion of cross-listing, change to preregs	FT 2015	Enforced prereq
3 IOE(MATH)	553(543)	Modification	Deletion of cross-listing, change to prereq	FT 2015	Enforced prereq
NAVARCH	260	Modification	Course description, credit hours	WT 2016	
NAVARCH	280	New course		WT 2016	
NAVARCH	370	Deletion			
NAVARCH	391	Modification	Course title, description, prereqs, credit hours Question: verify course is not repeatable	WT 2017	Enforced prereq
NAVARCH (MGF)	410(410)	Modification	Course description	FT 2015	Enforced prereq stays the same
/ NAVARCH	461	New course		WT 2018	Enforced prereq
NAVARCH	513	New course		FT 2015	
NAVARCH (MFG)	514 (515)	Modifications	Cross-listing of course with MFG, credits	FT 2015	
NAVARCH	551	New course		FT 2015	
3 NERS	671	Modification	Change to course title	FT 2015	
NERS	672	Deletion		FT 2015	



NAVAL ARCHITECTURE AND MARINE ENGINEERING 2600 DRAPER DR. ANN ARBOR, MICHIGAN 48109-2145 734 764-6470 FAX: 734 936-8820 http://www.engin.umich.edu/dept/name

March 24, 2015

From: Steve Ceccio, Chair

To: COE Curriculum Committee

Re: NA&ME Curriculum Revision Proposal

Dear Committee Members:

The faculty of the Department of Naval Architecture and Marine Engineering are pleased to submit to the COE Curriculum Committee a proposal to revise the undergraduate program curriculum.

1. Description of Current Curriculum

• Sophomore, Junior and Senior years descriptive summaries:

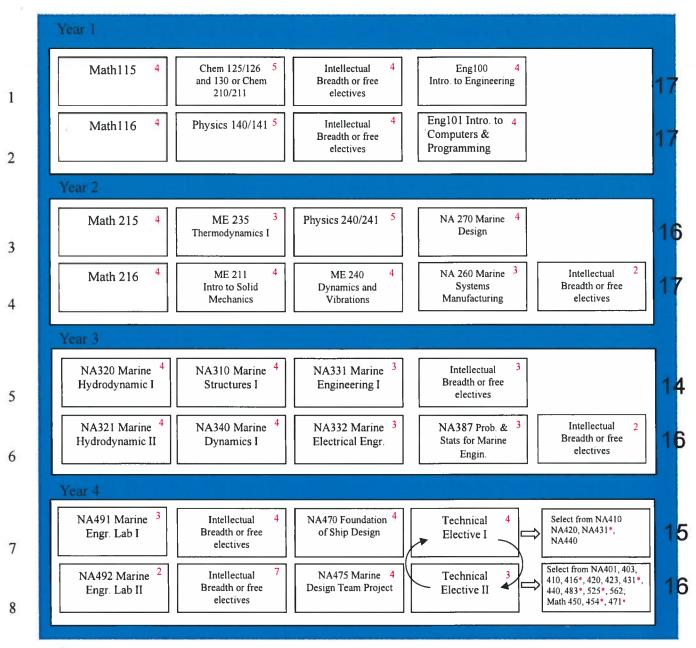
Year 2 - Currently the curriculum in Naval Architecture and Marine Engineering begins with an introduction to the design process (NA 270) in the Sophomore year. While NA 270 is offered both terms of Year 2, 90% of new NAME students elect NA 270 in the fall term. As a follow-up, in the Winter semester of Year 2, NA 260 provides the student with an introduction to the manufacturing process, paving the way for Year 3.

Year 3 – The Junior year features specific instruction in the areas that contribute to the foundations of Naval Architecture and Marine Engineering. A solid engineering mechanics background is provided including courses in Marine Hydrodynamics, Marine Structures, Marine Engineering, Marine Electrical Engineering, Marine Dynamics and in Probability and Statistics for Marine Engineers. These classes prepare the students for their technical electives that follow, and the laboratory and capstone design courses in the Senior year.

Year 4 – The Senior year is comprised of two required laboratory classes (NA 491 and NA 492) with the opportunity to conduct experiments, analyze data including error analysis, and produce professional-level technical reports. In addition, the Seniors have an individual ship design course, NA 470, as well as their team design capstone project, NA 475. These lab and design courses allow the students to integrate their education over the course of their study into two design projects.

Naval Architecture and Marine Engineering Curriculum - Current Version

A typical study plan for a Naval Architecture and Marine Engineering student at the University of Michigan.



- * 3 credit Tech Elective
- College/Program Requirements = 128
- Intellectual/Breadth = 16
- Free Electives = 9-11

Sample Schedule 2013-2014

Naval Architecture and Marine Engineering

	Total	Terms:							
	Credit Hours	1	2	3	4	5	6	7	8
Subjects Required by All Programs (52 - 55 hours)	CARTA S	A Part	T) ALPRA		Mile Ha			2000	TO B
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	-
Engineering 100, Introduction to Engineering	4	4	-	-	•	-	-	-	-
Engineering 101, Introduction to Computers	4	-	4	-	-	-	-	-	-
Chemistry 125/126 and 130 or,Chemistry 210 and 211	5	5	•	-	-	-	-	-	*
Physics 140 with lab 141 ²	5	-	5	-	-	•	-	-	-
Physics 240 with lab 241 ²	5	-	-	5	-	-	-	-	-
Humanities and Social Science	16	4	4	-	-	•	-	4	4
Related Technical Core Subjects (11 hours)									ES I
ME 211, Introduction to Solid Mechanics	4	-	-	-	4	-	-	-	-
ME 240, Introduction to Dynamics	4	-	-	-	4	-	-	-	-
ME 235, Thermodynamics I	3	-	-	3	-	-	-	-	-
Program Subjects (45 hours)	TEST CO								
NA 270, Marine Design	4	•	-	4	-	-	-	-	-
NA 260, Marine Systems Manufacturing	3	-	-	-	3	-	-	-	-
NA 310, Marine Structures I	4		-	-	-	4	-	-	-
NA 320, Marine Hydrodynamics I	4	-	-	-	-	4	-	-	-
NA 321, Marine Hydrodynamics II	4	-	-	-	-	-	4	-	-
NA 331, Marine Engineering I	3	-	-	-	-	3	-		
NA 332, Marine Electrical Engineering	3	-	-	-	-	-	3	-	-
NA 340, Marine Dynamics I	4	-	-	-	-	-	4	-	-
NA 387, Probability and Statistics for Marine Engineers	3	•				-	3		-
NA 470, Foundations of Ship Design	4	•						4	-
NA 475, Marine Design Team Project	4	-	-	-	-	-	-	-	4
NA 491, Marine Engineering Laboratory I	3			-	•	-	-	3	-
NA 492, Marine Engineering Laboratory II	2	-	-	-	-	-	-	-	2
Electives (16 - 18 hours)		Laye	V BULK					A 132	
Technical Electives ³	7-8	-	-	-	-	-	-	4	3
General Electives	9 - 10	-	-	-	2	3	2	-	3
Total	128	17	17	16	17	14	16	15	16

Notes

Choose 2 from the following list. At least one must come from the first four on the list:

NA 410, Marine Structure II

NA 420, Environmental Ocean Dynamics

NA 431, Marine Engineering II

NA 440, Marine Dynamics II

NA 401, Small Craft Design

NA 403, Sailing Craft Design Principles

NA 416, Theory of Plates and Shells

NA 455, Nearshore Environmental Dynamics

NA 562, Marine Systems Production Strategy Operations Management

Advanced Mathematics: Math 450, Math 454, or Math 471

Other courses as approved by the department

¹ If you have a satisfactory score or grade in Chemistry AP, A-Level, IB Exams or transfer credit from another institution for Chemistry 125/126/130 you will have met the Chemistry Core Requirement for the College of Engineering

² If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and Physics 240/241 you will have met the Physics Core Requirement for the College of Engineering.

³ Technical Electives

2. Description of the New Curriculum

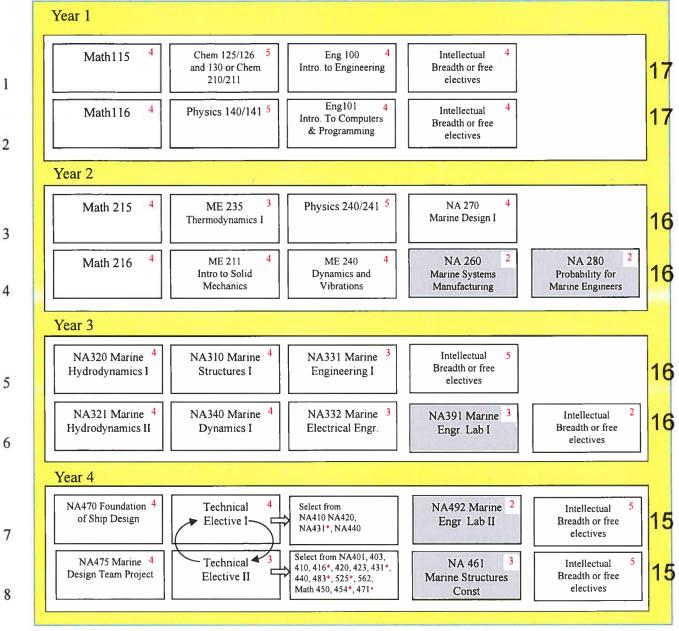
- Major drivers for curricular change:
 - Laboratory work and design projects are very time intensive
 - Some laboratory experience in the Junior year would reinforce the engineering mechanics learned then. Students would benefit from timely exposure to technical content covered in non-laboratory classes by bringing hands-on experience to supplement the text-book material
 - Junior level courses would benefit from earlier introduction of probability and statistics. In particular, NA387 is currently a prerequisite for NA340 but students sometimes delay taking NA387 due to scheduling conflicts. Having relevant materials covered in the Sophomore year would reduce this problem substantially

Proposed changes to enhance student experience and learning

- Move (revise and re-number) NA 491 lab to the Junior year as NA 391
- Move NA 492 to the fall semester of the Senior year, which frees the students from a lab during the course of their capstone Senior Design project
- Move and revise NA 387 to NA 280 and reduce material in NA 260 from three credits to two credits
- Introduce NA 461 as a required course in the Senior year. The course provides students with emphasis on manufacturing and production including some material that was eliminated from NA 387 and NA 260 in those course credit reductions

NA&ME Curriculum Modification 2015

Proposed study plan for a Naval Architecture and Marine Engineering student at the University of Michigan.



- * 3 credit Tech Elective
- College/Program Requirements = 128
- Intellectual/Breadth = 16
- Free Electives = 8-10
- Move (revise and re-number) NA 491 lab to the Junior year as NA 391
- Move NA 492 to the fall semester of the Senior year, which frees the students from a lab during the course of their capstone Senior Design project
- Move and revise NA 387 to NA 280 and reduce material in NA 260 from three credits to two credits
- Introduce NA 461 as a required course in the Senior year. The course provides students with emphasis
 on manufacturing and production including some material that was eliminated from NA 387 and NA
 260 in those course credit reductions



Revised Curriculum

Naval Architecture and Marine Engineering

	Total	Terms:							
.	Credit Hours	1	2	3	4	5	6	7	8
Subjects Required by All Programs (52 - 55 hours)	A LOCAL DE		Section 1		CATERINE	Q CI			BURN
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	
Engineering 100, Introduction to Engineering	4	4	-	-	-	-	-	-	·
Engineering 101, Introduction to Computers	4	-	4	-	•	-	-	-	
Chemistry 125/126 and 130 or, Themistry 210 and 211	5	5	-	-	-	-	-	-	-
Physics 140 with lab 141 ²	5	-	5	-	-	-	•	-	
Physics 240 with lab 241 ²	5	-	-	5	-	-	-	-	<u> </u>
Intellectual Breadth	16	4	4				-	4	4
Related Technical Core Subjects (11 hours)								Texa la	A CONTRACTOR
ME 211, Introduction to Solid Mechanics	4	-	-	-	4	-	•	-	-
ME 240, Introduction to Dynamics	4	-	-	-	4	-	-	-	
ME 235, Thermodynamics I	3	-	•	3	-	•	-	-	. ·
Program Subjects (46 hours)	Was a								
NA 270, Marine Design	4	-	•	4	-	-	-	-	-
NA 260, Marine Systems Manufacturing	2	•	•	•	2	-	-	-	
NA 280, Probability for Marine Engineers	2	,	•	-	2	-	•	•	
NA 310, Marine Structures I	4	-	1	-	-	4	-	•	-
NA 320, Marine Hydrodynamics I	4	-	4	-	-	4		-	-
NA 321, Marine Hydrodynamics II	4	-	1	-	-	•	4	-	-
NA 331, Marine Engineering I	3	-	-	-	-	3	-	-	-
NA 332, Marine Electrical Engineering	3	-	-	-	-	-	3	-	-
NA 340, Marine Dynamics I	4	-	-	-			4	-	-
NA 391, Marine Engineering Laboratory I	3	-	-	-	-	-	3	-	-
NA 461, Marine Structures Construction	3		-	-	-	-	-	· _	3
NA 470, Foundations of Ship Design	4	-	-	-	-	-	-	4	-
NA 475, Marine Design Team Project	4	-	-	-	-	-	-	-	4
NA 492, Marine Engineering Laboratory II	2	-			-	-	-	2	•
Electives (15 - 18 hours)							MUST		you'll be
Technical Electives ³	7-8	-	-	-	-	-	-	4	3
General Electives	8-10	-	-	-	-	5	2	1	1
Total	128	17	17	16	16	16	16	15	15

Notes

Choose 2 from the following list. At least one must come from the first four on the list:

NA 410, Marine Structure II

NA 420, Environmental Ocean Dynamics

NA 431, Marine Engineering II

NA 440, Marine Dynamics II

NA 401, Small Craft Design

NA 403, Sailing Craft Design Principles

NA 416, Theory of Plates and Shells

NA 455, Nearshore Environmental Dynamics

NA 562, Marine Systems Production Strategy Operations Management

Advanced Mathematics: Math 450, Math 454, or Math 471

Other courses as approved by the department

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² If you have a satisfactory score or grade in Physics AP, A-Level, IB Exams or transfer credit from another institution for Physics 140/141 and Physics 240/241 you will have met the Physics Core Requirement for the College of Engineering.

³ Technical Electives:

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING

Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Building Form Number

2562

Action Requested

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Effective Term Fall 2015

Date

1/19/2015

New CourseModification of Existing CourseDeletion of Course

	Deletions - A & C completely	Course Offer Freq Indefinitely One term only
	A. CURRENT LISTING	B. REQUESTED LISTING
	Home Department Course Number	Home Department Course Number
	Microbiology 504	BIOMEDE Biomedical Engineering 504
X	Cross Listed Course Information	Cross Listed Course Information
	BIOMEDE Biomedical Engineering 504	Microbiology 504
	Course Title	Course Title Cellular Biotechnology
	Time Sched	
	TITLE Max = 19 Spaces ABBRE- Transcript Transcript	ABBRE- Max = 19 Spaces
	VIATION Transcript Max = 20 Spaces Course Description	VIATION Transcript Cell Biotech Max = 20 Spaces Cell Biotech Course Description for Official Publication (Max = 50 words)
	and treat human disease. Biotechnology companies combine knowledge in science, business, management, and intellectual property to accomplish these goals. Emphasis will be placed on: basic biological/engineering principles, translating lab discovery to biotechnology industry, and scientific and translational innovation.	Biotechnology is a rapidly evolving, multi-disciplinary field that impacts nearly every aspect of our daily lives from the food we eat to the medicine we take. This course covers basic scientific and engineering principles behind this growing field, along with entrepreneurial aspects of translating innovative biotechnological solutions into new products.
	PROGRAM a cegglok OUTCOMES: b d f h j	PROGRAM a c e g l k OUTCOMES: b d f h j
	Degree O Degree Requirement O Tech Elective Requirements O Core Course O Other	Degree O Degree Requirement © Tech Elective Requirements O Core Course O Other
х	Prereq O Enforced O Advised	Prereq Graduate student standing or consent of the instructor. O Enforced O Advised
	Credit Restrictions	Credit Restrictions
	Level of Credit Undergrad only Rackham Grad Rackham Grad Rocham G	Level of Credit Undergrad only Ugrad or Non-Rickhm Grad Rackham Grad Rickham Grad
C.	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeata	O Yes III Con it has connected O Yes
J.	Class Type(s) Grading Location	Cognizant Faculty Member: Title
Х	□ Lec □ Sem □ Dis □ Other □ ☒ A-E ☒ Ann Arbor □ Rec □ Lab □ Ind □ CR/NC □ Biological Station	Andrew Putnam Associate Professor
	Graded Section P/F Camp Davis	
	X Lec	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty
	Approval Info Approved by Name Approved Date	
		Department Chair Name Chair Signature
	☐ Faculty ☐ Cross listed Unit 1 ☐ Cross listed Unit 2	Home Dept. Biomedical Engineering //0/10/10/2010 Annix
		- Cross-listed Working 723//S Videou Purify

 Dept(s).		
	***************************************	***************************************

Form Number

2562

This Cellular Biotechnology course was originally developed as a core course required for all trainees appointed to the NIH-funder Cellular Biotechnology. Training Program (T32), here at UM. In July 2014, Dr. Andrew Putnam (BME) took over from Dr. Joel Swanson (Microbiology, and Immunology), as the Director of this training grant, and moved the grant to BME. As a result, Dr. Putnam thereby became responsible for this course as well. Given that his home department is BME, we request that the course be officially moved to the BME department for administrative purposes (scheduling classroom assignment, enrollment, etc.) and the ensure that Dr. Putnam receives credit for teaching this course. The course has a long history of being cross-listed with multiple departments, and that feature will be relained moving forward. Students from the Medical School, LSA, College of Pharmacy, and the CoE will continue to be welcome in the class.
re any special resources or facilities required for this course? ☐ Yes ☒ No
·
Detail the Special requirements

Cellular Biotechnology 504 Winter 2015

Course overview/description:

Biotechnology is a rapidly evolving and highly multi-disciplinary field that impacts nearly every aspect of our daily lives from the food we eat to the medicine we take. This one-semester, 3-credit course provides an overview and integration of several disparate disciplines that together define the field of cellular biotechnology. Topics this year will include: (1) commercialization strategies and technology evaluation, (2) microtechnologies, (3) fluorescence and FRET, (4) DNA repair and control of gene expression, (5), protein engineering, (6) translational control mechanisms and assay development, (7) stem cells, tissue engineering, and regenerative medicine, (8) gene editing technologies, (9) immune-bioengineering, and (10) drug delivery, and (11) regulatory affairs.

Emphasis will be placed not only on the basic scientific and engineering principles behind the growing field of biotechnology, but also on the entrepreneurial aspects of translating innovative solutions into new commercial products.

This course is cross-listed with the Departments of Anatomy; Biological Chemistry; Microbiology & Immunology; and Biomedical Engineering.

Grading criteria:

Student performance will be evaluated in three ways:

- <u>Homework:</u> Brief homework assignments (4) based on lecture content and supplemental readings will be given out throughout the semester. **25% of the grade**
- <u>Class Participation:</u> Attendance, questions asked, and comments made in class will be tallied by the instructor. **25% of the grade**
- <u>Projects:</u> The main assignment of this course is a team-based project consisting of formulating, writing, and presenting an innovative biotechnological solution to a problem that is related to, or incorporates, some of the topics discussed in class. Students will be assigned to small groups (~5/group). Proposals must be cross-disciplinary in approach, include both business motivation and overview as well as scientific innovation in an NIH SBIR format. Various milestones will be met through the term to keep groups on track (more details forthcoming). 50% of the final grade

Time: Tuesdays and Thursdays from 2:30-4:00 p.m.

Place: 3427 EECS

Course Director:

Andy Putnam, PhD Associate Professor, Biomedical Engineering Director, Cellular Biotechnology Training Program 2204 Lurie Biomedical Engineering Phone: (734) 615-1398

Email: putnam@umich.edu
Website: http://www.csetlab.org/

Course Instructors:

Lola Eniola-Adefeso, Ph.D. Associate Professor, Chemical Engineering Miller Faculty Scholar B28-G046W NCRC (734) 936-0856

Email: lolaa@umich.edu

Web: http://cheresearch.engin.umich.edu/eniola/

Amanda Garner, Ph.D. Assistant Professor, Medicinal Chemistry College of Pharmacy 4565 CC Little (734) 763-2654

Email: algarner@umich.edu

Web: http://www.garnerlaboratory.com/

James Moon, Ph.D.
John Gideon Searle Assistant Professor
Pharmaceutical Sciences and Biomedical Engineering
B10-A190 NCRC
(734) 936-2570

Email: moonjj@umich.edu

Web: http://www.umich.edu/~moonlab/James_Moon_Lab/Home.html

Patrick O'Brien, Ph.D.
Associate Professor, Biological Chemistry
4220B MSRB3, Box 5606
(734) 647-5821
Email: pjobrien@umich.edu

David C. Olson, Ph.D. CEO Swift Biosciences (734) 678-7689

Email: dolson@alumni.princeton.edu

Email: olsonphd@gmail.com Web: http://www.swiftbiosci.com/

Gene Parunak, Managing Director in2being, LLC 100 E Michigan Ave, Suite 208 Saline, MI 48176

Phone: 734-681-0031

Email: gparunak@in2being.com/
Web: http://in2being.com/

Other instructors may be added throughout the semester as the course evolves.

Cellular Biotechnology Syllabus 2015 Tuesday/Thursday 2:30-4 pm (EECS 3427) Course Director: Dr. Andy Putnam (putnam@umich.edu) Biomedical Engineering

January 8	Introduction: What is Cellular Biotechnology? – Dr. Andy Putnam
January 13 January 15	Examples of Commercial Success in Biotechnology – Dr. Andy Putnam Examples of Commercial Success in Biotechnology – Dr. Andy Putnam
January 20 January 22	A Case Study in Biotechnology Commercialization – Dr. David Olson Career Paths in Biotechnology - Dr. David Olson
January 27 January 29	Microtechnologies in Biotechnology – Dr. Andy Putnam Microtechnologies in Biotechnology – Dr. Andy Putnam
February 3 February 5	Fluorescence and FRET – Dr. Andy Putnam (HW #1 DUE) Fluorescence and FRET – Dr. Andy Putnam
February 10 February 12	DNA Repair Mechanisms and Control of Gene Expression - Dr. Patrick O'Brien DNA Repair Mechanisms and Control of Gene Expression - Dr. Patrick O'Brien
February 17 February 19	Protein Engineering - TBD Protein Engineering - TBD
February 24 February 26	Translation (mRNA, miRNA) and Assay Development - Dr. Amanda Garner Translation (mRNA, miRNA) and Assay Development - Dr. Amanda Garner (HW #2 DUE)
March 3 March 5	UM Break UM Break
March 10 March 12	Stem Cells, Tissue Engineering, Regenerative Medicine – Dr. Andy Putnam Stem Cells, Tissue Engineering, Regenerative Medicine – Dr. Andy Putnam
March 17 March 19	Engineering the immune system – Dr. James Moon Engineering the immune system – Dr. James Moon (HW #3 DUE on Friday, 3/20 – Specific Aims page for Group Project)
March 24 March 26	Gene Editing, CRISPR/Cas9 technologies - Dr. Andy Putnam Gene Editing, CRISPR/Cas9 technologies - Dr. Andy Putnam
March 31 April 2	Drug delivery - Dr. Lola Eniola-Adefeso Drug delivery - Dr. Lola Eniola-Adefeso
April 7 April 9	Regulatory Affairs – Gene Parunak TBD (HW #4 DUE)
April 14	Proposal Presentations
April 16	Proposal Presentations
April 16 April 21	

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request

College Curriculum Committee, 1420 Lurie Engineering Center Building

2537 **Form Number**

Date

11/10/2014

	Action Requested	Date 11/10/2014
	O New Course Complete the following sections:	
	Modification of Existing Course New Courses - B & C completely Modifications - A modified information	Effective Term Winter 2016
	O Deletion of Course Modifications - A modified information Deletions - A & C completely	Course Offer Freq Indefinitely
	A. CURRENT LISTING	☐ One term only
		B. REQUESTED LISTING
		Home Department Course Number
	CEE Civil & Environmental Engin 370	CEE Civil & Environmental Engin 375
	Cross Listed Course Information	Cross Listed Course Information
х	Course Title Sensors, Electrical Circuits, and Signal Processing	Course Title Sensors, Circuits, and Signals
	ABBRE- Max = 19 Spaces	ABBRE- Max = 19 Spaces Sensors and Circuits
	VIATION Transcript Max = 20 Spaces	VIATION Transcript Sensors and Circuits
7	Course Description	Course Description for Official Publication (Max = 50 words)
		This course introduces students to the fundamentals of collecting and processing experimental data. The course begins with an introduction to DC and AC circuits. The design and operation of sensors are then introduced followed by an introduction to digital signal processing.
	PROGRAM OUTCOMES: a c e g i k b d f h j	PROGRAM
	Degree O Degree Requirement O Free Elective O Other Requirements O Core Course O Tech Elective	Degree © Degree Requirement O Free Elective O Other Requirements O Core Course O Tech Elective
	Prereq	Prereq Physics 240.
	O Enforced O Advised	O Enforced O Advised
	Credit Restrictions	Credit Restrictions
х	Level of Credit Undergrad only Ugrad or Non-Rckhm Grad Rackham Grad Non-Rckhm Grad Non-Rckhm Grad Ugrad or Rckhm Grad Ugrad or Rckhm Grad w/add'l Work Credit Hours Hrs/Wk 3 Number of Wks 14	Level of Credit ☑ Undergrad only
C.	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeata	ble? Yes Max Max Can it be repeated Yes in the same term? No Hours? Times? in the same term? No
Ο.	Class Type(s) Grading Location	Cognizant Faculty Member: Title
X	Lec ☐ Sem ☐ Dis ☐ Other _ X A-E	Jerome P. Lynch Professor
	☐ Rec ☑ Lab ☐ Ind ☐ CR/NC ☐ Biological Station ☐ CR/NC ☐ CR/DC ☐ CR/D	
	Staded Section S/U Extension	
	X Lec Sem Dis Other □ Course Is Y Graded Rec Lab Ind Course Is Y Graded □	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty
	Approval Info Approved by Name Approved Date	
	Curriculum Comm.	Department Chair Name Chair Signature
	☐ Faculty	Home Dept. Kim F. Hayes, Chair & Professor
	☐ Cross listed Unit 1	Civil & Environmental Engin
	☐ Cross listed Unit 2	Cross-listed Civil & Environmental Engin Dept(s).

2537

SUPPORTING STATEMENT	
First, we are proposing a slight change in course title, we wish to be more concise in the description of the course with the minor name change. The course description and course content remains unchanged. Second, we are formally changing the course to be listed as a lab course. For the past two offerings we have run a lab with the course with extremely enthusiastic student feedback. (citing the lab as the best part of the course). The lab was established as part of a grant from the Provost Third Century program to convert the course from a lecture style to one anchored by a lab to provide hands-on learning experiences for students. The Provost funding allow us to build a state-of-the-art electronics and sensing lab in GG Brown which is now used in CEE370 and CEE575. The course will go from 3 hours of classical lecture to 2 hours lecture and 2 hours lab each week.	 S
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	••••
	••••
	••••
Are any special resources or facilities required for this course?	

CEE370 - Sensors, Electrical Circuits, and Signal Processing (3 Credits) Winter Semester 2015-2016 Course Description

Instructor: Jerome P. Lynch

2380 G. G. Brown jerlynch@umich.edu

Assistant: TBD (Instructional Aid)

Lectures: Mondays and Wednesdays

11:30 -12:30 pm 1200 EECS Building

Lab: Fridays

1:30 – 3:30 pm 1000 G. G. Brown

Office Hours: Prof. Lynch: Monday and Wednesday 10:30 - 11:30 am, 2380 G. G. Brown

Website: http://www-personal.umich.edu/~jerlynch/cee370/

Catalog Description:

This course introduces students to the fundamentals of collecting and processing experimental data for civil and environmental applications. The course begins with an introduction to DC and AC circuits followed by the coverage of sensors used in the civil and environmental field. Examples and hands-on demonstrations will be presented relevant to seismic, environmental, structural and hydraulic monitoring.

Textbook:

- Introduction to Electric Circuits, R. C. Dorf and J. A. Svoboda (Wiley, 2010) 9th Edition
- Handbook of Modern Sensors, J. Fraden (Springer, 2010) 4th Edition (available online) http://link.springer.com/book/10.1007/978-1-4419-6466-3/page/1

Course Presentation Strategy:

The majority of lectures pertinent to circuit analysis are viewed outside of class time. Specifically, Lecture #1 through #23 are archived and posted to the course website. It is imperative students watch these lectures when assigned to ensure they progress with the course material. Classroom time is reserved for a mixture of problem solving sessions and a number of in-class lectures on sensors (Class #1 through #7). On occasion, a quiz will be provided in class to ensure students are watching the lecture videos. Every Friday, the class will engage in a lab activity. Lab reports are expected of students conducting the laboratory.

Course Requirements:

- In-class quizzes
- Weekly homework assignments
- Midterm exam
- Laboratory projects

Homework:

Homework will normally be assigned each Monday and due the following Monday *in class*. Late homework will not be accepted. You are allowed to discuss the homework problems with peers, but you must write up your own homework to hand in. Please

submit homework assignments in a neat and presentable manner with all calculations shown. Submission of homework on engineering pad paper is required. Homework will be graded on a scale of 100. Please abide by the University of Michigan Honor Code – it will be strictly enforced, including on homework.

Grading:

Homework 30%, midterms 40%, labs 30%. These weights are approximate; the instructor reserves the right to change later (normally to the students' advantage).

Prerequisites:

• Physics 240 - General Physics II (strongly recommended)

CEE370 – Sensors, Electrical Circuits, and Signal Processing Winter Semester 2015-2016

Course Outline

Date	Pre-Lecture Video	In-Class	Laboratory
Wed, 1/6		Introduction to CEE370	
Fri, 1/8	Lecture #1: Definition of Circuits	-	Introduction to Lab
Mon, 1/11	Lecture #2: Circuit Elements	Circuit Basics -Problems	
Wed, 1/13	Lecture #3: Power Sources	Circuit Basics - Problems	
Fri, 1/15	Lecture #4: Analyzing Resistive Circuits	•	Lab #1
Wed, 1/20	Lecture #5: Analyzing Res Circuits Cont.	Power Sources - Problems	
Fri, 1/22	•	-	Lab #1
Mon, 1/25	Lecture #6: Source Transformations	Resistive Circuits - Problems	
Wed, 1/27	Lecture #7: Introduction to Op-Amps	Class #1: Resistivity-Based	
	.f.	Sensing: Strain, Temperature	50
	-	and Cracks	
Fri, 1/29	-	-	Lab #2
Mon, 2/1	Lecture #8: Op-Amp Circuits	Op-Amp - Problems	
Wed, 2/3	Lecture #9: Energy Storage Elements	Op-Amps - Problems	
Fri, 2/5	-	-	Lab #2
Mon, 2/8	Lecture #10: C & L Elements in Circuits	Energy Storage - Problems	
Wed, 2/10	Lecture #11: LC Op-Amp Circuits	LC- Op Amp - Problems	
Fri, 2/12	<u>-</u>		Lab #3
Mon, 2/15	Lecture #12: Response of RCL Circuits	Class #2: Position and Displacement by Resistive and Cap. Sensing	
Wed, 2/17	Lecture #13: Stability and Differential Operators via RC and RL Circuits	Midterm #1	
Fri, 2/19	-		Lab #3
Mon, 2/23	Lecture #14: Intro 2 nd Ord RCL Circuits	RCL Circuits - Problems	
Wed, 2/25	Lecture #15: Natural Res of RCL Circuits	RCL Circuits - Problems	
Fri, 2/27	•		Lab #4
Mon, 3/7	Lecture #16: Forced Res of RCL Circuits	Class #3: Position and Displacement by Inductive Sensing	
Wed, 3/9	Lecture #17: Introduction to AC Circuits	AC Circuits - Problems	
Fri, 3/11	-		Lab #4
Mon, 3/14	Lecture #18: Phasors and Complex Num.	AC Circuits - Problems	
Wed, 3/16	Lecture #19: Impedance RCL Elements	AC Circuits - Problems	
Fri, 3/18	-		Lab #5
Mon, 3/21	Lecture #20: AC Circuit Analysis	AC Circuits - Problems	
Wed, 3/23	Lecture #21: Data Acq. and Sensors	AC Circuits - Problems	
Fri, 3/25	-		Lab #5
Mon, 3/28	Lecture #22: Sensor Interfaces	Midterm #2	
Wed, 3/30	Lecture #23: Analog to Digital Conv.	Class #4: Acceleration and Velocity Sensors	
Fri, 4/1	-		Lab #6
Mon, 4/4		Class #5: MEMS Sensors	
Wed, 4/6	-	Class #6: Pressure Sensors	
Fri, 4/8	-		Lab #6
Mon, 4/11	-	Class #7: Flow Sensors	

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request

College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number 2580

	Action Requested	Date 2/10/2015
	New Course Modification of Existing Course New Courses - B & C completely	: ————————————————————————————————————
	 Modification of Existing Course Deletion of Course Modifications - A modified information 	ion, B & C completely
	Deletions - A & C completely	Course Offer Freq Indefinitely One term only
-	A. CURRENT LISTING	B. REQUESTED LISTING
	Home Department Course Number	Home Department Course Number
	270-7	CEE Civil & Environmental Engin 428
	Cross Listed Course Information	Cross Listed Course Information
		ENSCEN Environmental Sciences & Engin 428
_,†	Course Title	Course Title
_		Groundwater Hydrology
Ì	TITLE Time Sched Max = 19 Spaces	TITLE Time Sched Max = 19 Spaces Groundwater Hydrol
	ABBRE- VIATION Max = 20 Spaces	ABBRE- VIATION Transcript Croundwinter Hydrol
- ,†	Course Description	Course Description for Official Publication (Max = 50 words)
_		Basic principles which govern the flow of water in the subsurface.
		Development and solution of groundwater flow and contaminant
		transport equations, in presence and absence of pumping wells, for both confined and phreatic aquifers. Measurement and
		estimation of parameters governing flow and transport. Use of
		computer software for the simulation of flow.
	PROGRAM a cegalik	PROGRAM ⊠a ⊠c ⊠e □g □i ⊠k
	OUTCOMES: a c e g i k	OUTCOMES: S b d f Sh Sj
	Degree O Degree Requirement O Free Elective O Other Requirements O Core Course O Tech Elective	Degree O Degree Requirement O Free Elective O Other Requirements O Core Course © Tech Elective
	Prereq CEE 265 and CEE 325 or equivalent.	Prereq CEE 325 and (CEE 345 or CEE 366).
X II	○ Enforced Advised	O Enforced O Advised
	Credit	Credit
_	Restrictions	Restrictions Level of Credit Contact
	□ Undergrad only □ Ugrad or Non-Rckhm Grad	☐ Undergrad only ☐ Ugrad or Non-Rckhm Grad Credit Hours Hrs/Wk 5
	☐ Non-Rokhm Grad ☐ Rokhm Grad w/add'l Work	U Non-Rickhm Grad
_	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeat	Apple? Yes Max Max Can it be repeated Yes
C.	Olas Tanada	No Hours? 3 Times? 1 in the same term? No Cognizant Faculty Member: Title
\neg	Class Type(s) Grading Location ☐ Lec ☐ Sem ☐ Dis ☐ Other ☐ ☐ A-E ☐ Ann Arbor	Avery H. Demond Professor
_	☐ Rec 🛛 Lab ☐ Ind ☐ CR/NC ☐ Biological Station	
	Graded Section P/F Camp Davis	
	X Lec Sem Dis Other _ Course Is Y Graded □ Rec Lab Ind Course Is Y Graded □	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty
	Approval Info Approved by Name Approved Date	D. W. A.D. M. Hansa Bank D. Onesa Baked Bank
	Curriculum Comm.	Department Chair Name Chair Signature
	☐ Faculty	Home Dept. Kim F. Hayes, Chair & Professor
	Cross listed Unit 1	Cross-listed Civil & Environmental Engin
	☐ Cross listed Unit 2	Dept(s).
		Environmental Sciences & Engin

SUPPORTING STATEMENT

are any special resources or facilities required for this course? □ Yes ⋈ No Detail the Special requirements	The change that is being requested is to the listed prerequisites. The class enrolls both undergraduate and graduate students. With the implementation of the new BSE in Environmental Engineering, more undergraduates are electing the course includes a semester-long team design project, culminating with the writing of a consulting engineering report. Based on my experience in Eall 2014, the undergraduate students need some basic soil property knowledge and to have had technical communication training for them to really benefit from the design experience the class offers. This background is provided in both CEE 345 and CEE 366. So the request is to add (CEE 345 or CEE 366) to the prerequisites.
are any special resources or facilities required for this course? ☐ Yes ☒ No	
are any special resources or facilities required for this course? ☐ Yes ☒ No	
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are any special resources or facilities required for this course? ☐ Yes ☒ No	
are any special resources or facilities required for this course? ☐ Yes ☒ No	
are any special resources or facilities required for this course? ☐ Yes ☒ No	
are any special resources or facilities required for this course? ☐ Yes ☒ No	
are any special resources or facilities required for this course? □ Yes ⋈ No	***************************************
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THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request

Action Requested

College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number

Date

2595

2/23/2015

	Deletic	cation of Existing Cou on of Course	urse New Co Modific	ourses - B &	owing section C completely odified informations completely	ation, B & C		Effective Term	<u> </u>	nitely
ĺ		RENT LISTING			Course Number	T	QUESTED L	ISTING	(X)	Course Number
		epartment	–			Home Dep	oartment			Course Number
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	Cross List	ed Course Informatio	n	- = -		Cross List	ted Course Inf	ormation		
	Course Ti					Course T	itle			
_	TITLE	Time Sched				TITLE	Time Sched	+		
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C.	Close	Yma(a)		L =	nation		o Hours? - zant Faculty	111163:	in the same	term? No
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	<u> </u>	val Info rriculum Comm.	Approved by	Name	Approved D	ate		ted By:	1	s-listed Dept. Signature
	□Fac	culty				Home D	ept. Kim F.	Hayes, Chair & Pro	ofessor	
	☐ Cro	ss listed Unit 1						Environmental Eng		
	☐ Cro	oss listed Unit 2					ept(s).			

SUPPORTING STATEMENT

The CEE 543 Geosynthetics course was last taught in 2000. Since then, most of the material covered by this course has been moved to CEE 542 and CEE 549 taught by Dimitrios Zekkos.
The course therefore is considered redundant and needs to be removed from the course listings

•
Are any special resources or facilities required for this course?
Detail the Special requirements

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Buildin

2596 Form Number

	Action Requested	iculum Committee, 142	-	•	Date	2/23/2015							
	New Course Modification of Existing Course	New Courses - B &	C completely	on, B & C completely	Effective Term	Fall 2015							
	A. CURRENT LISTING	Deletions - A & C o		B. REQUESTED L	Course Offer Freq	Indefinitely ☐ One term only							
	Home Department		Course Number	Home Department	isting	Course Number							
				CEE Civil & Enviro	nmental Engin	543							
	Cross Listed Course Information			Cross Listed Course In									
2.4	Course Title		p	Course Title									
	Oddrse Title			Numerical Modeling i	n Geotechnical Eng	ineering							
	TITLE Time Sched			TITLE Time Sched	+								
	ABBRE- VIATION Max = 19 Spaces Transcript	- Ann		ABBRE- Max = 19 Space									
(2)	Max = 20 Spaces Course Description			VIATION Transcript Max = 20 Space Course Description for									
	Course Description			Finite element metho	od formulation, cons	titutive laws							
				for geotechnical materials including linear elastic, nonlinear elastic, linear elastic-perfectly plastic and									
				nonlinear elasto-plastic. Critical state framework for									
				modeling soil behavior. Finite element program									
				PLAXIS for performing static analyses of earth									
				structures. Soil-structure interaction. Finite difference method and discrete element method. Advanced soil									
				method and discrete element method. Advanced soil models.									
	20.00												
	PROGRAM a c c OUTCOMES: b d	e	k	PROGRAM OUTCOMES:	a c e c	g							
	Degree O Degree Require Requirements O Core Course	ement O Free Electiv			Degree Requirement Core Course	O Free Elective							
	Prereq			_ '	r equivalent.								
	O Enforced O Advised			O Enforced May Advised									
	Credit Restrictions			Credit Restrictions									
	Level of Credit	1	Contact	Level of Cre		Contact							
	☐ Undergrad only ☐ Ugrad or Non-Rckh ☐ Rackham Grad ☐ All Credit types	I Min Max	Hrs/Wk	□ Rackham Grad X A	Il Credit types	Credit Hours Hrs/Wk 3							
Ш	☐ Non-Rckhm Grad ☐ Rckhm Grad w/add' ☐ Ugrad or Rckhm Grad	l Work	Number of Wks	☐ Non-Rckhm Grad ☐ F☐ Ugrad or Rckhm Grad	lckhm Grad w/add'i Work	3 3 Number of Wks 14							
C.	Repeatability (Indi Research, Dir. St	udy, Dissertation: Is t	his course repeata	ble? Yes Max No Hours?	3 Max 1	Can it be repeated Yes in the same term? No							
	Class Type(s)	g	cation	Cognizant Faculty		Title							
Ш	│		Ann Arbor Biological Station	Adda Athanasopoul	os-∠ekkos	Assistant Professor							
	Graded Section	☐ P/F ☐	Camp Davis										
	Lec □ Sem □ Dis □ Othe	er	Extension	Grad Course: Attach	nomination if Cogniza	ant Faculty							
	Rec Lab Ind	Course is Y G		is not a regular grad	luate faculty	·							
	Approval Info Appr Curriculum Comm.	oved by Name	Approved Date		•	pt. Cross-listed Dept.							
				-	tment Chair Name	_							
	Faculty	· . <u></u>			Hayes, Chair & Pro								
	☐ Cross listed Unit 1 ☐ Cross listed Unit 2				Environmental Eng	in							
	Orosa listed Orlit Z			Dept(s).									

SUPPORTING STATEMENT

I.ne.course will discuss the application of numerical methods and geotechnical constitutive laws to analyze	
problems in geotechnical engineering. The emphasis will be on the use of the Finite Element Method (FEM) in	*************
Geomechanics, but will also present the Finite Difference Method and the Discrete Element Model (DEM) and	
some new developments in numerical modeling.	*************
Specifically the course will examine the importance of adequately modeling soil behavior. The finite element	
method will be presented and constitutive laws for geotechnical materials will be developed including linear	
elastic, nonlinear elastic, linear elastic-perfectly plastic and nonlinear elasto-plastic. The critical state soil	
mechanics (CSSM) framework for modeling soil behavior will be studied.	
Students will be introduced to and will use the finite element program PLAXIS to perform static analyses of ear	th
structures and develop recommendations regarding realistic consulting projects.	
Numerical modeling of Soil-structure Interaction will be presented, as well as various Advanced Soil Models	
A course focusing on numerical modeling in geotechnical engineering is very important and was missing from a	our
curriculum. Currently students in the Civil MSE program with a focus on geotechnical engineering had to take.	a
finite element course in Mechanical Engineering or AOSS. This is not appropriate since soil materials are very	
different from other materials and require different considerations when developing constitutive models to be	
used in numerical analyses.	
Are any special resources or facilities required for this course?	
Detail the Special requirements	



Department of Civil and Environmental Engineering

CEE 501.043 – Special Topics: Numerical Modeling in Geotechnical Engineering (3) Fall 2014

Time:

MWF 11:30 (11:40 start) – 12:30 pm

Place:

1363 GG Brown

Instructor:

Prof. Adda Athanasopoulos-Zekkos

2362 G.G. Brown Building phone: 764-0057 (office) addazekk@umich.edu

Office Hours:

MW 10:30am to 11:30am;

or by appointment

Textbook:

No textbook is required for class, however reading materials will

be provided in class.

Grading:

Homework

40%

Midterm

25%

Final Exam

35%

Midterm Exam: Monday, October 20, 11:30am-12:30pm 1363 GG Brown

Final Exam: Wednesday, December 17, 10:30am – 12:30pm 1363 GG Brown

Course Outline

- I. Introduction to Numerical Modeling in Geotechnical Engineering
 - Modeling of Soil response to Loadings
 - Introduction to PLAXIS A finite element program

II. The Finite Element Method

- The Finite Element "Approximation"
- Finite Element Formulation
- Numerical Procedures
- Incremental Finite Element Analysis
- Development of Finite Element Model

III. Soil Constitutive Models

- Linear Elasticity
 - o Theory
 - o Application to Shallow Foundations
- Linear Elastic Perfectly Plastic
 - o Theory
 - o Application to Shallow Foundation
- Non-Linear Stress Dependent Elastic Model
 - o Incremental Duncan Hyperbolic Soil Model
 - o Application to Shallow Foundation and Earth Embankment
- Non-Linear Elasto-Plastic Strain Hardening Model
 - o Critical State Soil mechanics
 - o Incremental Cam-Clay and modified Cam-Clay models
 - o Application to Shallow Foundation and Earth Embankment

IV. Soil-Structure Interaction and Advanced Analysis

- Interface element
- Reinforced soil systems and soil-culvert systems
- Boundary deformation problems and slope stability
- Excavations

V. Recent Developments and Summary

- Finite difference method with dynamic relaxation
- Discrete Element Method
- Advanced Soil Models

Policy and Guidelines on Homework and Project Report Preparation

Assignments are typically due one week after they were assigned, unless otherwise specified. Late homework grades will be reduced by 25%. Homework submitted after the solutions have been posted or discussed in class will not be accepted.

You are allowed to consult with other students in the class during the conceptualization of a problem but all written work (calculations, figures, tables, graphs, etc.) is to be generated by you working alone. Violation of this policy will be considered a violation of the College of Engineering's Honor Code. If you have any questions about this policy, please do not hesitate to contact the instructor.

Guidelines for Submission

- Print neatly and in order.
- Name, date, and number every page. Staple pages together. Landscape pages should be inserted such that the top of the landscape page corresponds to the left edge of the portrait pages.
- If including a graph is required, print the graph on official logarithmic paper or use a computer program for printing graphs. Label all graph axes.
- Give the units for all answers (unless they are dimensionless) and do not use an excessive number of significant digits in your final answer.
- When using equations, always first write the complete equation in variable form.
 Never just write numbers without explaining what equation you have inserted them into.
- Use spreadsheets whenever repetitive calculations are to be performed. However, always provide a hand-written sample calculation. Spreadsheets are also excellent for preparing graphs.

University of Michigan Office of the Registrar - Evaluations ro.umich.edu/evals/

Instructor with Comments Report 2014-11-26 - 2014-12-11 Report ID: MSR04734

Fall 2014 Final

5 students responded out of the total enrolled 6

Instructor: Athanasopoulos-Zekkos, Adda

CEE 501 043

Other Users of This Item*

		Resp	Responses from your Students**	rom yo	ur Stuc	ents**		Univ	University Wide	de de	Sch	School/College	a
	ĸ	4	ო	7	-	;	Your	75%	20%	25%	75%	20%	25%
	SA	∢	Z	۵	SD	Y V	Median	Above	Above	Above	Above	Ароле	Above
		١.	٩	٩	٠		00 1	20.	4 23	;	30.4	4 50	4 70
Overall, this was an excellent course.	4	-	0	>	>	>	4.88	3.93	4.33	4.12	4.23	4.50	4.70
Overall the instructor was an excellent teacher.	3	7	0	0	0	0	4.67	4.15	4.61	4.85	4.39	4.65	4.85
Thermed a preat deal from this course	5	0	0	0	0	0	9.00	4.00	4.40	4.75	4.33	4.60	4.78
I had a strong desire to take this course	3	7	0	0	0	0	4.67	3.64	4.17	4.63	4.25	4.56	4.75
I increased my ability to apply math and science knowledge to engineering problems.	2	٣	0	0	0	0	4.33	4.06	4.28	4.55			
I increased my ability to analyze and interpret data.	4	-	0	0	0	0	4.88	4.03	4.27	4.50			
My confidence in my design abilities increased because of this course.	3	2	0	0	0	0	4.67	4.00	4.25	4.67			
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4.25	0 0 0 0 4.67 4.15 4.61 4.85 4.39 4.65	0 5.00 4.00 4.40 4.75	3.64 4.17 4.63 4.25	0 4.33 4.06 4.28	4.03 4.27	0 4.67 4.00 4.25	0 4.67 3.94 4.19	0 4.67 4.05 4.26	0 4.33 4.00	0 4.67 4.00 4.25	0 0 0 4.67 3.79 4.10	0 4.67 4.00 4.30	0 4.67 4.13 4.32	0 5.00 4.08 4.32	0 0 0 4.33 3.96 4.22	0 0 0 4.88 4.00 4.25	4.00 4.50	0 0 0 4.67 4.22 4.58	0 0 0 5.00 4.50 4.80	0 4.67 4.33	0 4.88 4.13 4.50	0 4.88 4.33	0 4.00 4.06 4.38 4	0	7	0 0 0 2 4.25 3.87 4.14 4.50	1 0 0 0 4.67 4.00 4.39 4.67
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4	3	5	٣	7	4	٣	٣	Ę	2	٣	3	٣	٣	2	7	4	4	3	5	٣	4	4	-	2	П	1	т
1 Overall, this was an excellent course.	2 Overall the instructor was an excellent teacher.	3 Hearned a great deal from this course.	4 I had a strong desire to take this course.	15 I increased my ability to apply math and science knowledge to engineering problems.	17 I increased my ability to analyze and interpret data.	20 My confidence in my design abilities increased because of this course.	21 I gained valuable experience working in teams in this course.	23 I increased my ability to formulate, and solve engineering problems.	25 I developed a greater understanding of my responsibilities as a professional.	28 Course improved my ability to communicate technical information, designs, and analyses.	30 I developed a greater understanding of the impact of engineering on the environment.	32 This course increased my desire to learn more about this subject in the future.	34 I have a greater understanding of how course concepts apply to contemporary problems.	35 I increased my ability to apply engineering tools and methods.	121 I gained a good understanding of concepts/principles in this field.	125 I developed the ability to solve real problems in this field.	201 The instructor gave clear explanations.	203 The instructor stressed important points in lectures/discussions.	207 The instructor appeared to have a thorough knowledge of the subject.	216 The instructor acknowledged all questions insofar as possible.	229 The instructor used class time well.	230 The instructor seemed well prepared for each class.	232 Work requirements and grading system were clear from the beginning.	239 The amount of work required was appropriate for the credit received.		360 Exams were reasonable in length and difficulty	366 The grading system was clearly explained.

Written Comments

900 Comment on the quality of instruction in this course.

Student 1

Professor Athanasopoulos-Zekkos provided very good course notes that I believe will be practical and useful in my future career. The class lectures were interesting and Professor Athanasopoulos-Zekkos did a very good job delivering the information. My favorite lecture was the lecture on the failure of levees during Hurricane Katrina. I thought that this lecture really showed the ability of numerical modeling to modeling. In the field, and the lessons that one can learn from numerical modeling.

Page 1 of 2

Fall 2014 Final

5 students responded out of the total enrolled 6

Instructor with Comments Report 2014-11-26 - 2014-12-11 Report ID: MSR04734

Instructor: Athanasopoulos-Zekkos, Adda

CEE 501 043

Student 2

NA

Student 3

NA

Course allowed lab test results to be used in implementing design models. Increased confidence in ability to apply and think critically about various numerical models. This class was a good follow up to Advanced Soil Mechanics in actually applying concepts developed in that class. Student 4

Student 5

This course is the first time that I had been exposed to numerical modeling specific to geotechnical engineering problems, and I feel at the end of this course that I have a much greater understanding of how models are applying, its limitations, the testing required to develop the parameters you were applying, its limitations, the testing required to develop the parameters you needed, and what the expected outcome is and how to validate your model based on the test data. Taking the time to go through the models in the assignments really helped them sink in. Also through the class I feel that I have developed a good amount of skill in using PLAXIS 2D, both developing the problems accurately and understanding and interpreting the results. Overall I feel that this course is very practical and

* The quartiles are calculated from Fall 2014 data. The university-wide quartiles are based on all UM classes in which an item was used. The school/college quartiles in this report are based on graduate level students in College of Engineering.

** SA - Strongly Agree, A - Agree, N - Neutral, D - Disagree, SD - Strongly Disagree, NA - Not Applicable

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request

2583

	Course Approval Reque	
	College Curriculum Committee, 1420 Lurie Engir Action Requested	neering Center Building Date 2/10/2015
	 New Course Modification of Existing Course Deletion of Course Modifications - A modified information 	ons: Ely Minter 2015 FT 2015
	Deletions - A & C completely	Course Offer Freq Indefinitely B. REQUESTED LISTING One term only
1	A. CURRENT LISTING Home Department Course Numb	1.12233733 1.331113
	Prome Department Course Number	
_	Cross Listed Course Information	CEE Civil & Environmental Engin 555 Cross Listed Course Information
	Cross Listed Course information	Cross Listed Course (mormation
_	Course Title	Course Title
		Sustainability of Civil Infrastructure Systems
	TITLE Time Sched Max = 19 Spaces	TITLE Time Sched Cue City Info Cyc
	ABBRE- Transcript	ABBRE-
_	Max = 20 Spaces Course Description	VIATION Transcript Max = 20 Spaces Sus Civ Infr Sys Course Description for Official Publication (Max = 50 words)
]	Source Description	Life Cycle Cost Analysis and Life Cycle Analysis - Methods and Applications in Civil Infrastructure Systems; Building Energy Modeling and Simulation; Energy Management in Buildings; Impact of Building Occupants and Behavioral Challenges; Renewable Energy and Efficiency in Buildings; Existing Buildings and Technical/Social Challenges of Energy Retrofits; and Building Certifications (e.g., LEED).
	PROGRAM OUTCOMES: b	PROGRAM OUTCOMES: b
	Prereq	Prereq
	O Enforced O Advised	O Enforced O Advised
- 1	Credit	Credit
	Restrictions	Restrictions
	Level of Credit Undergrad only Richam Grad Non-Richam Grad Ugrad or Rockhm Grad Non-Richam Grad Ugrad or Richam Grad Ugrad or Richam Grad Ugrad or Richam Grad	Level of Credit Unidergrad only Rackham Grad Non-Rckhm Grad Rckhm Grad Wadd'l Work Ugrad or Rckhm Grad Ugrad or Rckhm Grad
C.	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course re	Hours? Times? In the same term? No
_	Class Type(s) Grading Location ☑ Lec ☐ Sem ☐ Dis ☐ Other ☑ A-E ☑ Ann Arbor	Cognizant Faculty Member: Title
	Image: Sem in the properties of th	Carol Menassa Assistant Professor
	Graded Section P/F Camp Davis	
	∠ Lec Sem Dis Other	Grad Course: Attach nomination if Cognizant Faculty
	Approval Info Approved by Name Approved Curriculum Comm.	is not a regular graduate faculty I Date Submitted By: ☑ Home Dept. ☐ Cross-listed Dept.
		Department Chair Name Chair Signature
	☐ Faculty	Home Dept. Kim F. Hayes, Chair & Professor
	Cross listed Unit 1	Cross-listed Civil & Environmental Engin
	☐ Cross listed Unit 2	Dent(s)

Dept(s).

Form Number 2583

SUPPORTING STATEMENT
High oil prices, diminishing natural resources, and global warming are causing developed countries to investigate ways to reduce
their energy consumption. In the United States (US), the civil infrastructure and building sector represents an excellent opportunity
to achieve large-scale energy use reductions through efficiency and conservation
The objective of the class is to provide the students with the opportunity to explore the different challenges associated with making
civil.infrastructure.systems.and.buildings.sustainable.by.exploring.fundamental.concepts.practical.applications.and.academic
research in this field. The class will teach the students tools to evaluate different aspects of civil infrastructure and building
sustainability.(i.eeconomicenvironmental.and.social)A set of general questions will be used as guiding principles throughout
the course, these include:
systems and buildings with specific emphasis on energy consumption?
and buildings sustainable need to be revisited or improved to ensure effective results?
To what extent do these elements represent the interests of those affected by the decisions (e.g., building owners
buildings.occupants/tenants, building.operators)?
And vice versa, how the interests of those affected influence the design and outcome during the civil infrastructure.
systems or building operation phases?
Students will be able to achieve the following outcomes:
subsequently reduce greenhouse gas emissions.
sustainable
Explore why addressing economic, environmental and social issues is integral to achieving energy reduction from civil
infrastructure systems and building operations
Learn tools and techniques to evaluate civil infrastructure systems and civil infrastructure systems building performance
from economic, environmental and social perspectives.
Identify opportunities that leverage tools and techniques learned in the class to achieve sustainable buildings and infrastructure systems
Are any special resources or facilities required for this course? ☐ Yes ☒ No
Detail the Special requirements

CEE 501 - 059 SUSTAINABILITY OF CIVIL INFRASTRUCTURE SYSTEMS WINTER 2015 – 3 Credits

Lectures:

Monday/Wednesday 2:30 – 4:00 PM

2305 GGBL

Contact:

Carol Menassa, Assistant Professor

2322 G. G. Brown
Phone: (734) 764-7525
Email: menassa@umich.edu
Office Hours: by appointment

Credits:

3 hours

Required Text:

Material for this class is drawn from several different books and resources. There is no single required text book. All required course materials and notes will be posted on the course website.

Recommended text books:

- Sustainable Construction: Green Building Design and Delivery, 3rd Edition by Charles J. Kilbert. Publisher: John Wiley & Sons, Inc.
- 2) The Integrative Design Guide to Green Building Redefining the Practice of Sustainability by 7 Group and Bill G. Reed. Publisher: John Wiley & Sons, Inc.

Prerequisites:

A prior course in engineering economics will be beneficial but it not required. Fundamental skills in math, physics and computer-based problem solving are necessary. A desire to actively participate in a learning environment is required.

Course Website:

https://ctools.umich.edu

Once you register with the course, you will be able to use the course resources on C-Tools. Please take some time to familiarize yourself with the system.

COURSE DESCRIPTION

High oil prices, diminishing natural resources, and global warming are causing developed countries to investigate ways to reduce their energy consumption. In the United States (US), the building sector represents an excellent opportunity to achieve large-scale energy use reductions through efficiency and conservation. Residential and commercial buildings account for 40 percent of the total energy consumption by the built environment with an estimated 3 percent increase per year (http://www.eia.gov/2014).

The objective of the class is to provide the students with the opportunity to explore the different challenges associated with making buildings sustainable, by exploring fundamental concepts, practical applications and academic research in this field. The class will teach the students tools to evaluate different aspects of building sustainability (i.e., economic, environmental and social). A set of general questions will be used as guiding principles throughout the course, these include:

- What are the available methods and approaches that can effectively assist in achieving sustainability in buildings with specific emphasis on energy consumption?
- What elements of the design and decision making process related to making new and existing buildings sustainable need to be revisited or improved to ensure effective results?
- To what extent do these elements represent the interests of those affected by the decisions (e.g., building owners, buildings occupants/tenants, building operators)?
- And vice versa, how the interests of those affected influence the design and outcome during the building operation phases?

COURSE OUTCOMES

Students will be able to achieve the following outcomes:

- Understand why buildings we live and work in are going to play a central role in reducing demand for energy and subsequently reduce greenhouse gas emissions.
- Understand the challenges associated with making new and existing buildings sustainable.
- Explore why addressing economic, environmental and social issues is integral to achieving energy reduction from building operations.
- Learn tools and techniques to evaluate building performance from economic, environmental and social perspectives.
- Identify opportunities that leverage tools and techniques learned in the class to achieve sustainable buildings and infrastructure systems.

COURSE OUTLINE

The following is a list of planned topics that we will cover in the class.

Topic 1: Sustainability and Buildings – A General Overview

The class will start with an introduction to sustainability framework in buildings that will cover principles, phases and resources. The discussion will focus on new concepts related to achieving sustainable buildings such as Integrated Building Design (IBD) and Net Zero Buildings (NZB). Other issues related to site analysis, solar orientation and regulatory zoning factors will be introduced.

Topic 2: Life Cycle Cost Analysis - Methods and Applications in Buildings

The class will introduce the life cycle cost analysis (LCCA) by providing a comprehensive definition and discussing how and why it can be applied to buildings. In addition, several methods from engineering economics will be presented to teach students to perform LCCA using traditional present value approaches. This will be complimented with an introduction to real options and discussing how it can be used to overcome some of the technical limitations on applying the traditional LCCA to evaluate sustainable buildings.

Topic 3: Life Cycle Analysis - Methods and Applications in Buildings

This class will introduce the life cycle analysis (LCA) by providing a comprehensive definition and discussing how and why it can be applied to buildings. A contrast between LCA and LCCA will be provided. The students will be introduced to economic input-output (EIO-LCA), process models and hybrid models of performing LCA. The limitations of these methods to analyzing buildings will also be discussed and opportunities explored.

Topic 4: Building Energy Modeling and Simulation

This class will introduce the energy simulation and modeling in buildings. It will discuss applications, teach common software (e.g. eQuest and EnergyPlus), and discuss the advantages and disadvantages of some of the existing software. The students will perform analysis on typical buildings and couple that with sensitivity analysis to identify important input parameters for proper conceptual design and analysis of buildings.

Topic 5: Energy Management in Buildings

This class will introduce the principles of managing the consumption and conservation of energy in buildings. It will discuss the management cycle and introduce available energy management tools like Energy Star.

Topic 6: Impact of Building Occupants and Behavioral Challenges

This class will introduce the important topic of occupancy and their impact on energy use. The students will learn how this impact differs between residential and commercial buildings. Approaches to reduce occupancy impact in building energy use will also be introduced and evaluated. Technical approaches (e.g. occupancy sensors and building automation systems) will be contrasted with behavioral approaches (e.g. information sharing and feedback). In addition, different occupancy intervention strategies will be discussed, and their advantages/disadvantages highlighted.

Topic 7: Renewable Energy and Efficiency in Buildings

This class will build on the idea of net zero energy buildings (NZE) to introduce the students to renewable energy applications in buildings. The students will learn the different types of on-site and off-site renewable energy options. An important aspect of this class will to be to contrast efficiency and renewable energy application and discuss how a hybrid of these methods will be required to achieve NZE buildings of the future.

Topic 8: Existing Buildings and Challenges of Energy Retrofits - Technical/Social
This class will discuss the challenges of sustainably retrofitting existing buildings. The
students will explore the difference between general maintenance and sustainable retrofits
in existing buildings. The technical and social challenges to sustainably retrofitting existing
buildings will be discussed.

Topic 9: Building Certifications - Truths and Myths

This class will discuss drivers for building certifications and introduce some of the existing methods such as: New Building Certification Standards, International Federation of Consulting Engineers (FIDIC), Green Building Institute (GBI), Build It Green, KB Homes; Energy Performance Guide, U.S. Green Building Council (USGBC). Students will explore the opportunities and challenges in pursuing these certifications.

GRADING POLICY

Homework: 40%

Assignments will be given throughout the semester reflecting the lessons learned in the class. Students should keep their assignments neat and organized. Any further grading criteria will be provided with the homework, as it is assigned.

Semester Project: 30%

At the beginning of the semester, the students will organize in teams to work on a project. Each team will propose a project that interests them. It is required that students work on the project progressively through the semester. The project will require the students to analyze a sustainable concept or application, and defend it using the fundamentals and tools learned in this course.

The final project product will consist of the following parts:

- An oral presentation given in class at the end of the semester to present findings to the class. This presentation is worth 40 percent of the total project grade.
- A technical report, providing the details of the study, collected at the end of the semester and worth 60 percent of the score.

Further grading criteria will be provided in the detailed instructions to the project.

Quizzes: 30%

There will be two quizzes for this class. Quizzes will be offered during the regular class time on the assigned dates given below. The format of each quiz will be discussed in class.

Quiz 1: Wednesday February 25, 2015
Quiz 2: Wednesday April 15, 2015

ACADEMIC INTEGRITY AND ACADEMIC MISCONDUCT – HONOR CODE

The Department of Civil and Environmental Engineering at the University of Michigan adheres to the strictest standards of academic honesty. An important aspect of achieving these standards is to be sure that students are aware of faculty expectations regarding academic honesty. This statement clarifies these expectations as they apply to this course.

Assignments and semester projects performed by students for submission serve the following two purposes:

- Assignments and term project are seen as educational devices to help students master the course material. This includes the concepts, theories, methodologies, and tools presented in class and recitation; as well as, such skills as working in teams.
- Assignments and term project help the faculty evaluate how well each student has mastered the course material.

Students currently taking this class can work together to conceptualize general approaches to assignments. However, unless otherwise specified for a particular assignment, the work you submit must be done completely on your own. This includes text, numerical calculations, mathematical derivations, diagrams, graphs, computer programs and output. You are also expected to properly reference the source of any information used in a submission that is not your own. This includes any book, article, web page, MS PowerPoint presentation or personal correspondence from someone else that you used to create your work. It is recommended to use the American Society of Civil Engineers (ASCE) publications guidelines available at the link below to properly reference all types of sources.

http://www.asce.org/Audience/Authors,--Editors/Books/General-Book-Information/Quick-Guide-to-Common-Types-of-Referenced-Material/

It is also inappropriate to use assignments or projects submitted in previous years as a source. Academic honesty rules will be strictly implemented in this case.

If you have any questions about how these policies relate to a specific situation, please speak to the professor of this course for clarification. Just remember, when you have doubts, ask the professor for assistance.

Please refer to University policy regarding academic misconduct. Academic misconduct (cheating, plagiarism, etc.) on homework assignments, projects, etc. will not be accepted and such works will be given a score of zero, and reported to the Honor Council in the College of Engineering. More information can be found at the following link: http://honorcode.engin.umich.edu/.

Other Users of This Item*

Instructor Report

2014-04-10 - 2014-04-24 Report ID: MSR04732

Instructor: Menassa, Carol C

CEE 501 059

			Respo	nses fi	Responses from your Students**	ır Stud	ents**		Unive	University Wide	g g	Scho	School/College	
		S A	4 4	m Z	D 2	SD 1	A A	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
-	Overall, this was an excellent course.	6	12	3	-	0	0	4.21	3,95	4,33	4.73	4.17	4.50	4.75
7	Overall, the instructor was an excellent teacher.	14	00	3	0	0	0	4.61	4.16	4.60	4.85	4.27	4.69	4.83
3	I learned a great deal from this course.	12	10	3	0	0	0	4.45	4 00	4.38	4.72	4.30	4.58	4.79
4	I had a strong desire to take this course.	17	5	7	0	_	0	4.76	3.67	4.17	4.63	4.17	4.50	4.75
15	I increased my ability to apply math and science knowledge to engineering problems.	6	10	4	2	0	0	4.15	4 04	4.27	4.57			
17	I increased my ability to analyze and interpret data.	10	6	5	_	0	0	4.22	4 00	4.33	4.60			
20	My confidence in my design abilities increased because of this course.	∞	10	4	_	0	7	4.15	4.04	4.47	4.63			
21	I gained valuable experience working in teams in this course.	12	10	7	-	0	0	4.45	3.86	4.20	4.58			
23	I increased my ability to formulate, and solve engineering problems.	7	00	∞	2	0	0	3.81	4 04	4.29	4,53			
25	I developed a greater understanding of my responsibilities as a professional.	13	6	_	7	0	0	4.54	4.00	4.33	4.75			
28	Course improved my ability to communicate technical information, designs, and analyses,	10	-	C1	2	0	0	4.27	4.05	4.22	4.50			
30	I developed a greater understanding of the impact of engineering on the environment.	91	00	0	0	0	0	4.75	3.75	4.17	4.58			
32	This course increased my desire to learn more about this subject in the future.	12	6	3	_	0	0	4,44	3.94	4.17	4.58			
34	I have a greater understanding of how course concepts apply to contemporary problems.	13	Ξ	_	0	0	0	4.54	4.13	4.34	4.64			
35	I increased my ability to apply engineering tools and methods.	13	6	7	_	0	0	4.54	4.10	4.28	4.56			
121	I gained a good understanding of concepts/principles in this field.	13	Ξ	_	0	0	0	4.54	3.98	4.21	4.55			
125	I developed the ability to solve real problems in this field	13	5	9	_	0	0	4.54	3.93	4,25	4.64			
201	The instructor gave clear explanations.	15	∞	7	0	0	0	4.67	4.08	4.50	4.79			
203	The instructor stressed important points in lectures/discussions.	13	10	7	0	0	0	4.54	4.17	4.56	4.80			
207	The instructor appeared to have a thorough knowledge of the subject.	18	9	_	0	0	0	4.81	4.50	4.80	4.92			
216	The instructor acknowledged all questions insofar as possible.	18	5	_	0	0	0	4.83	4.33	4.67	4.83			
229	The instructor used class time well.	15	9	4	0	0	0	4.67	4.14	4.50	4.80			
230	The instructor seemed well prepared for each class.	18	7	0	0	0	0	4.81	4.33	4.69	4.86			
232	Work requirements and grading system were clear from the beginning	8	9	_	0	0	0	4.81	4.07	4.39	4.68			
239	-	13	Ξ	_	0	0	0	4.54	4.00	4.26	4.57			
356	Examinations covered the important aspects of the course.	00	٣	3	0	0	=	4.63	4.00	4.29	4.63			
360	Exams were reasonable in length and difficulty.	9	7	3	0	0	14	4.58	3.83	4.09	4.46			
366	The grading system was clearly explained.	14	10	0	0	0	_	4.64	4.00	4.33	4.64			

^{*} The quartiles are calculated from Winter 2014 data. The university-wide quartiles are based on all UM classes in which an item was used. The school/college quartiles in this report are based on graduate level students in College of Engineering.

Page 1 of 1

^{**} SA - Strongly Agree, A - Agree, N - Neutral, D - Disagree, SD - Strongly Disagree, NA - Not Applicable

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING 2540 **Form Number Course Approval Request** College Curriculum Committee, 1420 Lurie Engineering Center Building 11/12/2014 **Date** Action Requested Complete the following sections: New Course Fall 2015 New Courses - B & C completely **Effective Term** Modification of Existing Course Modifications - A modified information, B & C completely O Deletion of Course ☑ Indefinitely Deletions - A & C completely **Course Offer Freq** One term only A. CURRENT LISTING **REQUESTED LISTING** Course Number Course Number Home Department Home Department CEE Civil & Environmental Engin 572 Cross Listed Course Information Cross Listed Course Information Course Title Course Title Dynamic Infrastructure Systems Time Sched Time Sched TITLE TITLE Dynamic Infr Sys Max = 19 Spaces Max = 19 Space: ABBRF-ARRRE-Transcript Transcript Max = 20 Spaces VIATION VIATION Dynamic Infr Sys Max = 20 Spaces Course Description Course Description for Official Publication (Max = 50 words) Introduction to the fundamentals of dynamics system theory applied to infrastructure systems including system modeling as well as monitoring and controlling structural, transportation, hydraulic, and electrical grid systems. Continuous-time and discrete-time linear systems are emphasized but elementary concepts in nonlinear systems are also presented. **PROGRAM PROGRAM** □i□k a __ c _ е □g □i □k а C e g **OUTCOMES: OUTCOMES:** b d ☐ f ∄h. __ d ☐ f h 🔲 j Degree O Degree Requirement O Free Elective O Other Degree Requirements O Core Course O Tech Elective Requirements O Core Course O Tech Elective Prerea Prereg O Enforced O Enforced O Advised O Advised Credit Restrictions Restrictions **Level of Credit Level of Credit** Contact Contact Credit Hours Credit Hours Ugrad or Non-Rckhm Grad All Credit types Rckhm Grad w/add'l Work Hrs/Wk ☐ Ugrad or Non-Rckhm Grad X All Credit types ☐ Rckhm Grad w/add'l Work 3 Undergrad only Rackham Grad Non-Rckhm Grad Ugrad or Rckhm Grad Undergrad only Min Max Min Max Number Non-Rokhm Grad Ugrad or Rokhm Grad Number 14 of Wks of Wks Can it be repeated O Yes Max Max Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? No in the same term? No Hours? Times? Cognizant Faculty Member: Title Class Type(s) Location Grading 🔀 Lec 🗌 Sem Dis Other Jerome P. Lynch Professor X A-E Ann Arbor 🗌 Rec 🔲 Lab ☐ Ind CR/NC **Biological Station** P/F Camp Davis **Graded Section** □ S/U ☐ Extension 🔀 Lec 🗌 Sem Dis Other Grad Course: Attach nomination if Cognizant Faculty Rec Lab Ind Course Is Y Graded is not a regular graduate faculty Submitted By: Home Dept. Cross-listed Dept. **Approved by Name Approved Date** Approval Info ☐ Curriculum Comm. **Department Chair Name** Chair Signature ☐ Faculty Kim F. Hayes, Chair & Professor Home Dept.

☐ Cross listed Unit 1

☐ Cross listed Unit 2

Civil & Environmental Engin

Cross-listed

Dept(s).

Form	Number
2	540

SUPPORTING STATEMENT

dynamic system theory applied to problems in infrastructure systems. The course has been offered in Fall 2014 for the first time under CEE501 (Section 16 — Lynch) and will be offered every year henceforth. Attached is an overview of the course.

Are any special resources or facilities required for this course?

CEE572 - Dynamical Infrastructure Systems (3 Credits) Fall Semester 2014-2015 Course Description

Instructor: Jerome P. Lynch

jerlynch@umich.edu.

Lectures: Mondays and Wednesdays, 4:00 - 5:30 pm

G. G. Brown 2305

Office Hours: Friday, 10:00 - 11:00 am

2380 G. G. Brown

Website: http://www-personal.umich.edu/~jerlynch/cee572/

Catalog Description:

This course is an introductory course in the fundamentals of dynamics system theory applied to infrastructure systems including applications in modeling, motoring and controlling structural, transportation, hydraulic, and electrical grid systems. Linear systems are emphasized including continuous-time and discrete-time systems but elementary concepts in nonlinear systems are also presented. Additional topics include feedback control theory, system identification, and cyber-physical system architectures.

Textbook:

None required

Optional References (currently on reserve at the AAE Library):

- Introduction to Dynamic Systems: Theory, Models, and Applications, David G. Luenberger, Wiley, 1979
- Linear Dynamical Systems, John L. Casti, Academic Press, 1987
- Filtering and System Identification: A Least Squares Approach, Michel Verhaegen and Vincent Verdult, Cambridge Press, 2007

Course Requirements:

- Regular attendance
- Weekly homework assignments
- Midterm exams (2 exams)

Homework:

Homework will normally be assigned each Monday and due the following Monday in class (unless otherwise noted). Please note, late homework will not be accepted. You are allowed to work on the homework in small groups, but you must write up your own homework to hand in. Homework will often involve MATLAB programming. Homework will be graded on a scale of 100.

Grading:

Homework 30%, Midterm #1 35%, Midterm #2 35%.

These weights are approximate; the right to change them later is reserved.

Prerequisites:

Exposure to linear algebra and matrices. You should have seen the following topics: matrices and vectors, (introductory) linear algebra and differential equations. Deeper appreciation for the course would be derived from having taken CEE571: Linear System Theory

Course Outline:

Lectures:

- Class 1 Introduction to Dynamical Systems
- Class 2 Introduction to System Types
- Class 3 Single Variable Differential Equations for Continuous Time Systems
- Class 4 Difference Equation Models for Discrete Time Systems
- Class 5 Realization of Dynamical Systems
- Class 6 Convolution and the Laplace Transform
- Class 7 Dynamic Response Analysis of SISO Systems by Laplace Transforms
- Class 8 Complex Plane and Dynamic System Behavior
- Class 9 Block Diagrams for Dynamical Systems
- Class10 Control of SISO Dynamical Systems
- Class 11 Introduction to Signals
- Class 12- Correlation Analysis of Random Signals
- Class 13 Fourier Series, Integral and Transforms
- Class 14 Applications of the Continuous-Time Fourier Transforms
- Class 15 Introduction to Random Vibrations and Spectral Analysis
- Class 16 Discrete-time SISO Systems and the Z-Transform
- Class 17 Properties of the Discrete-Time Complex Plane
- Class 18 Discrete-time System Examples
- Class 19 Discrete Fourier Transform
- Class 20 Applications of DFT in System Analysis
- Class 21 Aliasing
- Class 22 State-Space System Models
- Class 23 Review of Linear Algebra
- Class 24 State Evolution Equations
- Class 24 Observability and Controllability
- Class 25 Linear Quadratic Regulation (LQR) Control
- Class 26 Nonlinear Systems Linearization and Phase Diagrams

Fall 2014 Final

5 students responded out of the total enrolled 8

Instructor with Comments Report 2014-11-26 - 2014-11 Report ID: MSR04734

Instructor: Lynch, Jerome P CEE 501 016 Other Users of This Item*

	s SA	4 4	mΖ	0 2	SD SD	NA N	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1 Overall, this was an excellent course.	5	0	0	0	0	0	5.00	3.95	4,33	4.72	4.25	4.50	4.70
2 Overall, the instructor was an excellent teacher.	5	0	0	0	0	0	5.00	4.15	4.61	4.85	4.39	4.65	4.85
3 I learned a great deal from this course.	5	0	0	0	0	0	5.00	4.00	4.40	4.75	4.33	4.60	4.78
4 I had a strong desire to take this course.	4	-	0	0	0	0	4.88	3.64	4.17	4.63	4.25	4.56	4.75
15 I increased my ability to apply math and science knowledge to engineering problems.	5	0	0	0	0	0	5.00	4,06	4.28	4.55			
17 I increased my ability to analyze and interpret data.	5	0	0	0	0	0	5.00	4.03	4.27	4.50			
20 My confidence in my design abilities increased because of this course.	5	0	0	0	0	0	5.00	4.00	4.25	4.67			
21 I gained valuable experience working in teams in this course.	3	0	_	0	0	-	4.83	3.94	4.19	4.50			
23 I increased my ability to formulate, and solve engineering problems.	4	-	0	0	0	0	4.88	4.05	4.26	4.54			
25 I developed a greater understanding of my responsibilities as a professional.	2	-	_	0	0	_	4.50	4.00	4.33	4.75			
28 Course improved my ability to communicate technical information, designs, and analyses.	3	2	0	0	0	0	4.67	4.00	4.25	4.50			
30 I developed a greater understanding of the impact of engineering on the environment.	٣	2	0	0	0	0	4.67	3.79	4.10	4.44			
32 This course increased my desire to learn more about this subject in the future.	5	0	0	0	0	0	5.00	4.00	4.30	4.58			
34 I have a greater understanding of how course concepts apply to contemporary problems.	5	0	0	0	0	0	5.00	4.13	4,32	4.63			
35 I increased my ability to apply engineering tools and methods.	2	0	0	0	0	0	5.00	4.08	4.32	4.57			
121 I gained a good understanding of concepts/principles in this field.	5	0	0	0	0	0	5.00	3.96	4.22	4.57			
125 I developed the ability to solve real problems in this field.	2	0	0	0	0	0	5.00	4.00	4.25	4.61			
201 The instructor gave clear explanations.	2	0	0	0	0	0	5.00	4.00	4.50	4.79			
203 The instructor stressed important points in lectures/discussions.	2	0	0	0	0	0	5.00	4.22	4.58	4.82			
207 The instructor appeared to have a thorough knowledge of the subject.	2	0	0	0	0	0	5.00	4.50	4.80	4.92			
216 The instructor acknowledged all questions insofar as possible.	2	0	0	0	0	0	5.00	4.33	4.67	4.83			
229 The instructor used class time well.	5	0	0	0	0	0	5.00	4.13	4.50	4.79			
230 The instructor seemed well prepared for each class.	5	0	0	0	0	0	5,00	4.33	4.69	4.86			
232 Work requirements and grading system were clear from the beginning.	4	-	0	0	0	0	4.88	4.06	4.38	4.67			
239 The amount of work required was appropriate for the credit received.	2	0	0	0	0	0	5.00	4.00	4.25	4.63			
356 Examinations covered the important aspects of the course.	4	-	0	0	0	0	4.88	4.10	4.38	4.67			
360 Exams were reasonable in length and difficulty.	4	-	0	0	0	0	4.88	3.87	4.14	4.50			
366 The grading system was clearly explained.	4	-	0	0	0	0	4.88	4.00	4.39	4.67			
	w w w w w w 4 w 4 4 4		0000000000	0000000000	0000000000	000000000	5.00 5.00 5.00 5.00 5.00 5.00 6.00 6.00	4.00 4.22 4.50 4.33 4.13 4.06 4.00 4.10 3.87 4.00	4.58 4.80 4.67 4.67 4.69 4.38 4.25 4.38 4.14 4.39	4,79 4,82 4,92 4,83 4,79 4,67 4,67 4,50 4,50			

Written Comments

900 Comment on the quality of instruction in this course.

Student 1
NA

Student 2

Date Printed:12/16/2014 8:28:17 AM

Page 1 of 2

Fall 2014 Final

5 students responded out of the total enrolled 8

Instructor with Comments Report

2014-11-26 - 2014-12-11 Report ID: MSR04734

Instructor: Lynch, Jerome P

CEE 501 016

I really appreciated the amount of effort that went into preparing (and launching) this course. The copies of lecture notes that were very helpful, and even more helpful were the recorded, since being able to pauselgo backletc, made it much easier to process the lecture material.) I think I gained a strong understanding of how systems operate, and how the dynamics of these systems can be easily represented and understood in the Laplace and Fourier domains. The part of the course that covered statistical representations of random signals was a bit more difficult for me to grasp, and having some homework problems on this would probably have helped. On the whole, though, I think I learned a lot, and concepts that seemed intimidating and difficult at the beginning of the course became much more obvious and tangible towards the end of it. Thanks for a great class, I really enjoyed it.

Student 3
NA

Student 4

l. Some knowledge needs to be made clearer at the beginning of the semester, e.g. clarifying a system is linear or nonlinear.

2. It is better if the notes can be uploaded to the website earlier.

3. It is easier to understand the lecture if there are more examples problem.

4. Handing out some materials like old textbooks is very helpful.

5. There are some mistakes of the question statement or solutions on the homework

Student 5 NA

* The quartiles are calculated from Fall 2014 data. The university-wide quartiles are based on all UM classes in which an item was used. The school/college quartiles in this report are based on graduate level students in College of Engineering

** SA - Strongly Agree, A - Agree, N - Neutral, D - Disagree, SD - Strongly Disagree, NA - Not Applicable.

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING **Course Approval Request**

2582 Form Number

College Curriculum Committee, 1420 Lurie Engineering Center Building

2/10/2015 Date

Action Requested

New Course
 Modification of Existing Course
 Deletion of Course

Complete the following sections:

New Courses - B & C completely

Modifications - A modified information, B & C completely

Deletions - A & C completely

Fall 2015 **Effective Term**

	- Table		Dolotte	IIIB-A OCO	Completely	Course Offer Freq Indefinitely One term only				
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	Home D	epartment			Course Number	Home Dep	artment			Course Number
	CHE Ch	emical Enginee	ring		290	CHE Ch	emical Engi	neering		290
	Cross List	ed Course Informati	on			Cross Liste	ed Course Info	rmation		
	Course Ti	itle	· ·			Course Tr	ile			
Ш	Directed	Study, Research,	and Special F	roblems		Directed S	Study, Resea	rch, and Special	Problems	
	TITLE ABBRE-	Time Sched Max = 19 Spaces	Res & Spec	Problems		TITLE ABBRE-	Time Sched Max = 19 Spaces	Res & Spec Prol	blems	
	VIATION	Transcript Max = 20 Spaces	Res & Spec	Problems		VIATION	Transcript Max = 20 Spaces	Res & Spec Prol	blems	
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Х	Rec	Sem Dis	Other 🔀 ,	A-E XI CR/NC [] P/F []	Ann Arbor Biological Station Camp Davis Extension	_	ant Faculty Nontgomery		Title Lecture	er
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		val Info riculum Comm.	Approved by	Name	Approved Date		Submitte	d By: Home De		listed Dept.
		uity ss listed Unit 1 ss listed Unit 2				Home De	pt. Mark Bu	rns, Chemical En		

 Dept(s).	115111111510
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Form Number

SUPPORTING STATEMENT	SI	JP!	OF	TING	STA	TEN	JEN
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SUPPORTING STATEMENT
Change to course description to "four hours" instead of "three to four hours." This change was approved to have more uniform expectations of our students working in research labs. A student in a fecture class is expected to work at least 3 hours outside of class for each lecture hours, so a four hour per week per credit standard matches this expectation.
Prerequisite should be enforced.
Class type should be independent instead of Lecture.
#51 March 100 Ma
Are any special resources or facilities required for this course?
Detail the Special requirements
Detail the opecial reduitements

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request

College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number

2585

2/11/2015

Date

O New Course
Modification of Existing Course
Deletion of Course

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Effective Term

Fall 2015

Course Offer Fred Indefinitely

	A. CURRENT LISTING		B. REQUESTED LISTING	only
	Home Department	Course Number	Home Department Co	ourse Number
	CHE Chemical Engineering	460	CHE Chemical Engineering	460
	Cross Listed Course Information		Cross Listed Course Information	
_				
	Course Title		Course Title	
_	Chemical Engineering Laboratory II		Chemical Engineering Laboratory II	
	TITLE Time Sched Max = 19 Spaces Chem Eng L	ab II	TITLE Time Sched Chem Eng Lab II	
	VIATION Transcript CHEM ENG	LAB II	VIATION Transcript CHEM ENG LAB II	
٦	Course Description		Course Description for Official Publication (Max = 50 words)	1-
	Experimentation in rate and separation places process models. Introduction to the	e use of instrumental	which tests process models. Introduction to the use of	
	analysis and process control. Laborator Technology communications.	ry, conferences, reports.	Instrumental analysis and process control. Laboratory, conferences, reports. Technology communications.	
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	OUTCOMES: b d f h		OUTCOMES: M b M d f h	
	Degree	Tech Elective Other	Degree	
	Prereq ChE 343, 360	,	Prereq ChE 344, ChE 360	
х	Enforced		Enforced	
	O Advised		O Advised	
	Credit Restrictions		Credit Restrictions	
_	Level of Credit	Credit Hours		Contact Hrs/Wk 6
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_	☐ Non-Rekhm Grad ☐ Rekhm Grad w/add'l Work ☐ Ugrad or Rekhm Grad	4 4 of Wks 14	Ugrad or Rickhin Grad	Wks 14
C.	Repeatability (Indi Research, Dir. Study, Dis	sertation: Is this course repeate	Hours? Times? In the same ter	
		rading Location	Cognizant Faculty Member: Title	_
		A-E Ann Arbor CR/NC Biological Station	Erdogan Gulari Professor	- 42
	Candad Santian	P/F Camp Davis S/U Extension	- Fan	M
	Lec Sem Dis Other	Course is Y Graded	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty	
	A			led Dept.
	Approved by Curriculum Comm.	, italie Apploted bac		-
	Faculty		Department Chair Name Chair Sig	Inature
	Cross listed Unit 1		Home Dept. Mark Burns, Chemical Engineering	m
	☐ Cross listed Unit 2		— Cross-listed	

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	Form Number
	2000
SUPPORTING STATEMENT	
Changing prerequisites from ChE 343 and 360 to now be ChE 344 and	
Reasoning:	**************************************
We seek to update the prerequisites for ChE 460, our senior lab, to inche fact that the lab includes a reactor experiment. We seek to remove ChE for ChE 360, so that by having ChE 360, as a prereq for ChE 460, the Ch	ide ChE 344, reactor engineering and design, to reflect the 343 as a prerequisite because it's already a prerequisite E 343 prerequisite is taken care of
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Are any special resources or facilities required for this course?	☐ Yes 🎖 No
Detail the Special requirements	
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#### THE UNIVERSITY OF MICHIGAN - COLLEGE OF ENGINEERING **Course Approval Request**

Form Number

2581

College Curriculum Committee, 1420 Lurie Engineering Center Building **Action Requested** 

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Effective Term Fall 2015

Date

2/10/2015

○ New Course⑤ Modification of Existing Course○ Deletion of Course

M Indefinitely

		Course Offer Freq One term only			
	A. CURRENT LISTING	B. REQUESTED LISTING			
	Home Department Course Number	Home Department Course Number			
	CHE Chemical Engineering 490	CHE Chemical Engineering 490			
	Cross Listed Course Information	Cross Listed Course Information			
	Course Title	Course Title			
Ш	Advanced Directed Study, Research and Special Problems	Advanced Directed Study, Research and Special Problems			
	TITLE Time Sched Max = 19 Spaces Adv Res & Spec Problem	TITLE Time Sched Max = 19 Spaces Adv Res & Spec Problem			
	VIATION Transcript Adv Res & Spec Problem	VIATION Transcript Adv Res & Spec Problem			
Х	Course Description	Course Description for Official Publication (Max = 50 words)  Provides an opportunity for undergraduate students to work in			
_	Provides an opportunity for undergraduate students to work in chemical engineering research or in areas of special interest such	chemical engineering research or design problems. For each hour			
	as design problems. For each hour of credit, it is expected that the student will work three or four hours per week. Oral presentation	of credit, it is expected that the student will work four hours per week in a full term. Oral presentation and/or written report due at			
	and/or written report due at end of term. Not open to graduate students.	end of term. Not open to graduate students.			
	Stade: No.				
	PROGRAM a ceegle k OUTCOMES: b d f h j	PROGRAM   a   c   e   g   l   k   outcomes:   b   d   f   h   j			
	Degree O Degree Requirement	Degree O Degree Requirement © Tech Elective Requirements O Core Course O Other			
	Prereq ChE 230 & ChE 341 or ChE 290 or equivalent	Prereq ChE 230 & ChE 341 or ChE 290 or equivalent and permission  • Enforced of instructor			
Х	O Enforced O Advised	O Advised			
	Credit Restrictions	Credit Restrictions			
ш	Level of Credit Contact	Level of Credit Contact Credit Hours HrsAWk ARB			
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C.	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeat	Times maio cano tomi.			
	Class Type(s) Grading Location	Cognizant Faculty Member: Title			
	│ □ Lec □ Sem □ Dis □ Other □ ☒ A-E ☒ Ann Arbor │ □ Rec □ Lab ☒ Ind □ □ CR/NC □ Biological Station	Susan Montgomery, ChE Lecturer			
	☐ P/F ☐ Camp Davis				
	☐ Lec ☐ Sem ☐ Dis ☐ Other ☐ Course is Y Graded ☐	Gred Course: Attach nomination if Cognizant Faculty			
	Annual by Name Amproved De	Is not a regular graduate faculty  Submitted By:   Home Dept.  Cross-listed Dept.			
	Approved by Name Approved by Name Approved Date   Curriculum Comm.	/			
	□ Faculty	Department Chair Name Chair Signature			
	Cross listed Unit 1	Home Dept. Mark Burns, Chair, Chemical Engineering			
	Cross listed Unit 2	- Cross-listed			

Dept(s).
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Form Number

SUPPORTING STATEMENT		
Change to course description mal	ing it "four hours" instead of "three to four ho	ours". This change was approved to have m

Change to course description making it "tout hours" instead of three to four hours. This change was approved to uniform expeciations of our students working in research labs. A student in a lecture class is expected to work at least 3 hours outside of class for each lecture hours, so a four hour per week per credit standard matches this expectation.
Prerequisites should be enforced.
***************************************
***************************************
410100-11111111111111111111111111111111
Are any special resources or facilities required for this course? $\square$ Yes $\square$ No
Detail the Special requirements

#### THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING College Curriculum Committee, 1420 Lurie Engineering Center Building

**Course Approval Request** 

Form Number

2584

**Action Requested** 

O New Course
Modification of Existing Course
Deletion of Course

Complete the following sections:
New Courses - B & C completely
Modifications - A modified information, B & C completely
Deletions - A & C completely

Effective Term Fall 2015

Date

2/11/2015

Course Offer Freq

Ţ	Inde	finitel	У
	One	term	only

	A. CURRENT LISTING				B. REQUESTED LISTING				
				Home De	Course Number				
				CHE C	496				
				Cross Listed Course Information					
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	TITLE ABBRE	Time Sched Max = 19 Spaces	Special Top	ics in ChE	TITLE	Time Sched Max = 19 Spaces	Special Topics Ch	E	
	VIATION	Transcript Max = 20 Spaces	SP TOPIC	CHE	ABBRE- VIATION	Transcript Max = 20 Spaces	SP TOPIC CHE		
	Course De	scription topics pertinent t				escription for O	ficial Publication (Max ent to chemical engir	•	
	PROGRAM   a   c   e   g   l   k OUTCOMES:   b   d   f   h   J				PROGRAM   a   c   e   g   i   k OUTCOMES:   b   d   f   h   j				
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	Credit Restrictions				Credit Restrictions				
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	Repeatab	ility (Indi Research,	Dir. Study, Dis	sertation: Is this course repeats	able? ON		Max C	an it be repeated  Yes the same term?	
C.	☐ Rec ☐ Graded	Sem Dis Lab Ind	Other	A-E Ann Arbor CR/NC Biological Station P/F Camp Davis S/U Extension	A Acres A	ant Faculty M Nontgomery	lember:	Title Lecturer	
		Sem Dis Lab Ind	Other	Course Is Y Graded		ourse: Attach n a regular gradus	omination if Cognizant	Faculty	
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		s listed Unit 1			_ Home D	-	rns, Chemical Engine		
	☐ Cross listed Unit 2					Cross-listed			

Dept(s).
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Form Number

SUPPORTING STATEMENT			
Changing Level of credit from "All Credit Types" to "Undergrad only"			
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	THE UNIVERSITY OF MICHIGAN COLLEGE OF Course Approval Request	ENGINEERING 2603			
	College Curriculum Committee, 1420 Lurie Engineeri	ng Center Building			
	Action Requested	Date 3/17/2015			
	O New Course O Modification of Existing Course O Modification of Existing Course O New Courses - B & C completely				
	<ul> <li>Modification of Existing Course</li> <li>Deletion of Course</li> <li>New Courses - B &amp; C completely</li> <li>Modifications - A modified information</li> </ul>				
	Deletions - A & C completely	Course Offer Freq Indefinitely			
	A. CURRENT LISTING	B. REQUESTED LISTING One term only			
	Home Department Course Number	Home Department Course Number			
	IOE Industrial & Operations Engin 552				
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	Mathematics 542				
_	Course Title	Course Title			
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	TITLE Time Sched	FINANCIAL ENGINEERING I			
	ABBRE- MRX = 19 Species	ABBRE- Max = 19 Spaces FINANCIAL ENGINEERING I			
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	Course Description	Course Description for Official Publication (Max = 50 words)			
		Theory and applications to financial engineering. Designing,			
		structuring and pricing financial engineering products (including			
		options, future, swaps and other derivative securities) and their			
		applications to financial and investment risk management.			
		Mathematical methodology that forms the basis of financial engineering, applied stochastic processes and numerical methods			
		in particular.			
	PROGRAM a c e g i k	PROGRAM   a   c   e   g   i   k			
	OUTCOMES:   b   d   f   h	OUTCOMES:   b   d   f   h   j			
	Degree Requirement O Free Elective O Other	Degree   O Degree Requirement   O Free Elective   O Other			
	Requirements O Core Course O Tech Elective Prereq IOE 452 and 453 or Math 423	Requirements O Core Course O Tech Elective			
_	Prereq IOE 452 and 453 or Math 423  Enforced	Prereq IOE 453 or Math 423. Business School students: Fin 580 or Enforced Fin 618 or BA 855			
	O Advised	O Advised			
	Credit	Cred			
Ш	Restrictions	Restrictions			
	Level of Credit  ☐ Undergrad only ☐ Ugrad or Non-Robrin Grad  Credit Hours Hrs.Wk	Level of Credit  Credit Hours  Credit Hours			
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	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeata	able? Yes Max Max Can it be repeated Yes			
C.	Oliver Table	Hours? in the same term?  No			
<del></del>	Class Type(s)  Grading Location  Class Type(s)  Grading Location	Cognizant Faculty Member: Title			
لسا	Per Clab Clad	Romesh Saigal Professor, IOE			
	Graded Section CR/NC Biological Station    CR/NC   Biological Station   P/F   Camp Davis				
	☑ Lec ☐ Sem ☐ Dis ☐ Other ☐ S/U ☐ Extension				
	Rec Lab Ind Course is Y Graded	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty			
	Approval Info Approved by Name Approved Date				
	Curriculum Comm.				
		Department Chair Name Chair Signature			
	☐ Faculty	Home Dept. [IOE] Mark S. Daskin			
	Cross listed Unit 1	- Cross-listed [Math] Mel Hochster			
	Cross listed Unit 2	Dept(s).			

Form	Number
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SUPPORTING STATEMENT			
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	Course Approval Request						Form Number	2604	1	
		College Curriculum	Committee, 14	20 Lurie Engineerle	ng Center Build	ing		014719045	_	
	Action Requested	C					Date	3/17/2015		
	New Course     Modification of Exis     Deletion of Course	ting Course New	Courses - 8 8	owing sections: C completely codified informati		noletely	Effective Term	Fall 2015		
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-	Course Description						Micial Publication (Ma			
					Advanced issues in financial engineering: stochastic interest rate modeling and fixed income markets, derivatives trading and arbitrage, international finance, risk management methodologies including Value-at-Risk and credit risk. Multivariate stochastic calculus methodology in fiance: multivariate Ito's lemma, Ito's stochastic integrals, the Feynman-Kac theorem and Girsanov's theorem.					
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C.	Repeatability (Indi Res	earch, Dir. Study, Di	ssertation: Is t	his course repeata	ble? © Yes	Max Hours? _	Max Times?	Can it be repeated in the same term	-	
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### Form Number 2604

SUPPORTING STATEMENT	
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# THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number 25

Action Requested	Date 2/3/2015
New Course  Modification of Existing Course  New Courses - B & C completely	Effective Term Winter 2016
Modification of Existing Course     Deletion of Course      Modifications - A modified informations - A modified information - A modified inf	Ellooute lotte
Deletions - A & C completely	Course Offer Freq  Indefinitely
A. CURRENT LISTING	B. REQUESTED LISTING
Home Department Course Number	Home Department Course Number
	NAVARCH Naval Arch & Marine Engin 260
Cross Listed Course Information	Cross Listed Course Information
	Closs Listed Course Information
Course Title	Course Title
1	Marine Systems Manufacturing
TITLE Time Sched Max = 19 Spaces	TITLE Time Sched Max = 19 Spaces MarineSysManuf
VIATION Max ≈ 20 Spaces	VIATION Transcript Max = 20 Spaces MarineSysManuf
Course Description	Course Description for Official Publication (Max = 50 words)
Overview of the marine industry and its environment as it relates to	The marine industry and its environment as it relates to all aspect
all aspects of naval architecture and marine engineering, including	that impact the production and operations of maritime products.
industry characteristics; organization; product types and	Industrial and operations aspects of shipping/shipbuilding. Topics
components; materials used, joining methods, shipbuilding, boat building and offshore equipment manufacturing methods; design;	include industry characteristics; product types/components;
production engineering; planning; contracts and specifications; cost	shipbuilding, boatbuilding, offshore equipment manufacturing
estimating; production and material control.	methods; design; production engineering; planning; contracts/specifications; cost estimating; production and material
317	control.
PROGRAM a c e g i k OUTCOMES: b d f h j	PROGRAM a c e g i k OUTCOMES: b d f h j
Degree  O Degree Requirement  O Free Elective  O Other Requirements  O Core Course  O Tech Elective	Degree O Degree Requirement O Free Elective O Other Requirements © Core Course O Tech Elective
Prereq	Prereq NA 270 or NA 270 concurrent enrollment
O Enforced	D Enforced
O Advised	Advised     none
Credit Restrictions	Credit Restrictions
Level of Credit Contact	
	Level of Credit Contact
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Oldrag of Non-Rocking Grad   All Credit types   A	Max   Max
Olgrad or Rickhm Grad   All Credit types   All Cr	St. Undergrad only   Ugrad or Non-Rickhm Grad   All Credit types   Min   Max   Non-Rickhm Grad   Ugrad or Rickhm Grad w/add'l Work   2   Number of Wks   14
Class Type(s)   Class Type(s)   Class Type(s)   Class Type(s)   Class Type(s)   CRACKDE   CRAC	St. Undergrad only   Ugrad or Non-Rickhm Grad   All Credit types   Min   Max   Non-Rickhm Grad   Ugrad or Rickhm Grad w/add'l Work   2   Number of Wks   14
Class Type(s)   Grading   Location     Reck   Sem   Dis   Other   X A-E   Sem   Dis   CR/NC   CR/NC	Max   Max   Can it be repeated   Yes   In the same term?   No
Outgrad or Non-Rickham Grad   All Credit types	By Undergrad only   Ugrad or Non-Rickhim Grad   All Credit types   Min   Max   2   Number of Wks   14
Outpact of any   And Credit types   And Credit ty	By Undergrad only   Ugrad or Non-Rickhim Grad   All Credit types   Min   Max   Non-Rickhim Grad   Grad or Rickhim Grad   All Credit types   Min   Max   2   2   2   Number of Wks   14
Outgrad or Non-Rickham Grad   All Credit types	By Undergrad only   Ugrad or Non-Rickhim Grad   All Credit types   Min   Max   2   Number of Wks   14
Outpact of any   And Credit types   And Credit ty	Submitted By:
Output of Packham Grad   Aff Credit types   Aff C	Mon-Rickhim Grad   All Credit types   Min   Max   Mon-Rickhim Grad   Non-Rickhim Grad   Non-Rickhim Grad   All Credit types   Min   Max   Min   Max   Min   Min

Form	Number
2	573

#### **SUPPORTING STATEMENT**

The reduction of NA 260 from 3 to 2 credits is justified by the creation of the 3 credit hour NA 460. In the original 3 credit version of NA 260 the course covered all the topics listed above but also included material preservation and corrosion, general discussion of materials and their properties, and material joining. With the creation of NA 460 the one credit hour of material that was originally in NA 260 will now be expanded into a full 3 credit hours course. With the removal of this material NA 260
can be reduced to two credit hours.
ALLE CONTROL OF THE C
are any special resources or facilities required for this course? LYes No  Detail the Special requirements
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#### COURSE DESCRIPTION:

Overview of the marine industry and its environment as it relates to all aspects that impact the production and operations of maritime products. The course is specifically focused on industrial and operations aspects of shipping and shipbuilding. The topics covered include industry characteristics; product types and components; shipbuilding, boatbuilding and offshore equipment manufacturing methods; design; production engineering; planning; contracts and specifications; cost estimating; production and material control.

#### **COURSE TOPICS:**

- 1. Introduction to Marine Industry
  - a. Introduction to Shipbuilding Industry
  - b. Introduction to the Military Shipbuilding Industry
  - c. Introduction to Offshore Industry
  - d. Introduction to Pleasure Boat Industry
    - i. Composites Design and Technology
- 2. Ship and Boat Types and Components
  - a. Overview of ship types focusing on ship production issues
  - b. Overview of major ship components with focus on ship production
- 3. Modern Shipbuilding Practice
  - a. Block Construction
  - b. Advanced Outfitting
  - c. Accuracy Control
  - d. Shipyard Business strategy
  - e. Shipyard Organization & Management
  - f. Productivity
- 4. Shipyard Layout & Equipment
  - a. Introduction of Welding processes
  - b. Shipyard Design
  - c. Productivity as a function of design
- 5. Global Shipbuilding Markets, Demand and Supply
  - a. Global shipbuilding drivers and trends
- 6. Lean Manufacturing and Lean Shipbuilding
- 7. Six Sigma
  - a. Overview of how to use basic statistics
- 8. Design for Production
- 9. Specifications and Contracts
- 10. Economics
  - a. General overview of engineering economics
  - b. General overview of how to read a balance sheet
- 11. Planning and Scheduling

#### THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING 2569 **Course Approval Request** Form Number College Curriculum Committee, 1420 Lurie Engineering Center Building Date 3/2/2015 **Action Requested** Complete the following sections: New Course Winter 2016 New Courses - B & C completely **Effective Term** O Modification of Existing Course O Deletion of Course Modifications - A modified information, B & C completely **☒** Indefinitely Deletions - A & C completely Course Offer Freq One term only A. CURRENT LISTING B. REQUESTED LISTING **Home Department** Course Number **Home Department** Course Number NAVARCH Naval Arch & Marine Engin 280 Cross Listed Course Information Cross Listed Course Information Course Title Course Title Introduction to Probability for Marine Engineers Time Sched Time Sched TITLE Prob Marine Eng Max = 19 Spaces Max = 19 Spaces ARRES. ABBRE-Transcript Transcript VIATION VIATION Prob Marine Eng Max = 20 Spaces Course Description Course Description for Official Publication (Max = 50 words) Introduction to the fundamentals of probability theory, with marine applications. Events, Probabilities, Combinatorics, Independence, Bayes Theorem; Discrete and Continuous Random Variables, Central Limit Theorem, Elements of Engineering Statistics, goodness of fit, regression, correlation. **PROGRAM PROGRAM** □a □c □e □g □i □k ∐g □i □k ∐a ∐c ∐ e **OUTCOMES:** $\Box$ b $\Box$ d $\Box$ f ☐ h **OUTCOMES:** □b □d □f ∐ h O Degree Requirement O Free Elective O Other Degree O Degree Requirement O Free Elective O Other Degree Requirements O Core Course O Tech Elective Core Course Requirements O Tech Elective Prereq Prereq Math 116 O Enforced Enforced O Advised O Advised Credit Restrictions Credit Restrictions Level of Credit Level of Credit Contact Contact Credit Hours Credit Hours ☐ Ugrad or Non-Rokhm Grad ☐ All Credit types ☐ Rokhm Grad w/add'i Work ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rokhm Grad ☐ Ugrad or Rokhm Grad Ugrad or Non-Rokhm Grad All Credit types Rokhm Grad w/add'i Work Hrs/Wk Undergrad only Rackham Grad Non-Rickhm Grad Hrs/Wk Min Max Min Max Number Number of Wks Ugrad or Rokhm Grad of Wks © Yes Can it be repeated () Yes Max Max Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? O No Hours? in the same term? (a) No Times? . _ Cognizant Faculty Member: Class Type(s) Location Title Grading ∠ Lec Sem Dis Other X A-E Ann Arbor **Perakis** Assoc Professor Rec Lab Ind Ind CR/NC **Biological Station** P/F Camp Davis **Graded Section** ☐ S/U Extension Grad Course: Attach nomination if Cognizant Faculty

is not a regular graduate faculty

Home Dept.

Cross-listed

Dept(s).

Department Chair Name

Naval Arch & Marine Engin

Submitted By: Home Dept. Cross-listed Dept.

Chair Signature

C.

Rec Lab

**Approval Info** 

☐ Faculty

Curriculum Comm.

☐ Cross listed Unit 1

Cross listed Unit 2

☐ Ind

Course is Y Graded

**Approved Date** 

Approved by Name

Form	Number
2	569

#### **SUPPORTING STATEMENT**

Recent Curriculum changes regarding modifications and additions to the lab courses, bringing them to the Junior from the Senior year, necessitated that we cancel NA387, our probability and statistics course, and move most of its statistics material to other courses (such as NA460), with
its remaining material (2 credits) to be taught in the Sophomore year, to be called NA280 (2).
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MATTER TO THE PROPERTY OF THE
Are any special resources or facilities required for this course?
are any special resources of facilities required for the source.
Detail the Special requirements

Course Title: NA 280 Introduction to Probability for Marine Engineers Required course; third year Course Function: A.N. Perakis Cognizant Faculty: Credit Hours: 2 credits Fall and Winter Term Schedule: Prerequisites: Prerequisite: Math 116 Short Description: Introduction to the fundamentals of probability theory, with engineering applications. Engineering Statistics, goodness of fit, regression, correlation. Textbook, Devore, Probability And Statistics for Engineering and the Sciences, Text: Outline and Time Allocation hours I. Intro. to Probability and Statistics, Mechanics of NA280 1 15 Π. Introduction to Probability Theory 2 Introduction - definitions 2 Conditional prob., independence, Bayes theorem Random variables, discrete and continuous; PMF's and PDF's 3 Mean, variance, moments and central moments of Random Variables. 2 Examples-uniform, Poisson-exponential Gaussian; the Central Limit theorem. 3 2 Functions of several random variables; joint PDF-PMF's 1 Linear and statistical independence of RV's; correlation 5 Ш. Introduction to Statistics 1 Introduction to statistics-sampling Curve fitting, regression, correlation 2 2 Goodness of fit tests, Chi2, K-S 5 Marine Applications of Probability and Statistics IV. one Midterm and one Final Examinations 3 28 **Total** 

ABET Categories:

Engineering Science (0.5), Mathematics (1.5)

Threads Served:

Dealing with Uncertainty, Computing

Computing:

Use of educational probability and statistics software available on CAEN

computers; use of spreadsheets throughout the course.

#### THE UNIVERSITY OF MICHIGAN - COLLEGE OF ENGINEERING 2568 Form Number Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Building 1/30/2015 Date **Action Requested** Complete the following sections: O New Course Fall 2015 New Courses - B & C completely Effective Term O Modification of Existing Course Modifications - A modified information, B & C completely Deletion of Course ☐ Indefinitely Deletions - A & C completely Course Offer Freq One term only A. CURRENT LISTING B. REQUESTED LISTING Home Department Course Number Home Department Course Number NAVARCH Naval Arch & Marine Engin 370 Cross Listed Course Information Cross Listed Course Information Course Title Course Title Computer Techniques Time Sched Time Sched TITLE TITLE Computer Tech Max = 19 Spaces Max = 19 Spaces ABBRE-ARRRE-Transcript Max = 20 Spaces Transcript VIATION Computer Tech VIATION Max = 20 Spaces Course Description Course Description for Official Publication (Max = 50 words) Course description not available **PROGRAM** □g □i □k □a □c □e □g □i □k **PROGRAM** □а □ с □e **OUTCOMES.** □ b □ d □ f □ h □ j **OUTCOMES:** □b □d □f ∏h O Degree Requirement O Free Elective O Degree Requirement O Free Elective Degree Degree O Core Course O Tech Elective O Core Course Requirements Requirements O Tech Elective Prereq Prerea O Enforced O Enforced O Advised Advised Credit Restrictions Credit Restrictions **Level of Credit** Level of Credit Contact Contact Credit Hours Credit Hours ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work Hrs/Wk ☐ Ugrad or Non-Rokhm Grad ☐ Ali Cradit types ☐ Rokhm Grad w/add*! Work Hrs/Wk Undergrad only Rackham Grad Non-Rickhm Grad Ugrad or Rickhm Grad Undergrad only Rackham Grad Non-Rokhm Grad Ugrad or Rokhm Grad Min Max Min Max Number Number 14 3 14 of Wks of Wks O Yes Max Can it be repeated ) Yes Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? in the same term? O No Hours? Times? -Cognizant Faculty Member: Title Class Type(s) Location Grading Lec ☐ Sem ☐ Dis ☐ Other ____ **Professor** X A-E Ceccio Ann Arbor Rec X Lab ☐ Ind CR/NC **Biological Station** Camp Davis □ P/F **Graded Section** S/U Extension 🔀 Lec 🗌 Sem 🔲 Dis 🔲 Other _ Grad Course: Attach nomination if Cognizant Faculty Rec Lab Ind Ind Course Is Y Graded is not a regular graduate faculty Submitted By: Home Dept. Cross-listed Dept. Approved by Name **Approved Date** Approval info ☐ Curriculum Comm.

Department Chair Name

Naval Arch & Marine Engin

Home Dept.

Cross-listed

Dept(s).

X

C.

☐ Faculty

☐ Cross listed Unit 1

Cross listed Unit 2

Chair Signature

### Form Number 2568

SUPPORTING STATEMENT  Course approval form to delete NA.370 submitted at:	he request of the Unive	ersity Registrars Office	
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#### THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING 2570 Form Number **Course Approval Request** College Curriculum Committee, 1420 Lurie Engineering Center Building 1/30/2015 Date **Action Requested** Complete the following sections: O New Course Winter 2017 **Effective Term** New Courses - B & C completely Modification of Existing Course Modifications - A modified information, B & C completely O Deletion of Course ☑ Indefinitely Course Offer Freq Deletions - A & C completely One term only **B. REQUESTED LISTING** A. CURRENT LISTING Course Number Course Number Home Department Home Department 391 NAVARCH Naval Arch & Marine Engin NAVARCH Naval Arch & Marine Engin 391 Cross Listed Course Information Cross Listed Course Information Course Title Course Title Marine Engineering Laboratory I Marine Engineering Laboratory Time Sched Time Sched TITI F Marine Engin Lab I TITLE Marine Engin Lab Max = 19 Space Max = 19 Spaces ABBRE-ABBRE Transcript Max = 20 Spaces Transcript VIATION VIATION Mar Eng Lab I Mar Eng Lab Max = 20 Spaces Course Description for Official Publication (Max = 50 words) Course Description Instruction in laboratory techniques and instrumentation. Use This course is the first in a two-part capstone laboratory of computers in data analysis. Technical report writing. class. It provides experimental foundation for the Investigation of fluid concepts, hydro-elasticity, marine Engineering Mechanics part of the curriculum. Instruction dynamics, propeller forces, wave mechanics, ship includes laboratory techniques and instrumentation, as well hydrodynamics, and extrapolation of model tests to full scale. as error analysis. Investigations include fluid dynamics and structural mechanics. Technical report writing is stressed. ∏i∏k **PROGRAM PROGRAM** □i □k □с □е ∐ c ∐e **OUTCOMES** □b □d □f □ h □ j **OUTCOMES:** _| h O Degree Requirement O Free Elective O Degree Requirement O Free Elective Degree Degree Core Course O Tech Elective O Core Course O Tech Elective Requirements Requirements NA 320, NA 310, NA 331; Concurrent enrollment with NA 321, NA 321, NA 340 Prereq Prereq NA 340, NA 332 O Enforced Enforced Advised Advised Credit Restrictions Credit Restrictions **Level of Credit** Level of Credit Contact Contact Ugrad or Non-Rokhm Grad All Credit types Rokhm Grad wladd'l Work Credit Hours Credit Hours 5 Hrs/Wk 5.5 Hrs/Wk Ugrad or Non-Rckhm Grad Ali Credit types Rckhm Grad w/add'l Work Undergrad only Rackham Grad Non-Richm Grad Ugrad or Richm Grad Undergrad only Rackham Grad Non-Rokhm Grad Ugrad or Rokhm Grad Max Min Min Max Number Number 3 3 14 of Wks Can it be repeated () Yes Max Max Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? O No in the same term? O No Times? .... Hours? _ Cognizant Faculty Member: Title Class Type(s) Grading Location Dis Other Professor Perlin X Lec ☐ Sem X A-E Ann Arbor CR/NC

**Biological Station** Camp Davis

**Approved Date** 

Course Is Y Graded

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Rec X Lab

**Graded Section** 

Rec Lab

Approval Info Curriculum Comm.

☐ Faculty

☐ Cross listed Unit 1

Cross listed Unit 2

☐ Ind

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□ Lec □ Sem □ Dis □ Other

P/F

S/U

Approved by Name

is not a regular graduate faculty Submitted By: Home Dept. Copss-listed Dept. Signature Department Chair Name Home Dept. Naval Arch & Marine Engin Cross-listed Dept(s).

Grad Course: Attach nomination if Cognizant Faculty

Form	Number
2	570

Sl	<b>JPP</b>	<b>OR1</b>	ING	STA	TEME	ENT

This course will replace the former, three-credit class, NA 491, which was so	heduled for the first semester
senior year. As it appears that our students have less hands-on experience ey	ery year, the faculty decided
to offer the class during the second semester junior year. This serves two pur	poses: (1) the students get
the laboratory experience (that reinforces the theory they learn) in closer pro	cimity to when they are
presented with that material and (2) the students obtain hands-on experience	earlier in their education (In
addition, the second part of the sequence, NA 492 will be moved from the se	cond semester senior year to
the first semester senior year so that it does not conflict with the senior capst	<u>-</u>
for that class, the students will have then experienced all the naval architectu	· · · · · · · · · · · · · · · · · · ·
laboratories.)	•
As an additional note, to place this course in perspective its history is import	
taught as 391, it had 11 labs and was four credits. Students complained of the	
credits were insufficient for the effort involved. Hence, the department decid	
two courses taught over two semesters, call the courses 491 and 492, and to a	
credits for the two classes, respectively for six labs and for four labs in each	course
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Are any special resources or facilities required for this course? ☐ Yes ☒ N	
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Detail the Special requirements	
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THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING 2597 Form Number Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Building 3/4/2015 **Date Action Requested** Complete the following sections: O New Course Fall 2015 New Courses - B & C completely **Effective Term** Modification of Existing Course O Deletion of Course Modifications - A modified information, B & C completely ☑ Indefinitely Deletions - A & C completely Course Offer Freq One term only A. CURRENT LISTING **B. REQUESTED LISTING** Course Number Course Number Home Department Home Department NAVARCH Naval Arch & Marine Engin 514 **Cross Listed Course Information Cross Listed Course Information** MFG Manufacturing 515 Course Title Course Title Fatigue of Structures Time Sched Time Sched TITLE TITLE Fatigue of Structures Max = 19 Spaces Max = 19 Spaces ABBRE-ABBRE-Transcript Transcript VIATION VIATION **Fatigue of Structures** Max = 20 Spaces Max = 20 Spaces Course Description Course Description for Official Publication (Max = 50 words) Fundamental concepts associated with fatigue damage and failure in engineering structures and contemporary design and analysis procedures with an emphasis on fatigue of welded structures, including most recent developments in finite element based fatigue design and analysis procedures, e.g., mesh-insensitive structural stress method and master S-N curve approach. **PROGRAM** □ i □ k □a □c □e □g □i □k **PROGRAM** □с ☐ e OUTCOMES: □b □d □f **OUTCOMES:** □ d Ь □h O Degree Requirement O Free Elective Degree O Other O Degree Requirement O Free Elective Degree O Tech Elective Requirements O Core Course Requirements O Core Course O Tech Elective Prereq Prereq O Enforced O Enforced O Advised Advised Credit Restrictions Restrictions **Level of Credit** Level of Credit Contact Contact Credit Hours Credit Hours Ugrad or Non-Rokhm Grad Ali Credit types Rokhm Grad wiedd'i Work Hrs/Wk Hrs/Wk Undergrad only Rackham Grad ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☑ Ugrad or Rckhm Grad Ugrad or Non-Rokhm Grad Ali Credil types Rokhm Grad w/add'i Work Min Max Min Max Number Number Non-Rokhm Grad Ugrad or Rokhm Grad 14 of Wks of Wks O Yes Can it be repeated O Yes Max Max Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? (No Hours? in the same term? () No Times? Cognizant Faculty Member: Title Class Type(s) Location Grading __ Dis Other _ X A-E Dong **Professor** Rec Lab ☐ Ind CR/NC **Biological Station** P/F Camp Davis **Graded Section** Extension S/U Dis Other Grad Course: Attach nomination if Cognizant Faculty Rec Lab

C.

Form	Number
2	597

SUPPORTING STATEMENT

Structural fatigue is one of major failure modes of concern in design, manufacture, and analysis of
engineering structures spanning aerospace, automotive, earth-moving equipment, marine/offshore,
petrochemical and power generation industries. With an increasing pressure for cost reduction, product
durability, environmental safety, computational methods that are capable of predicting fatigue life at final
product level has been identified as a key enabler to achieving competitive edge in global market place. At
present, there is no equivalent course offering at College of Engineering. This course should complement
ME 576 (Fatigue in Mechanical Design) by focusing on computational fatigue analysis theories and
methodologies at structural level, particularly on as fabricated structures such as ship and offshore structures
subjected to random wave loadings.
HARMON AND THE PROPERTY AND A STATE OF THE PROPERTY AND A
Lab component is being dropped to facilitate online course offering, hence the reduction in credits from 4 to
3
Mercental designation of the second s
Are any special resources or facilities required for this course?
Detail the Special requirements

	Course Approval Request	Form Number 2561
	College Curriculum Committee, 1420 Lurie Engineer	
	Action Requested	Date 12/22/2014
	New Course New Course	Effective Term Fall 2015
	Modification of Existing Course Deletion of Course Modifications - A modified informat	Elicoaro Icilii
	Deletions - A & C completely	Course Offer Freq Indefinitely
	A. CURRENT LISTING	B. REQUESTED LISTING
		Home Department Course Number
	Home Department Course Number	
		NAVARCH Naval Arch & Marine Engin 551
	Cross Listed Course Information	Cross Listed Course Information
	Course Title	Course Title
	-	Offshore Engineering I
	TITLE Time Sched Max = 19 Spaces	TITLE Time Sched Offshore Engin I
	ABBRE- Transcript Transcript	ABBRE-
	Max = 20 Spaces	VIATION Transcript Offshore Engin 1 Course Description for Official Publication (Max = 50 words)
	Course Description	· ' ' '
		Offshore engineering structures. Introduction to
		hydrodynamic loads on offshore platforms. Detailed
		study of forces on slender bodies - risers, pipelines,
		cables. Morison's equation. Flow induced motions,
		vortex induced vibrations, galloping. Two-cylinder
		flows. Mathematical modeling, experiments, data
		processing. Marine hydrokinetic energy harnessing.
	PROGRAM a c e g i k	PROGRAM a c e g i k OUTCOMES b d f b i
	Degree O Degree Requirement O Free Elective O Other Regulrements O Core Course O Tech Elective	Degree O Degree Requirement Free Elective O Other Requirements O Core Course O Tech Elective
	Prered	Prereq Graduate student standing or permission of instructor
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Ш	O Advised	Enforced Advised
	Credit Restrictions	Credit Restrictions
Ш		Lovel of Coodif
	Condit House	☐ Undergrad only ☐ Ugrad or Non-Rickhm Grad Credit Hours Hrs/Wk 3
	☐ Rackham Grad ☐ All Credit types ☐ Min Max ☐ Number ☐ Non-Rokhm Grad ☐ Rokhm Grad w/add'l Work ☐ Number	Rackham Grad
<u></u>	☐ Ugrad or Rokhm Grad of Wks	☐ Ugrad or Rckhm Grad 3 3 of Wks 14
	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeata	ble? Yes Max Max Can it be repeated () Yes In the same term? No Hours? — Times? — In the same term?
C.	Class Type(s) Grading Location	Cognizant Faculty Member: Title
	Class Type(s) Grading Location ☑ Lec ☐ Sem ☐ Dis ☐ Other _ ☑ A-E ☑ Ann Arbor	Michael Bernitsas Professor
	Rec Lab Ind CR/NC Biological Station	Tridado - Tridado
	Graded Section P/F Camp Davis	
	□ Sem □ Dis □ Other □ S/U □ Extension	Grad Course: Attach nomination if Cognizant Faculty
	Rec Lab Ind Course Is Y Graded	is not a regular graduate faculty
	Approval Info Approved by Name Approved Date	Submitted By: Market Dept. Cross-listed Dept.
	Curriculum Comm.	Department Chair Name Chair,Signature
	=	
	Faculty	Home Dept. Naval Arch & Marine Engin
1	☐ Cross listed Unit 1 ☐ Cross listed Unit 2	- Cross-listed
	LI Closs listed Cliff 2	Dept(s)

Form	Number
2	561

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Эl	JFC	-UK	HNG	DIA		

The offshore oil and gas industry employs about 1/3 of our students overall and as many as 50% of our PhD students. The students typically took NA550 (4) as a crash course to be ready for employment. The material was not covered adequately in one course resulting in excessive work and very eight lengthy projects. In 2014-2015, we propose to replace NA550 (4) with two courses: NA551(3) offered in Fall 2014 and NA552(3) offered in Winter 2015.
NA551(3) focuses on the hydrodynamic loads on slender bodies, while NA552(3) focuses on the design of offshore platforms wave loads, dynamics of slender bodies, marine risers, mooring system dynamics.
Are any special resources or facilities required for this course? Yes No Detail the Special requirements
The Low Turbulence Free Surface Water Channel and the resources of the Marine Renewable Energy Laboratory (MRELab) will be used to conduct vortex induced vibration testing and hydrokinetic energy harnessing. Depending on availability, the Towing Tank of the Marine Hydrodynamics Laboratories (MHL) may be used

THE UNIVERSITY OF MICHIGAN -- COLLEGE OF ENGINEERING 2586 Course Approval Request Form Number College Curriculum Committee, 1420 Lurie Engineering Center Building **Action Requested** 2/13/2015 Date Complete the following sections: O New Course New Courses - B & C completely Modification of Existing Course Winter 2015 FT 2015 **Effective Term** Modifications - A modified information, B & C completely O Deletion of Course Deletions - A & C completely Course Offer Freq One term only A. CURRENT LISTING B. REQUESTED LISTING

	Home Department Course Number	Home Department Course Number
		NERS Nuclear Engin & Radiolog Sci 671
	Cross Listed Course Information	Cross Listed Course Information
×	Course Title Theory of Plasma Confinement in Fusion Systems I TITLE ABBRE- VIATION Transcript Max = 19 Spaces Transcript Max = 20 Spaces Course Description	Course Title Theory of Plasma Confinement in Fusion Systems Time Sched Max = 19 Spaces Plasma Conf Fus Sys Transcript Max = 20 Spaces PLASMA CONF FUS SYS Course Description for Official Publication (Max = 50 words) Study of the equilibrium, stability and transport of plasma in controlled fusion devices. Topics include MHD equilibrium for circular and non-circular cross section plasmas; magneto-hydrodynamic and micro-instabilities; classical and anomalous diffusion of particles and energy and scaling laws.
	PROGRAM OUTCOMES: b d f h j Degree O Degree Requirement O Free Elective O Other Requirements O Core Course Prereq	PROGRAM OUTCOMES: b d f h j Degree O Degree Requirement O Free Elective O Other Requirements O Core Course Tech Elective
		Prereq NERS 572 O Enforced
إلصا	O Advised	Advised
	Credit Restrictions	Credit Restrictions
	Level of Credit Undergrad only Rackham Grad	Level of Credit Undergrad cnly Rackham Grad Non-Rckhm Grad Rockham Grad Rockham Grad Rockham Grad Rockham Grad Rockham Grad Rockham Grad wladd Work Rockham Grad Rockham Grad wladd Work
C.	Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeata	ible?
	Class Type(s) Class	Cognizant Faculty Member: Title Alexander Thomas Associate Professor Grad Course: Attach nomination if Cognizant Faculty
	Rec Lab Ind Course Is Y Graded Approved Info Approved by Name Approved Date	is not a regular graduate faculty
	Curriculum Comm	Department Chair Name Chair Signature
	☐ Faculty ☐ Cross listed Unit 1	Home Dept Ronald Gilgenbach, Chair & Professor Ronald
	Cross listed Unit 2	Cross-listed Nuclear Engin & Radiolog Sci

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2586

SUPPORTING STATEMENT

NERS.671 and 672 are two courses containing advanced material relating to magnetic confinement fusion. The courses have not been taught for a number of years, in part because there has been no active research program in this area in the Nuclear. Engineering & Radiological Sciences Department. However, it is still an important core course in plasma science and engineering. Eollowing discussions amongst faculty in the plasmas research area in the NERS Department, it was unanimously agreed that while the content is still very important and there are faculty members who could teach them, the very advanced details are beyond the scope of the program. It was therefore unanimously agreed within the Plasmas Option that the material could be reduced to the fundamentals by condensing NERS 671 and 672 into a single course. NERS 671. Theory of Plasma Confinement in Eusion. Systems. This single course could then be taught by the current cohort of faculty in the Plasmas Option.
Are any special resources or facilities required for this course? Yes X No Detail the Special requirements

THE UNIVERSITY OF MICHIGAN - COLLEGE OF ENGINEERING Course Approval Request College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number

	Action Requested New Course Modification of Existing Course Deletion of Course A. CURRENT LISTING Home Department NERS Nuclear Engin & Radio Cross Listed Course Information	Complete the following sections New Courses - B & C completely Modifications - A modified informat Deletions - A & C completely Course Number log Sci 672	B. REC	completely C QUESTED LIS	200		015 FT 2015
	Course Title Theory of Plasma Confinement in	n Fusion Systems II	Course T	itle			
	TITLE Max = 19 Spaces Pism	Con Fus Sys II M CON FUS SYS II	TITLE ABBRE- VIATION Course De	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces escription for Off	ficial Publication (Ma	ax = 50 word:	5)
	Study of the equilibrium, stability controlled fusion devices. Topics circular and non-circular cross se hydrodynamic and micro-instabili diffusion of particles and energy	s include MHD equilibrium for ection plasmas; magneto- ities; classical and anomalous					
		e g l k f h j ment O Free Elective O Other	PROG OUTCO Degree	OMES: Dec	a	jĥ □j	k live O Other
	Requirements	● Tech Elective	Require Prereq O Enforce O Advised	d	re Course	O Tech Elec	tive
\neg	Credit Restrictions		Credit Restrictions	•			
	Level of Credit Undergrad only Ugrad or Non-Rickin Rackham Grad All Credit types Non-Rickin Grad Rickin Grad wladd	m Grad Credit Hours Hrs/Wk 3 Min Max Number of Wks 14	Undergrad Rackham Non-Rekh	ROUNTI Grad		Credit Hours Min Max	Contact Hrs/Wk Number of Wks
C.	Repeatability (Indi Research, Dir. St	udy, Dissertation: Is this course repeate	able? 🧓 N	MINIX	Max Times?	Can it be re	
	Class Type(s) Lec Sem Dis Othe Rec Lab Ind Graded Section Lec Sem Dis Othe Rec Lab Ind Approval Info Appro Curriculum Comm. Faculty Cross listed Unit 1 Cross listed Unit 2	CR/NC Biological Station P/F Camp Davis	Alexand Grad C Is not a	Departm ept. Ronald G isted Nuclear E	omination if Cogniza	pt. Cross Chair:	Sigpeture

Form	Number
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SUPPORTING	STATEMENT
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baen taught for a number of years, in part because there has been no active research program in this area in the Nuclear. Engineering & Radiological Sciences Department. However, it is still an important core course in plasma science and engineering Eollowing discussions amongst faculty in the plasmas research area in the NERS Department, it was unanimously agreed that while the content is still very important and there are faculty members who could teach them, the very advanced details are beyong the scope of the program. It was therefore unanimously agreed within the Plasmas Option that the material could be reduced to
WAS MINERAL SHARE AND
Systems. This single course could then be laught by the current cohort of faculty in the Plasmas Option.

Are any special resources or facilities required for this course?
Detail the Special requirements