The University of Michigan
College of Engineering
Curriculum Committee

Agenda
March 26, 2013
1:30-3:00 p.m.

Room 265 Chrysler Center

1. EE Program Modifications
2. ME Program Modifications
3. Possible Change in the MS Eng for Financial Engineering
4. Course Approval Forms

COURSE APPROVAL FORMS—03-26-2013

BME 241 Modification—changing course description
CEE 500 Deletion
CEE 501 Deletion
CEE 529 Deletion
CEE 616 New Course
CEE 628 Deletion
IOE 813 New Course
ISD 520 New Course
NERS 211(X-Listed with ENSCEN 211)Modification—changing prereq's from: Preceded or accompanied by Math 216 (Advised) ***to: Math 116 (enforced)***
NERS 499 Modification—Changing Course Description; Changing level of credit from: ugrad or Rckhm Grad ***to: undergrad only***
NERS 211(X-Listed with ENSCEN 211) Modification(Changing Prereq from: Preceded or accompanied by Math 216 (advised ***to: Math 116 (enforced)***

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

Form Number: 2351
Date: 3/5/2013
Effective Term: Fall 2013
Course Offer Freq: ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department:	Home Department: BIOMEDE Biomedical Engineering
Course Number:	Course Number: 241
☐ Cross Listed Course Information:	Cross Listed Course Information:
☐ Course Title:	Course Title: Biomedical Engineering Undergraduate Laboratory
TITLE ABBREVIATION — Time Sched Max = 19 Spaces:	BiomedE Undergrad Lab
TITLE ABBREVIATION — Transcript Max = 20 Spaces:	BiomedE Undergrad Lab
☒ Course Description: This course provides an introduction to experimentation in circuits, systems, physical chemistry, thermodynamics, and mechanics with emphasis on biological applications. Lectures and laboratories on lab safety, measurement and analysis of physiological systems; operational amplifiers; rate of reaction; whole body, tissue, and cellular mechanics; probability and statistical analysis.	Course Description for Official Publication (Max = 50 words): This course provides a hands-on introduction to the construction and characterization of electronic circuits, the acquisition and display of biopotentials, measurement and analysis of the mechanical properties of biological and non-biological materials, and basic cell culture techniques including live-dead assays and assessment of cell adhesion properties. Lectures cover probability and statistics in addition to basic concepts in laboratory record-keeping, electronics, materials testing, and cell culture.
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☒ a ☒ b ☐ c ☒ d ☒ e ☒ f ☒ g ☐ h ☒ i ☐ j ☒ k
Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ◉ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other
☐ Prereq: ○ Enforced ○ Advised	Prereq: BiomedE 211, 221, 231 ○ Enforced ◉ Advised
☐ Credit Restrictions:	Credit Restrictions:
☐ Level of Credit: ☐ Undergrad only ☐ Ugrad or Rckhm Grad ☐ R ☐ Rackham Grad ☐ Ugrad or Non-Rckhm Grad ☐ Non-Rckhm Grad ☐ All Credit types	Level of Credit: ☒ Undergrad only ☐ Ugrad or Rckhm Grad ☐ I ☐ Rackham Grad ☐ Ugrad or Non-Rckhm Grad ☐ Non-Rckhm Grad ☐ All Credit types
☐ Credit Hours Min / Max:	Credit Hours Min: 4 Max: 4
☐ Contact Hrs/Wk:	Contact Hrs/Wk: 4
☐ Number of Wks:	Number of Wks: 14

C.

Repeatability (Indi Research, Dir. Study. Dissertation: Is this course repeatable? ○ Yes ◉ No — Max Hours? — Max Times? — Can it be repeated in the same term? ○ Yes ○ No

☐ **Class Type(s)**: ☒ Lec ☐ Sem ☐ Dis ☐ Other ___ ☐ Rec ☒ Lab ☐ Ind

Graded Section: ☒ Lec ☐ Sem ☐ Dis ☐ Other ___ ☐ Rec ☒ Lab ☐ Ind

Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U

Course Is Y Graded ☐

Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member:	Title
Rachael Schmedlen	Lecturer
Dennis Claflin	Res. Scientist
Douglas Noll	Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Biomedical Engineering	
Cross-listed Dept(s)		

Form Number

2351

SUPPORTING STATEMENT

The change in course description is to keep it current with the updating of modules within the course.

Are any special resources or facilities required for this course? ☑ Yes ☐ No

Detail the Special requirements

Wet lab, 1220 LBME and prep room 1218 LBME
Dry lab, 1105 LBME

BME 241: Introductory Biomedical Engineering Laboratory

Instructors:	GSI[5]:	IA[5]
Dennis Claflin, Ph.D. claflin@umich.edu	Leng-Chun Chen (Sec 2, 3) lengleng@umich.edu	Tarun Koshy (Sec 2) tkoshy@umich.edu
Doug Noll, Ph.D. dnoll@umich.edu	David Lai (Sec 4) davlai@umich.edu	Jordan Pollack (Sec 3) jordapol@umich.edu
		John Hsieh (Sec 4) jwhsieh@umich.edu

Lecture: Mon & Wed, 12:30pm – 1:30pm, G906 Cooley

Lab:
Sec 2: Wed, 8:30am – 12:30pm, 1105/1220 LBME (Chen, Koshy)
Sec 3: Mon, 3:30pm – 7:30pm, 1105/1220 LBME (Chen, Pollack)
Sec 4: Wed, 3:30pm – 7:30pm, 1105/1220 LBME (Lai, Hsieh)

Office hours:

Claflin:	Wed, 1:30pm – 2:30pm (2232 LBME)
Noll:	Mon, 1:30pm – 2:30pm (1119 Gerstacker)
Chen:	Mon, 1:30pm – 3:30pm (1105/1220 LBME)
	Wed, 1:30pm – 3:30pm (1105/1220 LBME)
Lai:	Wed, 1:30pm – 3:30pm (1105/1220 LBME)

Course Materials

Required:

- Laboratory notebook (purchase scientific lab notebook – 192-page version)
- Course notes, lab handouts, and associated documents (CTools, Resources,...)

Suggested:

- Statistics text – Miller & Freund's Probability and Statistics for Engineers (8th Edition) by Richard Johnson, Irwin Miller, John Freund

Grading

Lab Notebooks	15%
Pre-lab Homework	10%
Post-lab Reports	30%
Research Project	10%
Statistics Homework	15%
Statistics Quizzes	20%

Lab Modules

Circuits, Op-Amps.....Introduction to lab instrumentation, simple circuits, op-amp circuits
EMG (+LabVIEW).....Instrumentation amps, acquire and analyze electromyograms (EMG)
Material Properties....Investigate and compare mechanical properties of biological materials
Cell Culture.....Attachment rates and live-dead assays using cultured cells
Research Project.....Develop hypothesis, then design and conduct experiments.
Project deliverables: proposal, lab notebook, poster presentation

Lab Safety

All students are expected to work safely in the lab. Safety glasses must be worn at all times in the Wet Lab. Students must wear long pants, shirts with sleeves (or a lab coat, buttoned up), and close-toed shoes. No eating, drinking or gum chewing are allowed in the lab.

Biohazardous material, glass material, solvents, raw chicken, etc. must be disposed of properly. Details for proper disposal will be discussed in lab. Please do not touch any materials or equipment not relevant to your lab. Take care when using fast-moving, sharp, or other dangerous parts of lab equipment and be familiar with safety features of the devices.

Lab Notebook Maintenance

Student performance is evaluated in part on the maintenance of a lab notebook (15% of course grade). Please consult lecture notes and lab notebook grading rubric (CTools) for detailed instructions on how to maintain your lab notebook.

Attendance Policy

Students are expected to attend *all* sessions of the laboratory. A student choosing to miss a lab session to attend another commitment (*e.g.* job interviews, graduate school interviews) must inform the GSI in advance and then make up the session at a time convenient to the GSI and possibly her/his lab partners – subject to availability of equipment. If a convenient time cannot be established or the student chooses to not make up the session, no points will be given for the assignments related to that session. Illness and family emergencies will be handled on an individual basis. Contact the GSI as soon as possible if an emergency arises.

Honor Code Policy

Much of the learning in this lab will be from coaching and interaction with other students, the instructors, and the GSI. It is important that a collegial environment is maintained. For most experiments, you and your partners will collect only one set of data. You may discuss strategies for data preparation and interpretation with your partners and other students, but you must do all data calculations, graphing, tabulating, etc. yourself. All homework sets and quizzes are also to be completed individually. Finally, you must do all of the writing yourself, unless specified otherwise (an exception being the final 2 lab reports, which are group efforts). You may consult the lab protocols, course notes, other textbooks, review articles, and published research papers. Information taken from journals, books and websites must be adequately referenced.

BME 241 Lab and Lecture Schedule, W-2013

Week	Lab	Lecture			
		Monday		Wednesday	
		Date (2013)	Topic	Date (2013)	Topic
1	**No Lab** Mon, 01-07 Wed, 01-09	01-07	No Lecture	01-09	Intro, Circuits
2	**Lab 1: Introductory Circuits** Mon, 01-14 Wed, 01-16	01-14	Lab Notebooks, Lab Reports, Breadboards	01-16	Bode Plots, Fourier Analysis, LabVIEW
3	**Lab 2 - LabVIEW "take home"** To complete Part 4: Lab open Wednesday and Friday (1/23 & 1/25) from 9am to 5pm	01-21	No Lecture (MLK Holiday)	01-23	R-C Filters, Operational Amplifiers
4	**Lab 3: Op-Amps** Mon, 01-28 Wed, 01-30	01-28	Op-Amps, Active Filters, Instrumentation Amplifiers	01-30	Definitions, Probability, Descriptive Statistics
5	**Lab 4: EMG** Mon, 02-04 Wed, 02-06	02-04	Electromyogram (EMG), Origin & Acquisition	02-06	Materials Testing: Stress, Strain, Young's Modulus, Tensile Testing, Viscoelasticity
6	**Lab 5: Tensile Testing** Mon, 02-11 Wed, 02-13	02-11	Discrete Random Variables and Distributions	02-13	Continuous Random Variables and Distributions
7	**Lab 6: Tensile Testing - Biological** Mon, 02-18 Wed, 02-20	02-18	Materials Testing: Compression, Beam Theory, Flexure Tests, Research Project introduction	02-20	Sampling Statistics, t distribution
8	**Lab 7: Compression Testing** Mon, 02-25 Wed, 02-27	02-25	Central Limit Theorem, Point Estimation, Confidence Intervals	***02-27***	***Quiz 1*** *(Section 002: DOW 1006)* *(Section 003: DOW 2166)* *(Section 004: DOW 3150)*
9	**No Lab (Spring Break)** Mon, 03-04 Wed, 03-06	03-04	Spring Break	03-06	Spring Break
10	**Lab 8: Flexure Testing** Mon, 03-11 Wed, 03-13	03-11	Cell Culture, Research Project	03-13	Hypothesis Testing
11	**Lab 9: Cell Adhesion** Mon, 03-18 Wed, 03-20	03-18	Design of Experiments, Power Analysis, Sample Size	03-20	***Research Project proposal due,*** ***Project micro-pitches***
12	**Lab 10: Cell Viability, Counting** Mon, 03-25 Wed, 03-27	03-25	Regression	03-27	***Quiz 2*** *(Section 002: DOW 1006)* *(Section 003: DOW 2166)* *(Section 004: DOW 3150)*
13	**Lab 11: Research Project (1 of 3)** Mon, 04-01 Wed, 04-03	04-01	Multiple Regression	04-03	ANOVA
14	**Lab 11: Research Project (2 of 3)** Mon, 04-08 Wed, 04-10	04-08	Categorical Data	04-10	Non-Parametric Tests
15	**Lab 11: Research Project (3 of 3)** Mon, 04-15 Wed, 04-17	04-15	Special Topics, Quiz 3 Review	04-17	***Quiz 3*** *(Section 002: DOW 1006)* *(Section 003: DOW 2166)* *(Section 004: DOW 3150)*
16	**No Lab** Mon, 04-22 Wed, 04-24	**Research Project poster presentations: Friday, April 26, 1:30pm - 3:30pm** (Due midnight, 04-25: Poster in PDF format - upload to CTools) (Due 04-26: Poster hard-copy, Peer Evaluations, Lab Notebooks)			

BME 241 Lab Assignment Due Dates, W-2013

Week	Lab	What's Due?		
		Pre-lab (collected at start of lab)	Lab Report (collected at start of lab)	Lab Notebook (collected at end of lab)
1	No Lab Mon, 01-07 Wed, 01-09			
2	Lab 1: Introductory Circuits Mon, 01-14 Wed, 01-16	Intro Circuits pre-lab (Lab 1)		
3	Lab 2 - LabVIEW "take home"			yes (Lab 1)
4	Lab 3: Op-Amps Mon, 01-28 Wed, 01-30	Op-Amps pre-lab (Lab 3)		
5	Lab 4: EMG Mon, 02-04 Wed, 02-06	EMG pre-lab (Lab 4)	Op-Amps (5-page limit, individual)	yes (Labs 2 & 3)
6	Lab 5: Tensile Testing Mon, 02-11 Wed, 02-13	Tensile testing pre-lab (Lab 5)		
7	Lab 6: Tensile Testing - Biological Mon, 02-18 Wed, 02-20		EMG (5-page limit, individual)	yes (Labs 4 & 5)
8	Lab 7: Compression Testing Mon, 02-25 Wed, 02-27	Compression testing pre-lab (Lab 7)		
9	No Lab (Spring Break) Mon, 03-04 Wed, 03-06			
10	Lab 8: Flexure Testing Mon, 03-11 Wed, 03-13	Flexure testing pre-lab (Lab 8)		
11	Lab 9: Cell Adhesion Mon, 03-18 Wed, 03-20		Tensile & Compression (10-page limit, group)	yes (Labs 6 & 7)
12	Lab 10: Cell Viability, Counting Mon, 03-25 Wed, 03-27			
13	Lab 11: Research Project (1 of 3) Mon, 04-01 Wed, 04-03		Cell Adhesion (5-page limit, group)	yes (Labs 8 & 9)
14	Lab 11: Research Project (2 of 3) Mon, 04-08 Wed, 04-10			yes (Lab 10)
15	Lab 11: Research Project (3 of 3) Mon, 04-15 Wed, 04-17			
16	No Lab Mon, 04-22 Wed, 04-24	**Research Project poster presentations: Friday, April 26, 1:30pm - 3:30pm** (Due midnight, 04-25: Poster in PDF format - upload to CTools) (Due 04-26: Poster hard-copy, Peer Evaluations, Lab Notebooks)		

Course Profile: Biomedical Engineering Program

COURSE #: BIOMEDE 241	**COURSE TITLE:** BIOMEDICAL ENGINEERING UNDERGRADUATE LAB
TERMS OFFERED: Fall and Winter	**PREREQUISITES:** BiomedE 211, 221, 231
TEXTBOOKS/REQUIRED MATERIAL: none	**COGNIZANT FACULTY:** R. Schmedlen **DATE OF PREPARATION:** Winter 2013
INSTRUCTOR(S): R. Schmedlen, D. Claflin, D. Noll	**SCIENCE/DESIGN:** 4/0
CATALOG DESCRIPTION: This course provides a hands-on introduction to the construction and characterization of electronic circuits, the acquisition and display of biopotentials, measurement and analysis of the mechanical properties of biological and non-biological materials, and basic cell culture techniques including live-dead assays and assessment of cell adhesion properties. Lectures cover probability and statistics in addition to basic concepts in laboratory record-keeping, electronics, materials testing, and cell culture.	**COURSE TOPICS:** 1. Probability and statistics. 2. Differential amplifiers, active filters, and transfer functions. 3. Biopotential signal acquisition and processing. 4. Mechanical properties of biomaterials. 5. Cell culture, cell viability, cell adhesion.

COURSE OBJECTIVES	1. Teach students how to acquire, condition, digitize, and analyze biopotentials from living systems. [1, 2, 4, 5, 6, 11, 13, 14] 2. Teach students how to measure and analyze the mechanical properties of biological materials. [1, 2, 4, 5, 11, 13, 14] 3. Teach students the concepts and basic techniques employed in cell and tissue culture laboratory environments. [2, 4, 11, 14] 4. Teach students how to process experimental data for quantitative analysis. [1, 2, 4, 5, 6, 11, 13, 14] 5. Teach students how to apply statistical techniques to data collected in a laboratory setting. [1, 2, 4, 5, 6, 11, 12, 14] 6. Enhance students' communication skills through formal reports and presentations. [6, 7, 9]
COURSE OUTCOMES	1. Construct a signal-conditioning system that provides an interface between a biosensor and a digital data acquisition system. [1, 2, 4, 5, 6, 7, 9, 11, 13] 2. Perform routine digital signal processing on acquired biopotentials signals (filtering, RMS, power spectra). [1, 2, 4, 5, 13, 14] 3. Apply statistical methods to analyses of experimental data. [1, 2, 4, 5, 13, 14] 4. Determine tensile properties of avian skin, bone. [1, 2, 4, 5, 6, 7, 9, 13, 14] 5. Determine compression and flexure properties of avian bone. [1, 2, 4, 5, 6, 7, 9, 13, 14] 6. Learn cell culture concepts and common techniques employed in cell and tissue culture laboratories. [2, 6, 9, 14] 7. Document laboratory experiences in both laboratory notebooks and formal laboratory reports. [6, 7, 9]
ASSESSMENT TOOLS	1. Homework. [1, 2, 5, 6, 11, 13] 2. In-class examinations. [1, 2, 5, 6, 9, 11, 13, 14] 3. Individual laboratory notebooks. [1, 2, 5, 6, 7, 9, 11, 13, 14] 4. Individual laboratory reports. [1, 2, 5, 6, 7, 9, 11, 13, 14] 5. Written proposal for course project (group). [1, 2, 4, 5, 6, 7, 9, 11, 13, 14] 6. Oral presentation of course project proposal. [1, 2, 4, 5, 6, 7, 9, 11, 13, 14] 7. Oral and poster presentation on results of course project. [1, 2, 4, 5, 6, 7, 9, 11, 13, 14]

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

Form Number 2389
Date 2/19/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department: CEE Civil & Environmental Engin	Home Department:
Course Number: 500	Course Number:
Cross Listed Course Information: CHE Chemical Engineering 500; ENSCEN Environmental Sciences & Engin 500	Cross Listed Course Information:
Course Title: Environmental Systems and Processes I	Course Title:
TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Envir. Syst. Proc. I	TITLE ABBREVIATION — Time Sched Max = 19 Spaces:
TITLE ABBREVIATION — Transcript Max = 20 Spaces: Envir. Syst. Proc. I	TITLE ABBREVIATION — Transcript Max = 20 Spaces:
Course Description: Concepts of environmental systems and principles of related transport and transformation phenomena and processes, focusing on aquatic systems; development of fundamental models for articulation of relevant process dynamics; system and process scaling factors and methods; extension of process models to ideal and non-ideal natural and engineered homogeneous environmental systems.	Course Description for Official Publication (Max = 50 words):
PROGRAM OUTCOMES: ☒ a ☒ b ☒ c ☐ d ☒ e ☐ f ☒ g ☐ h ☐ i ☒ j ☒ k	**PROGRAM OUTCOMES:** ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	**Degree Requirements:** ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other
Prereq: CEE 460 ○ Enforced ◉ Advised	Prereq: ○ Enforced ○ Advised
Credit Restrictions:	Credit Restrictions:
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☒ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work	**Level of Credit:** ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work
Credit Hours Min 3 Max 3; Contact Hrs/Wk 3; Number of Wks	Credit Hours Min Max; Contact Hrs/Wk; Number of Wks

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? Max Times? Can it be repeated in the same term? ○ Yes ◉ No

C.

Class Type(s): ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind
Graded Section: ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind
Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U
Course Is Y Graded ☐
Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member: Walter J. Webber, Jr — Title: Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Civil & Environmental Engin	
Cross-listed Dept(s).	Chemical Engineering	
	Environmental Sciences & Engin	

Form Number

2389

SUPPORTING STATEMENT

We would like to delete CEE 500. This course was last taught in Fall 2004, and we have no plans to offer it for the foreseeable future.

Are any special resources or facilities required for this course? ☐ Yes ☒ 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 2399
Date 3/19/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Course Number	Home Department: CEE Civil & Environmental Engin / Course Number: 501
Cross Listed Course Information	Cross Listed Course Information
Course Title	Course Title: Special Topics in CEE
TITLE ABBREVIATION — Time Sched Max = 19 Spaces / Transcript Max = 20 Spaces	TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Special Topics CEE / Transcript Max = 20 Spaces: Special Topics CEE
Course Description	Course Description for Official Publication (Max = 50 words): Selected topics pertinent to civil & environmental engineering.
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other
Prereq: ○ Enforced ○ Advised	Prereq: ○ Enforced ○ Advised
Credit Restrictions	Credit Restrictions
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min ___ Max ___; Contact Hrs/Wk ___; Number of Wks ___	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☒ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 1 Max 4; Contact Hrs/Wk vary; Number of Wks vary

C.

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ◉ Yes ○ No Max Hours? 99 Max Times? 99 Can it be repeated in the same term? ◉ Yes ○ No

Class Type(s)
☒ Lec ☐ Sem ☐ Dis ☐ Other
☐ Rec ☐ Lab ☐ Ind

Graded Section
☒ Lec ☐ Sem ☐ Dis ☐ Other
☐ Rec ☐ Lab ☐ Ind

Grading
☒ A-E
☐ CR/NC
☐ P/F
☐ S/U
Course Is Y Graded ☐

Location
☒ Ann Arbor
☐ Biological Station
☐ Camp Davis
☐ Extension

Cognizant Faculty Member: -various- Title

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Civil & Environmental Engin	
Cross-listed Dept(s).		

Form Number

2399

SUPPORTING STATEMENT

We would like to create a new special topics number for our department. We have been using many different numbers for special topics in the past 5 years, depending on the level and subfield: CEE 490, 622, 682, 810, 880, 930, 946, 980. On occasion, we also use these course numbers for independent study/research in the same semester. The Registrar's Office no longer approves of this practice and requested we create one Special Topics designation, separate from Independent Study.

Are any special resources or facilities required for this course? ☐ Yes ☒ 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 2404
Date 3/25/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING

Home Department: CEE Civil & Environmental Engin
Course Number: 529

Cross Listed Course Information:

Course Title: Hydraulic Transients I

TITLE ABBREVIATION
Time Sched Max = 19 Spaces: Hydr Transients I
Transcript Max = 20 Spaces: Hydr Transients I

Course Description:
Incompressible unsteady flow through conduits; numerical, algebraic and graphical analysis of waterhammer; solution of transient problems by the method of characteristics; digital computer applications to pump failures, complex piping systems; valve stroking, and liquid column separation.

PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k

Degree Requirements ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective

Prereq: CEE 421.
○ Enforced
◉ Advised

Credit Restrictions:

Level of Credit
☐ Undergrad only ☐ Ugrad or Non-Rckhm Grad
☐ Rackham Grad ☒ All Credit types
☐ Non-Rckhm Grad ☐ Rckhm Grad w/add'l Work
☐ Ugrad or Rckhm Grad

Credit Hours Min 3 Max 3
Contact Hrs/Wk 3
Number of Wks 14

B. REQUESTED LISTING

Home Department:
Course Number:

Cross Listed Course Information:

Course Title:

TITLE ABBREVIATION
Time Sched Max = 19 Spaces:
Transcript Max = 20 Spaces:

Course Description for Official Publication (Max = 50 words):

PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k

Degree Requirements ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective

Prereq
○ Enforced
○ Advised

Credit Restrictions:

Level of Credit
☐ Undergrad only ☐ Ugrad or Non-Rckhm Grad
☐ Rackham Grad ☐ All Credit types
☐ Non-Rckhm Grad ☐ Rckhm Grad w/add'l Work
☐ Ugrad or Rckhm Grad

Credit Hours Min Max
Contact Hrs/Wk
Number of Wks

C.

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? Max Times? Can it be repeated in the same term? ○ Yes ◉ No

Class Type(s)
☒ Lec ☐ Sem ☐ Dis ☐ Other
☐ Rec ☐ Lab ☐ Ind

Graded Section
☒ Lec ☐ Sem ☐ Dis ☐ Other
☐ Rec ☐ Lab ☐ Ind

Grading
☒ A-E
☐ CR/NC
☐ P/F
☐ S/U
Course Is Y Graded ☐

Location
☒ Ann Arbor
☐ Biological Station
☐ Camp Davis
☐ Extension

Cognizant Faculty Member: E Benjamin Wylie
Title: Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info | **Approved by Name** | **Approved Date**
☐ Curriculum Comm.
☐ Faculty
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

Department Chair Name | **Chair Signature**
Home Dept. Civil & Environmental Engin
Cross-listed Dept(s).

Form Number

2404

SUPPORTING STATEMENT

We would like to delete CEE 529. This course was last taught in Fall 2006, and we have no plans to offer it for the foreseeable future.

Are any special resources or facilities required for this course? ☐ Yes ☒ 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 2400
Date 3/20/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Course Number	Home Department: CEE Civil & Environmental Engin / Course Number: 616
Cross Listed Course Information	Cross Listed Course Information
Course Title	Course Title: Passive Control of Structural Systems
TITLE ABBREVIATION — Time Sched Max = 19 Spaces / Transcript Max = 20 Spaces	TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Pass Ctrl Struc Sys / Transcript Max = 20 Spaces: Pass Ctrl Struc Sys
Course Description	Course Description for Official Publication (Max = 50 words): Design and theoretical understanding of passive control techniques applied to structures; a critical comparison of different passive control systems and how to model them; and potential of supplemental energy dissipation, seismic isolation, and other innovative passive control systems to reduce the response of structures under dynamic and seismic loads.
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ○ Degree Requirement ○ Core Course ◉ Free Elective ○ Tech Elective ○ Other
Prereq: ○ Enforced ○ Advised	Prereq: Prior or concurrent enrollment in CEE 511 or equivalent. ○ Enforced ◉ Advised
Credit Restrictions	Credit Restrictions
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min Max; Contact Hrs/Wk; Number of Wks	Level of Credit: ☐ Undergrad only ☒ Rackham Grad ☒ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 3 Max 3; Contact Hrs/Wk 3; Number of Wks 14

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? ____ Max Times? ____ Can it be repeated in the same term? ○ Yes ◉ No

C.

Class Type(s)
☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind

Graded Section
☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind

Grading
☒ A-E ☐ CR/NC ☐ P/F ☐ S/U
Course Is Y Graded ☐

Location
☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member: Jason P. McCormick
Title: Assistant Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Department Chair Name	Chair Signature
Home Dept. Civil & Environmental Engin	
Cross-listed Dept(s).	

Form Number

2400

SUPPORTING STATEMENT

The course content includes a detailed study of passive control systems that is currently not offered within the department. The topics will be of interest to graduate structural engineering students who may be going into practice or conducting research in the area of extreme load mitigation. The course content may also be relevant for students in the infrastructure systems graduate program focusing on structures. This course was taught as a special topics course in Fall 2011; twelve students were enrolled.

Are any special resources or facilities required for this course? ☐ Yes ☒ No

Detail the Special requirements

SYLLABUS
CEE 810 – SPECIAL TOPICS:
PASSIVE CONTROL OF STRUCTURAL SYSTEMS

OBJECTIVE:

(1) Gain an understanding of how passive control techniques are applied to structures in the context of earthquake engineering requirements.
(2) Provide a critical comparison of different passive control systems and necessary information to model and design such systems.
(3) Demonstrate the potential of supplemental damping, seismic isolation, and other innovative passive control systems for reducing the response of structures under seismic loads.

LECTURES:

Tuesday and Thursday
1:00 pm – 2:30 pm (class starts at 1:10 pm)
1371 GGBL

INSTRUCTOR:

Professor Jason McCormick
2372 G.G. Brown Building
e-mail: jpmccorm@umich.edu *phone:* (734) 764-4462

OFFICE HOURS:

Monday 3:00 pm – 4:00 pm
Tuesday and Thursday 2:30 pm – 3:30 pm
Or by appointment

TEXTBOOK:

No formal textbook will be used for this class. A list of reference materials is provided. As a courtesy to your classmates, please do not check these out of the library for an extended period of time. Other necessary materials and handouts will be provided in class during the term.

GRADING SCHEME: The course will be graded using the following distribution:

30% -- Homework
35% -- Midterm Exam
35% -- Term Project

TOPICS COVERD:

(1) Review of structural dynamics
(2) Review of seismic design philosophies and analysis methods
(3) Principles of supplemental damping and seismic isolation
(4) Concepts and Design Requirements for Energy Dissipation Systems
(5) Metallic and Friction Dampers
(6) Viscous and Viscoelastic Dampers
(7) Self-Centering Systems
(8) Tunes Mass Dampers
(9) Concepts and Design Requirements for Seismic Isolation Systems
(10) Base Isolation Systems

CEE 810
T,Th 1:00-2:30 p.m.

COURSE WEBSITE: CTools – updated throughout the semester with announcements, handouts, homework assignments, and other information.

HONOR CODE: Details can be found at:
http://www.engin.umich.edu/students/bulletin/rules/#honor
The honor code will apply to all examinations.

HOMEWORK: Discussing homework problems with other students in this class is permitted (and encouraged). You are encouraged to form "study groups" if that helps you. However, you are responsible for completing and submitting your own assignment. Copying the work of another student will be considered a violation of the Honor Code.

Homework will be collected at the end of class on the due date. Late homework will not be permitted except with prior approval of the instructor.

EXAMINATIONS: There will be one in class mid-term exams (1-1/2 hrs.). The format of the exams will be provided prior to each.

PROJECT: Details of the project will be provided during the semester to provide adequate time for completion of the project.

REFERENCES:

- Clough, R.W. and Penzien, J., Dynamics of Structures, McGraw-Hill, 1993.
- Chopra, A.K., Dynamics of Structures: Theory and Applications to Earthquake Engineering 3rd Edition, Prentice Hall, 2006.
- Christopoulos, C. and Filiatrault, A., Principles of Passive Supplemental Damping and Seismic Isolation, IUSS Press, Pavia-Italy, 2006.
- Soong, T.T. and Dargush, G.F., Passive Energy Dissipation Systems in Structural Engineering, John Wiley & Sons, 1997.
- Connor, J.J. Introduction to Structural Motion Control, Prentice Hall, 2003.
- 2009 International Building Code (IBC), International Code Council, 2009.
- 2012 International Building Code (IBC), International Code Council, 2011.
- FEMA 451, NEHRP Recommended Provisions: Design Examples, Building Seismic Safety Council, 2006.
- FEMA P-749, Earthquake-Resistant Design Concepts: An Introduction to the NEHRP Recommended Seismic Provisions for New Buildings and Other Structures, Building Seismic Safety Council, 2010.
- FEMA 356, Prestandard and Commentary for the Seismic Rehabilitation of Buildings, Building Seismic Safety Council, 2000.

TENATIVE LECTURE SCHEDULE – Fall 2011

Lec. #	Date	Topic(s) Covered
1	09/06 T	Syllabus, Introduction, Motivation
2	09/08 Th	Review of Structural Dynamics
3	09/13 T	Review of Structural Dynamics cont.
4	09/15 Th	Review of Structural Dynamics cont.
5	***09/20 T***	Seismic Design Philosophies and Analysis Methods
6	***09/22 Th***	Energy Concepts in Earthquake Engineering
7	09/27 T	Energy Dissipation Systems (Concepts & Design Requirements)
8	09/29 Th	Metallic and Friction Dampers
9	10/04 T	Metallic and Friction Dampers cont.
10	10/06 Th	Metallic and Friction Dampers cont.
11	10/11 T	Metallic and Friction Dampers cont.
12	10/13 Th	Viscous and Viscoelastic Dampers
--	10/18 T	*Fall Study Break (No class)*
13	10/20 Th	Viscous and Viscoelastic Dampers cont.
14	10/25 T	Viscous and Viscoelastic Dampers cont.
15	10/27 Th	Self-Centering Systems
16	***11/01 T***	Self-Centering Systems cont.
17	11/03 Th	MIDTERM EXAM
18	11/08 T	Self-Centering Systems cont.
19	11/10 Th	Tuned Mass Dampers
20	11/15 T	Tuned Mass Dampers cont.
21	11/17 Th	Seismic Isolation Systems (Concepts & Requirements) cont.
22	11/22 T	Seismic Isolation Systems (Concepts & Requirements) cont.
--	11/24 Th	*Thanksgiving (No class)*
23	11/29 T	Base Isolation Systems
24	12/01 Th	Base Isolation Systems cont.
25	12/06 T	Base Isolation Systems cont.
26	12/08 Th	Retrofit of Structural Systems
27	12/13 T	Presentations

Note: *I am scheduled to be out of the country on **09/20**, **09/22**, and **11/01**. **There will not be any classes on these days**, but the classes will be made up at an alternative time that is convenient for the class.*

DAILY LEARNING OBJECTIVES – CEE810 F11
PASSIVE CONTROL OF STRUCTURAL SYSTEMS

Lecture 1, Tuesday, September 6, 2011
Introduction & Motivation for Passive Control of Structures (Syllabus & Handout)

1. Discuss syllabus and course related topics.
2. Introduce the motivation behind passive control.
3. Discuss the fundamental of passive control.

Lecture 2, Thursday, September 8, 2011
Review of Structural Dynamics

1. Consider different possible seismic protection systems.
2. Discuss variables necessary to model a SDOF system and the resulting equation of motion.
3. Determine the response of a SDOF system under free vibration.

Lecture 3, Tuesday, September 13, 2011
Review of Structural Dynamics cont.

1. Determine the response of a SDOF system under harmonic vibration.
2. Discuss the effect of a passive damper on the response.
3. Solve for natural frequencies and mode shapes for a MDOF system.

Lecture 4, Thursday, September 15, 2011
Review of Structural Dynamics cont. (Handout)

1. Determine the solution of a MDOF system under free vibration (damped and undamped)
2. Calculate the classical damping matrix.
3. Apply modal analysis to other loading cases.

Lecture 5, Tuesday, September 27, 2011
Seismic Design Philosophies & Analysis Methods (Handout & Articles)

1. Provide an overview of force-based design methods.
2. Consider the benefits of performance-based design and the corresponding analysis needs.

Lecture 6, Thursday, September 29, 2011
Energy Concepts in Earthquake Engineering (Handout)

1. Discuss displacement-based design procedures, benefits, and limitations.
2. Provide an overview of energy concepts.
3. Derive the energy balance equations.

Lecture 7, Tuesday, October 4, 2011
Energy Dissipating Systems: Basics Concepts & Design Requirements (Handout & Articles)

1. Consider an energy balance example problem.
2. Identify types of energy dissipating systems and their effect on energy balance.

Lecture 8, Thursday, October 6, 2011
Energy Dissipating Systems: Design & Metallic and Friction Dampers (Handout)

1. Outline analysis and design procedures for energy dissipating systems.
2. Determine the effect of hysteretic dampers on structural response.

Lecture 9, Friday, October 7, 2011
Metallic and Friction Dampers cont.

1. Compare response of an equivalent linear system to time history analysis results.
2. Determine the optimum response at resonance for nonlinear SDOF systems with hysteretic dampers.
3. Calculate the optimal geometry for yielding dampers.

Lecture 10, Tuesday, October 11, 2011
Metallic and Friction Dampers cont. (Handout)

1. Evaluate different metallic dampers that have been studied.
2. Evaluate the main assumptions associated with solid friction.
3. Determine the various parameters that affect friction behavior.

Lecture 11, Thursday, October 13, 2011
Metallic and Friction Dampers cont. (Handout)

1. Complete discussion on various aspects affecting friction behavior.
2. Discuss existing friction-based systems.
3. Outline the design procedure using optimum hysteretic damping design spectrum (Brace Details & Activation Load).

Lecture 12, Thursday, October 20, 2011
Hysteretic Damper Design & Viscous and Viscoelastic Dampers

1. Complete outline of optimum hysteretic damping design spectrum procedure and example.
2. Determine the force and energy dissipation of linear and nonlinear viscous dampers.

Lecture 13, Friday, October 21, 2011
Viscous and Viscoelastic Dampers cont. & RUAUMOKO (Handout)

1. Determine the energy dissipated by a nonlinear viscous damper.
2. Evaluate the hysteretic behavior of viscoelastic material.
3. Provide an overview of RUAUMOKO.

Lecture 14, Tuesday, October 25, 2011
Viscous and Viscoelastic Dampers cont. (Handout)

1. Determine the response for structures with viscous or viscoelastic dampers under an earthquake.
2. Discuss current viscous dampers.
3. Consider design procedures for viscoelastic and linear viscous dampers.

Lecture 15, Thursday, October 27, 2011
Viscous and Viscoelastic Dampers cont. (Handout)

1. Consider practical design of linear viscous dampers.
2. Discuss design requirements for nonlinear viscous dampers.
3. Determine optimal distribution and geometric configurations of dampers.

Lecture 16, Thursday, November 3, 2011
Midterm Exam

Lecture 17, Tuesday, November 8, 2011
Self-Centering Systems (Handout)

1. Introduce self-centering systems through comparison.
2. Consider the response of SDOF systems and how to model.
3. Determine the frequency response for harmonic excitation.
4. Discuss parameters needed for analysis of SDOF self-centering systems.

Lecture 18, Thursday, November 10, 2011
Self-Centering Systems cont. (Handout)

1. Consider energy balance formulation for self-centering SDOF systems.
2. Discuss key response indices for self-centering systems.
3. Determine the variation in response indices for various SDOF parameters.
4. Evaluate shape memory alloys for self-centering applications.

Lecture 19, Tuesday, November 15, 2011
Self-Centering Systems cont. (Handout)

1. Continue evaluation of shape memory alloys for self-centering applications.
2. Determine the self-centering mechanism for post-tensioned systems.

Lecture 20, Thursday, November 17, 2011
Self-Centering Systems cont. and Tuned Mass Dampers (Handout)

1. Discuss mechanism and modeling of post-tensioned systems.
2. Outline seismic design considerations for self-centering systems.
3. Derive the behavior for undamped tuned mass dampers under harmonic loading.

Lecture 21, Tuesday, November 22, 2011
Tuned Mass Dampers cont. (Handout)

1. Derive the behavior of tuned mass dampers under different loadings (damped and undamped).
2. Determine optimum tuning parameters for tuned mass dampers.
3. Discuss design considerations for MDOF systems.

Lecture 22, Wednesday, November 30, 2011
Seminar – Larry Fahnestock (University of Illinois at Urbana-Champaign)

Lecture 23, Thursday, December 1, 2011
Seismic Isolation (Concept & Design) (Handout)

1. Discuss general idea of seismic isolation.
2. Determine the natural frequency and mode shape for linear isolated systems.
3. Apply modal analysis to understand the behavior of linear isolated systems.

Lecture 24, Tuesday, December 6, 2011
Seismic Isolation (Concept & Design) cont. (Handout)

1. Outline design procedure for isolated buildings.
2. Define design method for isolated bridges.

Lecture 25, Thursday, December 8, 2011
Seismic Isolation (Design) & Seismic Isolation Systems (Handout)

1. Conclude discussion of design methods for isolated bridges.
2. Discuss design of laminated rubber bearings.

Lecture 26, Tuesday, December 13, 2011
Project Presentations

UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

November 10, 2011

CEE 810 – Special Topics: Passive Control of Structural Systems
Fall 2011
Course Project
Presentations on Tuesday December 13, 2011
Final Reports due Friday, December 16, 2011 (by 5pm)

As mentioned earlier in the term, there will be a class project in which you are to work in groups of 2-3 students. Each group will be responsible for a written report and oral presentation at the end of the semester. One person from each group is to notify Prof. McCormick by email with the names of the members in the group so that you can be assigned a group number. Groups are to be chosen by **Monday, November 14** or you will be assigned to a group.

The objective of the project is to evaluate the effect of passive control systems on the response of a structure when used for seismic retrofit of a 6-story steel moment resisting frame building. This will be completed using the general-purpose nonlinear time-history analysis program RUAUMOKO and DYNAPLOT which have been used for previous assignments. A model of the structure in the form of an input file will be provided. All groups will be working with the same building structure.

The project is divided into 4 phases:

1. Fully evaluate the building structure to be retrofitted by identifying the geometry and member properties, evaluating curvature and ductility capacity, determining the dynamic characteristics of the structure, and obtaining the structures capacity

2. Characterization of the assigned design ground motions by considering the time histories, response spectra, and damage potential of the ground motions.

3. Evaluate the performance of the original building structure under the design ground motions based on an analysis of the energy balance, plastic hinge distribution, peak and residual inter-story drifts, and peak absolute floor accelerations.

4. Retrofit the building with either a hysteretic damper, viscous damper, or tuned mass damper (on the roof) and evaluate the retrofitted structure.

Phase 1: The objective of this phase is to become familiar with the original 6-story frame structure (see figure). The design complies with the 1994 Uniform Building Code requirements for a building located in Zone 4 on soil type S2. The design gravity loads are:

Roof dead load = 3.8 kPa; Floor dead load = 4.5 kPa;
Roof live load =1.0 kPa; Floor live load = 3.8 kPa;
Weight of cladding = 1.7 kPa
Wind loads = basic wind speed of 113 km/h and exposure type B

The input file for the building model can be found on Ctools (building.txt). It represents a 2-D model of one frame for the building in the North-South direction. Gravity columns are included to represent all interior frame columns where the total gravity loads carried by interior columns are applied to the gravity column. All members are considered to be A36 steel (nominal F_y = 290 MPa).

The inelastic response is considered concentrated in plastic hinges at the end of the members where the plastic hinges are assigned a bilinear behavior (see figure). The plastic hinge length is assumed 90% of the member depth.

An axial load-moment interaction is considered for the columns. Rigid offsets are specified at the end of the frame members to account for the actual size of the members at the joints. The panel zones are assumed not to undergo shear deformation or yielding (i.e. all energy is dissipated through plastic hinging at the beam and column ends).

Rayleigh damping of 5% based on the first two elastic modes of vibration is assigned.

Tasks:

- Geometry and Member Properties
  - Draw an elevation view of the analyzed frame with nodes and members labeled.
  - Create a table with the properties of each member: member depth, cross-sectional area, moment of inertia around appropriate bending axis, yield bending moment, yield axial force.
  - For each column member, plot the axial load-moment interaction diagram.
- Curvature Ductility Capacity (the failure criteria for all steel beams and columns is based on a plastic hinge rotation limit of 0.03 rad.)
  - For each member, determine the curvature ductility capacity at failure (θ_p = 0.03 rad.)
- Dynamic Characteristics of the Structure
  - Create a table showing the first five periods of vibration of the building structure
  - For each of the five periods of vibration, draw the corresponding mode shapes. Indicate numerical values corresponding to the lateral modal displacement of each floor level
- Pushover Analysis
  - Perform a pushover analysis on the structure choosing a proper seismic loading distribution (must justify selected distribution). (See procedure described on page 15 at back of RUAUMOKO Theory Manual)
  - Plot results indicating the variation of the base shear with respect to top floor lateral displacement.
  - On the plot, indicate the formation of the first plastic hinge in the beams and its location, the formation of the first plastic hinge in the columns and its location, and the first expected failure of a beam or column and its location.

Phase 2: The objective of this phase is to determine the characteristics of the ground motions considered for the retrofit of the building. Each group will be given 3 records with a 10% probability of exceedence in 50 years uniform hazard spectrum for LA. The absolute

acceleration and relative displacement response spectra for 5% damping will also be provided. No scaling of the ground motions is necessary. All of the motions are in SAC format.

Tasks:

- Characteristics of Time-Histories
  - For each earthquake ground motion plot the acceleration time-history and indicate the peak ground acceleration (PGA).
- Characteristics of Response Spectra
  - Plot the absolute acceleration response spectrum for each ground motion on the same plot along with the mean spectrum.
  - Plot the relative displacement response spectrum for each ground motion on the same plot along with the mean spectrum.
- Discuss the damage potential of the ground motions.

Phase 3: The objective of this phase is to evaluate the seismic response of the original building structure (prior to retrofit) under each design ground motion.

Tasks:

- Energy Balance
  - For each analyses, plot the time-histories of various energy components and verify that energy balance is achieved.
  - Determine the maximum difference in percentage between the seismic input energy and the sum of the internal energy components.
- Plastic Hinge Distribution
  - Draw an elevation view of the building and indicate all occurrence of a plastic hinge at the end of a member. Use a closed circle (square) if it is bi-directional or an open circle (square) if it is uni-directional for each beam (column).
  - Determine the maximum plastic rotation for yielded members and identify any that may have surpassed the failure criterion.
  - Discuss the findings in light of the performance indices (see table below)
- Envelopes of Peak and Residual Inter-story Drifts: It has been suggested that light damage corresponds to inter-story drifts less than 0.5% and structural damage occurs at inter-story drifts of 1.5%
  - Draw graphs comparing the variation of peak and residual inter-story drift along the building height for the ground motions.
  - Discuss the results obtained in light of the performance indices.
- Envelopes of Peak Absolute Floor Accelerations:
  - Draw graphs comparing the variation of peak absolute horizontal acceleration along the building height for the ground motions.
  - Discuss the results obtained in light of the performance indices.

Phase 4: The objective of this phase is to retrofit the original building structure with hysteretic dampers, linear viscous dampers, or a tuned-mass damper placed at the roof.

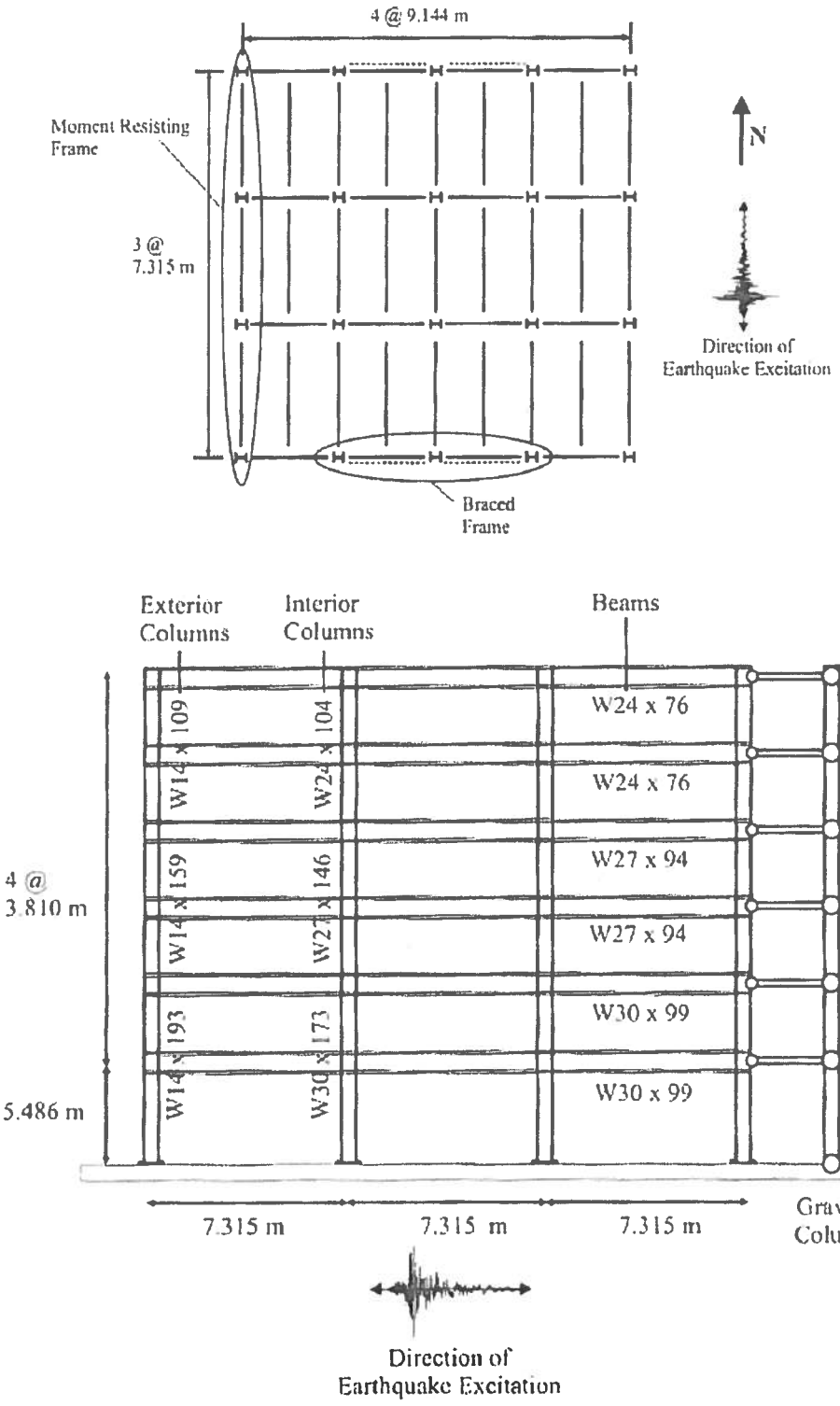
For *hysteretic dampers*, the retrofit strategy will be introduced through chevron braces added to the middle bay at each level of the moment resisting frame. The damper will be installed at one end of the bracing member as has been discussed in class. Brace forces induced by gravity loads can be ignored. Design parameters to determine are the activation load, F_a, of each damper along the building height and the HSS section for each diagonal cross-brace along the building height.

For *linear viscous dampers*, the retrofit strategy will be introduced through chevron braces added to the middle bay at each level of the moment resisting frame. The damper will be installed at one end of the bracing member as has been discussed in class. Brace forces induced by gravity loads can be ignored. Design parameters to determine are the damping constant, C_L, of each damper along the building height and the HSS section for each diagonal cross-brace along the building height.

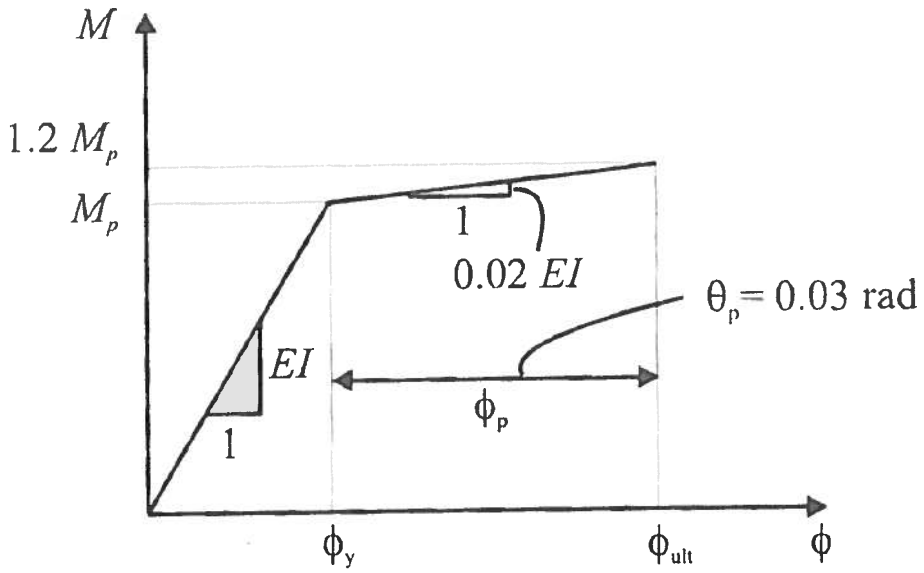
For *tuned-mass dampers*, the retrofit strategy will be introduced at the roof of the structure. The damper will consist of a mass m attached to the roof of the building by a horizontal linear spring of stiffness k, and a linear damper with constant c. It is assumed that the mass can slide on a special low-friction horizontal surface installed on the roof of the building. Design parameters to determine are the optimum mass m of the tuned-mass damper, optimum linear stiffness k of the tuned-mass damper, and optimum viscous damping constant c of the tuned-mass damper.

Tasks:

- Design of Passive Control System
  - Choose a design procedure (either discussed in class or found in the literature) to obtain the optimum parameters for the retrofit strategy. Include design calculations in the appendices.
  - Provide final choice for design parameters and a discussion that justifies the choice of the design procedure used.
- Perform Evaluation of Building Structure Retrofitted with the Passive Control Device
  - Analyze the retrofitted building under each design ground motion. Compare the results to the original building in terms of energy balance, envelopes of peak and residual inter-story drifts, envelopes of peak absolute floor accelerations.
  - Discuss the merits of the optimum solution in improving the response of the original building in light of the performance indices.
- Discuss any strategies that may be important to undertake to further assess the performance of the retrofit strategy and why they should be undertaken. These just need to be discussed and not implemented.



Building Structure Considered for Retrofit (Input file = building.txt)



Bilinear Moment Curvature Model for Plastic Hinges

Engineering Response Indices for the Seismic Performance of Steel Moment Resisting Buildings (Based on FEMA-356)

		Engineering Response Index		
		Description of Structural Damage	Maximum Drift	Residual Drift
Performance Level	Collapse Prevention [a]	Extensive distortion of beams and column panels; many fractures at moment connections, but shear connections remain intact.	5%	5%
	Life Safety [b]	Plastic hinges form; local buckling of some beam elements; severe joint distortion; isolated connection and element fractures, but shear connections remain intact.	2.5%	1%
	Immediate Occupancy [c]	Minor local yielding at a few locations; no fractures; minor buckling or observable permanent distortion of members.	0.7%	-

[a] Collapse Prevention: Structure supports gravity loads but has no margin against collapse.

[b] Life Safety: Damaged structure supports gravity loads with margin against collapse.

[c] Immediate Occupancy: Structure can be reoccupied immediately after the earthquake.

CEE 810 – Special Topics:
Passive Control of Structural Systems
Peer Evaluations of Project Presentations

Please evaluate the group listed from 1 to 5 in each of the categories below. Also, provide comments for improvement or other feedback (positive and negative) that may be helpful. The evaluations will be returned to each group so that you can continually improve upon your ability to present technical information through public speaking.

1	2	3	4	5
Needs Improvement		Average		Excellent

Group Members:

Technical Content ____ Comments:_____

Clear Explanations____ Comments:_____

Quality of Visuals____ Comments:_____

Understandable (Delivery speed/pronunciation)_____ Comments:_____

Overall Impression and Other Comments:_____

_____

CEE 810 – Special Topics:
Passive Control of Structural Systems
Project Presentations Grade Sheet

The presentation comprises 30% of the overall grade for the project and was scored numerically using the categories shown below. Each group received a single score for the presentation.

1	2	3	4	5
Below Expectation		Average		Excellent

Group Members:

CATEGORY	SCORE	COMMENTS
Technical Content		
1. Appropriate content and details		
2. Clear explanation of approach taken		
3. Understanding of findings		
4. Question and answers		
Visuals and Presentation		
1. Organized and readable		
2. Speakers clear and audible		

CEE 810 – Special Topics
Passive Control of Structural Systems
Project Report Grade Sheet

The report comprises 70% of the overall grade for the project and was scored numerically using the categories shown below. Each group received a single score for the report and for the overall project.

Group Members:

CATEGORY	SCORE	COMMENTS
Overall		
Organization and Presentation (5 points)		
Complete (5 points)		
Phase 1		
Approach (5 points)		
Findings and discussion of findings (10 points)		
Phase 2		
Approach (5 points)		
Findings and discussion of findings (10 points)		
Phase 3		
Approach (5 points)		
Findings and discussion of findings (10 points)		
Phase 4		
Approach (5 points)		
Findings and discussion of findings (10 points)		

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

Fall 2011 Final
10 students responded out of the total enrolled 12

Instructor with Comments Report

2011-12-02 - 2011-12-14 Report ID: MSR04734

Instructor: McCormick,Jason Paul
CEE 810 044

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	6	4	0	0	0	0	4.67	3.90	4.25	4.70	4.11	4.43	4.68
2	Overall, the instructor was an excellent teacher.	8	2	0	0	0	0	4.88	4.11	4.59	4.85	4.28	4.59	4.82
3	I learned a great deal from this course.	6	4	0	0	0	0	4.67	4.00	4.33	4.69	4.19	4.45	4.70
4	I had a strong desire to take this course.	5	3	2	0	0	0	4.50	3.60	4.08	4.58	4.10	4.40	4.67
15	I increased my ability to apply math and science knowledge to engineering problems.	7	3	0	0	0	0	4.79	4.00	4.20	4.50			
17	I increased my ability to analyze and interpret data.	4	5	1	0	0	0	4.30	4.06	4.26	4.52			
20	My confidence in my design abilities increased because of this course.	5	5	0	0	0	0	4.50	4.00	4.25	4.50			
21	I gained valuable experience working in teams in this course.	5	3	1	0	0	1	4.60	3.83	4.11	4.44			
23	I increased my ability to formulate, and solve engineering problems.	6	4	0	0	0	0	4.67	4.00	4.18	4.42			
25	I developed a greater understanding of my responsibilities as a professional.	4	5	1	0	0	0	4.30	3.98	4.27	4.63			
28	Course improved my ability to communicate technical information, designs, and analyses.	5	4	1	0	0	0	4.50	3.86	4.11	4.38			
30	I developed a greater understanding of the impact of engineering on the environment.	2	1	5	1	0	1	3.20	3.50	4.00	4.31			
32	This course increased my desire to learn more about this subject in the future.	7	3	0	0	0	0	4.79	3.80	4.12	4.43			
34	I have a greater understanding of how course concepts apply to contemporary problems.	6	4	0	0	0	0	4.67	4.06	4.23	4.50			
35	I increased my ability to apply engineering tools and methods.	5	5	0	0	0	0	4.50	4.00	4.20	4.46			
121	I gained a good understanding of concepts/principles in this field.	5	5	0	0	0	0	4.50	3.97	4.18	4.50			
125	I developed the ability to solve real problems in this field.	4	6	0	0	0	0	4.33	3.85	4.14	4.50			
201	The instructor gave clear explanations.	8	2	0	0	0	0	4.88	4.05	4.50	4.75			
203	The instructor stressed important points in lectures/discussions.	8	2	0	0	0	0	4.88	4.11	4.50	4.75			
207	The instructor appeared to have a thorough knowledge of the subject.	7	3	0	0	0	0	4.79	4.50	4.80	4.92			
216	The instructor acknowledged all questions insofar as possible.	6	4	0	0	0	0	4.67	4.27	4.58	4.80			
229	The instructor used class time well.	8	2	0	0	0	0	4.88	4.09	4.50	4.75			
230	The instructor seemed well prepared for each class.	8	2	0	0	0	0	4.88	4.30	4.67	4.86			
232	Work requirements and grading system were clear from the beginning.	7	2	0	0	0	0	4.86	4.00	4.33	4.67			
239	The amount of work required was appropriate for the credit received.	6	4	0	0	0	0	4.67	3.94	4.19	4.50			
356	Examinations covered the important aspects of the course.	4	5	0	0	0	1	4.40	4.07	4.31	4.64			
360	Exams were reasonable in length and difficulty.	6	3	0	0	0	1	4.75	3.87	4.10	4.50			
366	The grading system was clearly explained.	6	4	0	0	0	0	4.67	4.00	4.33	4.64			

Written Comments

900 Comment on the quality of instruction in this course.

Student 1
NA

Student 2

Fall 2011 Final
10 students responded out of the total enrolled 12

Instructor with Comments Report

2011-12-02 - 2011-12-14 Report ID: MSR04734

Instructor: McCormick,Jason Paul

CEE 810 044

NA

Student 3
The course was an excellent overview of passive control systems. I learned a considerable amount about the how such systems are designed, but a more thorough and complete reference would have been nice to reference throughout the class. However; I can't blame Prof McCormick if no suitable reference exists.

Student 4
NA

Student 5
Good coverage of topics, including introduction of structural dynamics concepts. Notes were clear and organized.

Student 6
NA

Student 7
Best CEE600 level class so far

Student 8
Good job for a first attempt teaching this course!

Student 9
NA

Student 10
NA

* The quartiles are calculated from Fall 2011 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
College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number: 2407
Date: 3/25/2013

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

Effective Term: Fall 2013

Course Offer Freq: ☒ Indefinitely ☐ One term only

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department: CEE Civil & Environmental Engin	Home Department:
Course Number: 628	Course Number:
Cross Listed Course Information:	Cross Listed Course Information:
Course Title: Numerical Modeling of Subsurface Flow	Course Title:
TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Num Mod Subs Flow	TITLE ABBREVIATION — Time Sched Max = 19 Spaces:
TITLE ABBREVIATION — Transcript Max = 20 Spaces: Num Mod Subs Flow	TITLE ABBREVIATION — Transcript Max = 20 Spaces:
Course Description: Application of numerical solution methods, including finite differences, finite elements, boundary elements, and method of characteristics to various subsurface flow problems: saturated isothermal flow, solute transport, multiphase flow, geothermal reservoirs, use and modification of existing models in addition to new code development.	Course Description for Official Publication (Max = 50 words):
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective	Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective
Prereq: CEE 528 or CEE 593 and Math 471. ◉ Enforced ○ Advised	Prereq: ○ Enforced ○ Advised
Credit Restrictions:	Credit Restrictions:
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work
Credit Hours Min 3 Max 3; Contact Hrs/Wk 3; Number of Wks 14	Credit Hours Min ___ Max ___; Contact Hrs/Wk ___; Number of Wks ___

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? ___ Max Times? ___ Can it be repeated in the same term? ○ Yes ◉ No

C.

Class Type(s)
☒ Lec ☐ Sem ☐ Dis ☐ Other ___
☐ Rec ☐ Lab ☐ Ind

Graded Section
☒ Lec ☐ Sem ☐ Dis ☐ Other ___
☐ Rec ☐ Lab ☐ Ind

Grading
☒ A-E
☐ CR/NC
☐ P/F
☐ S/U
Course Is Y Graded ☐

Location
☒ Ann Arbor
☐ Biological Station
☐ Camp Davis
☐ Extension

Cognizant Faculty Member: Linda J Abriola
Title: Professor

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.

Department Chair Name	Chair Signature
Home Dept. Civil & Environmental Engin	
Cross-listed Dept(s).	

Form Number

2407

SUPPORTING STATEMENT

We would like to delete CEE 628. This course was last taught in Witner 2002, and we have no plans to offer it for the foreseeable future.

Are any special resources or facilities required for this course? ☐ Yes ☒ 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 2388
Date 3/18/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

	A. CURRENT LISTING	B. REQUESTED LISTING
	Home Department / Course Number	Home Department: IOE Industrial & Operations Engin / Course Number: 813
☐	Cross Listed Course Information	Cross Listed Course Information
x	Course Title	Course Title: Seminars in Healthcare Systems Engineering
	TITLE ABBREVIATION — Time Sched Max = 19 Spaces	Health Eng Seminars
	TITLE ABBREVIATION — Transcript Max = 20 Spaces	Health Eng Seminars
x	Course Description	Course Description for Official Publication (Max = 50 words): Healthcare is critical to society, and has a major impact on our economy. In this course, focused around weekly seminars by leading scholars in this important area, we provide a broad overview to ways systems engineering can improve the delivery of healthcare: decreasing costs, reducing error, and developing innovations.
	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
	Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ○ Degree Requirement ○ Core Course ◉ Free Elective ○ Tech Elective ○ Other
x	Prereq: ○ Enforced ○ Advised	Prereq: Graduate standing or permission of Instructor — ◉ Enforced ○ Advised
☐	Credit Restrictions	Credit Restrictions
x	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min Max; Contact Hrs/Wk; Number of Wks	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☒ Ugrad or Non-Rckhm Grad ☒ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 2 Max 2; Contact Hrs/Wk 2; Number of Wks 14

C.

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? 2 Max Times? 1 Can it be repeated in the same term? ○ Yes ◉ No

x **Class Type(s)**: ☐ Lec ☒ Sem ☐ Dis ☐ Other ___ ☐ Rec ☐ Lab ☐ Ind
Graded Section: ☐ Lec ☒ Sem ☐ Dis ☐ Other ___ ☐ Rec ☐ Lab ☐ Ind
Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U
Course Is Y Graded ☐
Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member: Amy E. M. Cohn
Title: Assoc. Professor
Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info | **Approved by Name** | **Approved Date**
☐ Curriculum Comm.
☐ Faculty
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.
Department Chair Name | **Chair Signature**
Home Dept. IOE-Mark S. Daskin
Cross-listed Dept(s).

Form Number

2388

SUPPORTING STATEMENT

see attached supporting statement

Are any special resources or facilities required for this course? ☐ Yes ☒ No

Detail the Special requirements

IOE813 – Seminars in Healthcare Systems Engineering (2 credits)
Instructor: Amy Cohn (IOE)

Fall 2013 (Mondays 4:30pm to 6:30pm)

Course Justification and Description:

One of the most critical challenges facing society today is the ability to provide healthcare which is safe, effective, timely, patient-centered, efficient, and equitable. Due to the tremendous complexity of the healthcare system, industrial and operations engineering tools can play a critical role – and, arguably, will be essential – in meeting this challenge. As has been well-documented, however, many barriers exist that hinder the successful application of engineering techniques to healthcare environments.

The intent of this course is therefore not to develop specific engineering methodologies for solving systems engineering problems in healthcare. Instead, the purpose is two-fold. First, **we will provide students with an understanding of the opportunities for using sophisticated engineering techniques on a wide array of healthcare problems.** We will do so through a series of seminars by engineering researchers working on a range of applied healthcare problems. Second, **we will foster the ability of engineering students to communicate with healthcare practitioners,** while simultaneously providing students from healthcare fields (e.g. public health and nursing) with exposure to the uses of engineering in their field.

The course is structured around a weekly seminar presented by an engineering researcher. The focus of these talks is on the challenge being addressed, the role of engineering in addressing this challenge, the tools used, and the outcome of the research. The intent is to be accessible to a broad audience (including students from non-engineering fields) and to focus on outcomes and impact. In most cases, the engineering speaker will partner with a practitioner (typically, a collaborator) from the healthcare field – this may be a clinician from medicine, nursing, public health, etc. The seminars are designed to be informal and highly interactive, with significant time reserved for questions and discussion. By making the seminars open to the general public, the opportunity for broad discussion and student exposure is enhanced. [For example, previous sessions have been attended by professionals from UMHS, the VA hospital, Altarum, Wayne State, and more. These guests often participate actively and provide many interesting insights.]

In preparation for each of the weekly seminars, students will also read and critique a weekly paper or papers. This is done in student pairs, which rotate each week, providing the students with the opportunity to share their views and learn from the experiences of their classmates. Prior offerings have enrolled students not only from IOE but several other engineering

departments as well as nursing, public health, and business, enabling a wide range of experiences and knowledge base.

Beyond the weekly seminar, discussion, and paper review, the students will also have two written reports. First, they will each conduct a literature review on a healthcare application of their choice, drawing from both the engineering and medical literature. Second, they will interview a clinician, learning about the clinician's practice and identifying potential opportunities for engineering to improve the delivery of care. The students will write a paper summarizing this interview and their ideas as well.

Course Number

We propose an IOE8XX course number to capture the fact that this is a seminar-focused course, similar to IOE800, IOE836, IOE837, and IOE899. We suggest IOE813 specifically, in alignment with two other healthcare-related courses currently being offered, IOE413 and IOE513.

Enrollment Requirements

To encourage enrollment of students from other units (e.g. nursing, public health), both for their own benefit and to enhance the learning experience of the engineering students, we propose to not limit enrollment based on prior technical background. Instead, we propose to restrict to graduate standing, allowing (through approval of the instructor) advanced undergraduates to enroll only in special circumstances.

Other information (see attached):

- Weekly speaker topics from 2011 and 2012
- Course evaluations from 2011 and 2012

September 12	Patient Safety: A Systems Approach	James P. Bagian, MD, PE *This seminar starts 4:30PM*
September 19	Health Care Reform and the Future of American Medicine	Ezekiel J. Emanuel, MD, PhD *4:30PM in Danto Auditorium, CVC*
September 26	Ergonomic Solutions for Preventing Disability	Thomas J. Armstrong, PhD
October 3	Industrial Engineering in Healthcare	Kai Yang, PhD Susan Qian Yu, MS
October 10	Developing a Simulator to Teach Femoral Arterial Access: Channeling Simulation to Enhance Patient Safety	Albert J. Shih, PhD Hitinder S. Gurm, MD
October 24	Improving Emergency Department Patient Flow through Operations Decision Models	Mark P. Van Oyen, PhD Steven L. Kronick, MD, MS
October 31	Enhancing Equity in Kidney Allocations	Mark S. Daskin, PhD Robert M. Merion, MD, FACS
November 7	Global Health Design Specialization	Kathleen Sienko, PhD Timothy R.B. Johnson, MD
November 21	Operations Research in Medicine and Healthcare	Eva K. Lee, PhD
November 28	Breast Cancer Screening is Not One Size Fits All: Using Modeling to Personalize Breast Cancer Screening Policy	Julie S. Ivy, PhD Kathleen M. Diehl, MD
December 5	Operations Research in Healthcare	Mariel Lavieri, PhD Joshua D. Stein, MD, MS
December 12	Scheduling Problems in Medical Residency	Amy M. Cohn, PhD Brian K. Jordan, MD, PhD

This seminar series is presented by the U-M Center for Healthcare Engineering and Patient Safety (CHEPS): Our mission is to improve the safety and quality of healthcare delivery through a multi-disciplinary, systems-engineering approach.

Associated papers related to our speakers' presentations can be accessed at:
http://sitemaker.umich.edu/safety/home

For additional information and to be added to the weekly e-mail for the series, please contact genehkim@umich.edu.

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

Fall 2012 Final
6 students responded out of the total enrolled 16

Instructor Report

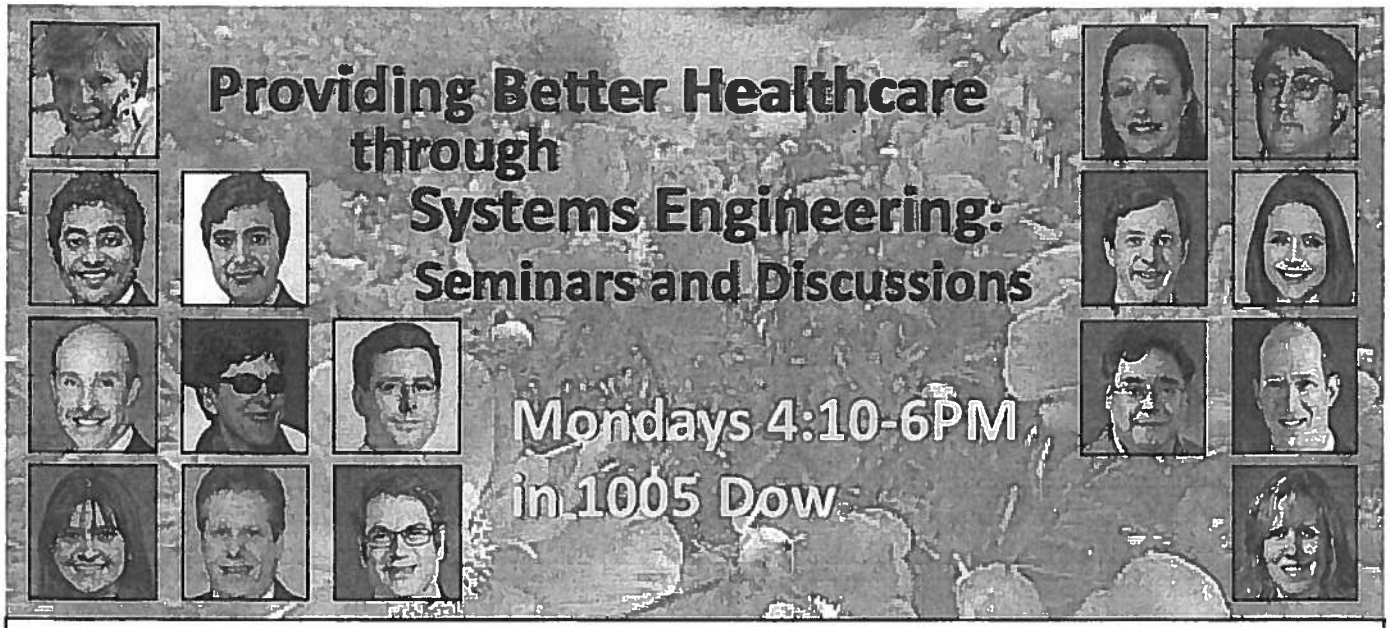
2012-11-29 - 2012-12-12 Report ID: MSR04732

Instructor: Cohn,Amy Ellen Mainville
IOE 691 002

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	1	4	1	0	0	0	4.00	3.90	4.25	4.68	4.08	4.42	4.75
2	Overall, the instructor was an excellent teacher.	1	5	0	0	0	0	4.10	4.13	4.61	4.83	4.25	4.67	4.83
3	I learned a great deal from this course.	1	4	1	0	0	0	4.00	4.00	4.33	4.69	4.17	4.50	4.77
4	I had a strong desire to take this course.	3	3	0	0	0	0	4.50	3.63	4.10	4.57	4.17	4.48	4.75
121	I gained a good understanding of concepts/principles in this field.	1	4	1	0	0	0	4.00	3.95	4.20	4.50			
140	I deepened my interest in the subject matter of this course.	1	3	2	0	0	0	3.83	3.81	4.17	4.57			
160	I participated actively in class discussion.	1	2	2	1	0	0	3.50	3.96	4.19	4.50			
201	The instructor gave clear explanations.	1	3	1	1	0	0	3.83	4.03	4.50	4.77			
202	The instructor made good use of examples and illustrations.	1	3	1	0	0	1	4.00	4.00	4.40	4.74			
205	The instructor put material across in an interesting way.	1	2	0	0	0	2	4.25	4.10	4.50	4.80			
207	The instructor appeared to have a thorough knowledge of the subject.	1	2	1	0	0	2	4.00	4.50	4.79	4.92			
211	The instructor was sensitive to student difficulty with course work.	1	5	0	0	0	0	4.10	4.10	4.50	4.76			
217	The instructor treated students with respect.	2	4	0	0	0	0	4.25	4.50	4.79	4.91			
218	The instructor encouraged constructive criticism.	1	3	2	0	0	0	3.83	4.17	4.54	4.80			
219	The instructor was willing to meet and help students outside class.	1	4	1	0	0	0	4.00	4.43	4.73	4.88			
229	The instructor used class time well.	1	5	0	0	0	0	4.10	4.13	4.50	4.77			
230	The instructor seemed well prepared for each class.	1	4	0	0	0	1	4.13	4.33	4.69	4.86			
232	Work requirements and grading system were clear from the beginning.	1	3	0	1	1	0	3.83	4.04	4.38	4.67			
241	The instructor set high standards for students.	1	5	0	0	0	0	4.10	4.21	4.55	4.77			
319	Writing assignments were interesting and stimulating.	1	3	1	1	0	0	3.83	3.69	4.00	4.30			
327	Reading assignments were interesting and stimulating.	1	4	1	0	0	0	4.00	3.64	4.00	4.36			
340	The textbook made a valuable contribution to the course.	1	1	0	0	0	4	4.50	3.45	4.00	4.42			
365	Grades were assigned fairly and impartially.	1	4	0	1	0	0	4.00	4.00	4.29	4.67			

* The quartiles are calculated from Fall 2012 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.



September 17	Medical Team Training: Putting Concepts Into Action	Jim Bagian, MD, PE
September 24	Operational Modeling of Emerging Viral Infectious Diseases	Diana Prieto, PhD
October 1	Building a Digital Ecosystem for Vulnerable Populations	Patricia A. Abbott, PhD, RN Satinder Singh, PhD
October 8	Balancing Timely Access and Patient-Physician Continuity in Primary Care	Hari Balasubramanian, PhD
October 22	Evolving Understanding of Lean in Healthcare; A Perspective from the VA Ann Arbor Healthcare System	Tom Kerr, MPH Valerie Chase, MSE
October 29	Quality Improvement in Hip and Knee Arthroplasty: Development of a Patient Registry in Michigan	Richard Hughes, PhD
November 5	Multinodal Interface Design: A Promising Means of Supporting Attention Management in Healthcare	Nadine Sarter, PhD
November 12	Optimal Design of Prostate Cancer Screening Policies	Brian Denton, PhD
November 26	The Impact of Declining Smoking on Radon Related Lung Cancer in the U.S.	David Mendez, PhD
December 3	Evaluating and Resolving Conflicts Between Deterministic Call Schedules and Stochastic Arrival Rates when Training Heart and Lung Transplant Surgeons	Jake Seagull, PhD, Mark Daskin, PhD, Rishi Reddy, MD, Andrea Obi, MD, Ryan Chen
December 10	Adaptive Health Communication to Improve Hypertension Medication Adherence	Larry An, MD Satinder Singh Baveja, PhD

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Our mission is to improve the safety and quality of healthcare delivery through a multi-disciplinary, systems-engineering approach.

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CHEPS Center for Healthcare Engineering & Patient Safety

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

Fall 2011 Final
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Instructor Report

2011-12-02 - 2011-12-14 Report ID: MSR04732

Instructor: Cohn,Amy Ellen Mainville
IOE 691 002

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	2	4	0	0	0	0	4.25	3.90	4.25	4.70	4.11	4.43	4.68
2	Overall, the instructor was an excellent teacher.	2	2	1	0	0	1	4.25	4.11	4.59	4.85	4.28	4.59	4.82
3	I learned a great deal from this course.	1	4	1	0	0	0	4.00	4.00	4.33	4.69	4.19	4.45	4.70
4	I had a strong desire to take this course.	3	2	1	0	0	0	4.50	3.60	4.08	4.58	4.10	4.40	4.67
121	I gained a good understanding of concepts/principles in this field.	1	5	0	0	0	0	4.10	3.97	4.18	4.50			
140	I deepened my interest in the subject matter of this course.	2	2	2	0	0	0	4.00	3.80	4.17	4.50			
160	I participated actively in class discussion.	2	2	2	0	0	0	4.00	3.93	4.17	4.50			
201	The instructor gave clear explanations.	2	3	1	0	0	0	4.17	4.05	4.50	4.75			
202	The instructor made good use of examples and illustrations.	1	2	1	0	0	2	4.00	4.00	4.38	4.72			
205	The instructor put material across in an interesting way.	1	3	1	0	0	1	4.00	4.10	4.56	4.81			
207	The instructor appeared to have a thorough knowledge of the subject.	1	4	1	0	0	0	4.00	4.50	4.80	4.92			
211	The instructor was sensitive to student difficulty with course work.	2	2	1	0	0	1	4.25	4.17	4.54	4.79			
217	The instructor treated students with respect.	4	2	0	0	0	0	4.75	4.50	4.79	4.90			
218	The instructor encouraged constructive criticism.	2	3	1	0	0	0	4.17	4.17	4.50	4.78			
219	The instructor was willing to meet and help students outside class.	1	3	0	0	0	2	4.17	4.40	4.71	4.88			
229	The instructor used class time well.	3	2	0	1	0	0	4.50	4.09	4.50	4.75			
230	The instructor seemed well prepared for each class.	3	0	2	0	0	1	4.67	4.30	4.67	4.86			
232	Work requirements and grading system were clear from the beginning.	1	3	2	0	0	0	3.83	4.00	4.33	4.67			
241	The instructor set high standards for students.	2	2	1	0	0	1	4.25	4.17	4.50	4.75			
319	Writing assignments were interesting and stimulating.	2	2	2	0	0	0	4.00	3.71	4.00	4.25			
327	Reading assignments were interesting and stimulating.	2	3	1	0	0	0	4.17	3.65	4.00	4.30			
340	The textbook made a valuable contribution to the course.	1	0	0	0	0	5	5.00	3.43	4.00	4.33			
365	Grades were assigned fairly and impartially.	2	1	3	0	0	0	3.50	4.00	4.25	4.60			

* The quartiles are calculated from Fall 2011 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
College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number 2397
Date 3/14/2013
Effective Term Fall 2013
Course Offer Freq ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Course Number	Home Department: Integrative Systems + Design (ISD) / Course Number: 520
☐ Cross Listed Course Information	Cross Listed Course Information
☐ Course Title	Course Title: Introduction to Systems Engineering
TITLE ABBREVIATION — Time Sched Max = 19 Spaces	Intro to Systems Engr
TITLE ABBREVIATION — Transcript Max = 20 Spaces	Intro to Systems Engr
☐ Course Description	Course Description for Official Publication (Max = 50 words): Introduction to the systems engineering process used to create multidisciplinary solutions to complex problems with multiple, often conflicting objectives; application to large developmental programs from such diverse areas as civil engineering and transportation, space and missiles, ships and land vehicle systems. Coursework includes homework assignments and projects.
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ○ Tech Elective ○ Other	Degree Requirements: ○ Degree Requirement ○ Core Course ○ Free Elective ◉ Tech Elective ○ Other
Prereq: ○ Enforced ○ Advised	Prereq: Graduate standing. ◉ Enforced ○ Advised — Background in multivariate calculus and statistics necessary.
☐ Credit Restrictions	Credit Restrictions
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min Max: ; Contact Hrs/Wk: ; Number of Wks:	Level of Credit: ☐ Undergrad only ☒ Rackham Grad ☒ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work; Credit Hours Min 3 Max 3; Contact Hrs/Wk 3; Number of Wks 14

C.

Repeatability (Indi Research, Dir. Study, Dissertation: Is this course repeatable? ○ Yes ◉ No Max Hours? 3 Max Times? 1 Can it be repeated in the same term? ○ Yes ◉ No

☐ **Class Type(s)**: ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind
Graded Section: ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind
Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U
Course Is Y Graded ☐
Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member: Don Winter — Title: Prof of Practice
Bogdan Epureanu — Assoc Professor
Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info | **Approved by Name** | **Approved Date**
☐ Curriculum Comm.
☐ Faculty
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Department Chair Name: Panos Papalambros — Chair Signature: for Panos
Home Dept.
Cross-listed Dept(s).

Form Number

2397

SUPPORTING STATEMENT

This course has been delivered five times previously as ENGR 599 001. Course evaluations and full syllabus are attached.

Previous enrollments: F12 = 11; W12 = 20; F11 = 13; W11 = 20; F10 = 25

ISD 520 has been successfully offered by Don Winter five times over the last two years. Offered during both Fall and Winter terms, the course introduces students to systems engineering processes and encourages them to determine multidisciplinary solutions to complex problems.

A true interdisciplinary course, ISD 520 will appeal to students from all engineering disciplines, including civil engineering, automotive engineering, energy systems engineering, and space and missile systems. Most important, the course will provide relevance to students who plan to work in the commercial, civil, or defense communities.

Students should have familiarity with analytic techniques up to and including multivariate calculus and statistical methods.

ISD 520 will satisfy the requirement for a systems engineering course for all MEng students in ESENG, GAME, AUTO, PharmEng, and MFG.

Are any special resources or facilities required for this course? ☐ Yes ☒ No

Detail the Special requirements

Introduction to Systems Engineering – Objectives, principles and practices

Winter Term 2013 - ENGR 599 section 059

Instructor

Donald Winter, dcwinter@umich.edu, 133 NAME Bldg, 764.8269

Course Overview

This course is intended to introduce the student to the systems engineering process used to create multidisciplinary solutions to complex problems which have multiple, often conflicting objectives. The course will provide an overview of systems engineering in the context of large developmental programs, with examples taken from a wide range of application areas, including civil engineering and transportation systems, space and missile systems, ship systems and land vehicle development. By focusing on the objectives, principles and practices of systems engineering, the course will enable the student to better understand the functions, capabilities and limitations of systems engineering. The course will be of value to all who will participate in major engineering efforts in the commercial, civil or defense communities.

Text

Alexander Kossiakoff, et al, Systems Engineering - Principles and Practice, 2nd Ed. , Wiley, 2011

Prerequisites

The course will focus on the concepts and objectives of systems engineering rather than the details of the analytic processes. However, to understand the concepts being discussed and to participate in the example applications, the students will need to have a familiarity with analytic techniques up to and including multivariable calculus and a basic understanding of statistical methods. The course is designed for first or second year graduate student, although well prepared undergraduates (seniors) are welcome, particularly if they have had experience working on developmental programs in industry or the military.

Lectures

Class meets 2-5PM on Tuesdays in 138 NAME

Course Outline

The course will be taught in three segments

Segment 1 - Systems Definition

- Systems Engineering Introduction and Objectives
- Requirements Analysis
- System Trades and Optimization
- Concept Development and Refinement

Segment 2 – Setting the Stage for Development

- Requirements Decomposition and Allocation
- Risk and Margin Management
- Availability, Reliability, Maintainability Considerations

Segment 3 – Systems Engineering Support to Development

- Managing Interfaces and the Change Process
- Control Gates
- Test, Validation and Verification

Homework will consist principally of extensions of the lecture and is to be submitted electronically (via CTools). The final examination will be in the form of a take home assignment. Students will be given several alternative problems to choose from, tailored to the backgrounds of students enrolled in the course.

Grading

Grades will be determined based on homework (50%) and the final exam (50%).

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

Fall 2012 Final
8 students responded out of the total enrolled 11

Instructor Report

2012-11-29 - 2012-12-12 Report ID: MSR04732

Instructor: Winter,Donald C
NAVARCH 599 059

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	3	5	0	0	0	0	4.30	3.90	4.25	4.68	4.08	4.42	4.75
2	Overall, the instructor was an excellent teacher.	6	2	0	0	0	0	4.83	4.13	4.61	4.83	4.25	4.67	4.83
3	I learned a great deal from this course.	5	3	0	0	0	0	4.70	4.00	4.33	4.69	4.17	4.50	4.77
4	I had a strong desire to take this course.	3	4	1	0	0	0	4.25	3.63	4.10	4.57	4.17	4.48	4.75
120	I learned a good deal of factual material in this course.	5	1	2	0	0	0	4.70	4.00	4.29	4.67			
121	I gained a good understanding of concepts/principles in this field.	5	3	0	0	0	0	4.70	3.95	4.20	4.50			
160	I participated actively in class discussion.	5	2	1	0	0	0	4.70	3.96	4.19	4.50			
203	The instructor stressed important points in lectures/discussions.	5	2	1	0	0	0	4.70	4.17	4.54	4.78			
207	The instructor appeared to have a thorough knowledge of the subject.	8	0	0	0	0	0	5.00	4.50	4.79	4.92			
31	I can see myself furthering my education in this area.	4	1	2	0	1	0	4.50	3.75	4.04	4.38			
32	This course increased my desire to learn more about this subject in the future.	5	2	1	0	0	0	4.70	3.83	4.13	4.50			
33	I now have a greater understanding of the contemporary issues in this field.	6	1	1	0	0	0	4.83	3.90	4.17	4.50			
34	I have a greater understanding of how course concepts apply to contemporary problems.	5	2	0	0	0	1	4.80	4.13	4.31	4.54			
320	Writing assignments made students think.	5	2	0	0	0	1	4.80	3.90	4.25	4.67			
340	The textbook made a valuable contribution to the course.	0	1	0	0	0	7	4.00	3.45	4.00	4.42			
356	Examinations covered the important aspects of the course.	0	1	1	0	0	6	3.50	4.05	4.31	4.63			
362	The exams were returned in a reasonable amount of time.	0	2	0	0	0	6	4.00	4.00	4.21	4.50			
363	The examinations were graded very carefully and fairly.	0	1	1	0	0	6	3.50	3.82	4.19	4.65			
365	Grades were assigned fairly and impartially.	4	3	1	0	0	0	4.50	4.00	4.29	4.67			

* The quartiles are calculated from Fall 2012 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.

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

Winter 2012 Final
10 students responded out of the total enrolled 20

Instructor Report

2012-04-06 - 2012-04-18 Report ID: MSR04732

Instructor: Winter,Donald C
ENGR 599 001

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	6	4	0	0	0	0	4.67	3.93	4.29	4.70	4.17	4.43	4.72
2	Overall, the instructor was an excellent teacher.	7	3	0	0	0	0	4.79	4.13	4.60	4.85	4.25	4.64	4.83
3	I learned a great deal from this course.	7	3	0	0	0	0	4.79	4.00	4.35	4.70	4.23	4.50	4.78
4	I had a strong desire to take this course.	6	4	0	0	0	0	4.67	3.65	4.13	4.61	4.13	4.50	4.75
140	I deepened my interest in the subject matter of this course.	6	4	0	0	0	0	4.67	3.83	4.20	4.63			
201	The instructor gave clear explanations.	6	4	0	0	0	0	4.67	4.10	4.50	4.78			
203	The instructor stressed important points in lectures/discussions.	8	2	0	0	0	0	4.88	4.11	4.50	4.78			
207	The instructor appeared to have a thorough knowledge of the subject.	9	1	0	0	0	0	4.94	4.50	4.79	4.92			
216	The instructor acknowledged all questions insofar as possible.	8	2	0	0	0	0	4.88	4.23	4.59	4.83			
218	The instructor encouraged constructive criticism.	6	4	0	0	0	0	4.67	4.13	4.53	4.79			
228	The instructor followed an outline closely.	5	3	2	0	0	0	4.50	4.10	4.50	4.79			
229	The instructor used class time well.	6	3	1	0	0	0	4.67	4.10	4.50	4.75			
230	The instructor seemed well prepared for each class.	8	2	0	0	0	0	4.88	4.30	4.67	4.86			
232	Work requirements and grading system were clear from the beginning.	6	4	0	0	0	0	4.67	4.00	4.33	4.67			
239	The amount of work required was appropriate for the credit received.	4	5	0	0	1	0	4.30	3.95	4.21	4.50			
240	The amount of material covered in the course was reasonable.	6	4	0	0	0	0	4.67	4.00	4.25	4.58			
318	Writing assignments seemed carefully chosen.	7	3	0	0	0	0	4.79	3.88	4.19	4.56			
331	The laboratory was a valuable part of this course.	0	2	0	0	0	8	4.00	3.89	4.33	4.80			
332	Laboratory assignments seemed carefully chosen.	0	2	0	0	0	8	4.00	3.83	4.09	4.60			
336	Laboratory assignments required a reasonable amount of time and effort.	0	2	0	0	0	8	4.00	3.90	4.12	4.50			
337	Laboratory assignments were relevant to what was presented in class.	1	1	0	0	0	8	4.50	4.00	4.28	4.71			
340	The textbook made a valuable contribution to the course.	2	4	4	0	0	0	3.75	3.38	4.00	4.43			
356	Examinations covered the important aspects of the course.	4	4	0	0	0	2	4.50	4.00	4.30	4.67			
365	Grades were assigned fairly and impartially.	4	6	0	0	0	0	4.33	4.00	4.25	4.62			
366	The grading system was clearly explained.	1	7	2	0	0	0	3.93	4.00	4.33	4.67			

* The quartiles are calculated from Winter 2012 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.

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

Fall 2011 Final
4 students responded out of the total enrolled 13

Instructor Report

2011-12-02 - 2011-12-14 Report ID: MSR04732

Instructor: Winter,Donald C
ENGR 599 001

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	1	2	1	0	0	0	4.00	3.90	4.25	4.70	4.11	4.43	4.68
2	Overall, the instructor was an excellent teacher.	2	2	0	0	0	0	4.50	4.11	4.59	4.85	4.28	4.59	4.82
3	I learned a great deal from this course.	1	2	1	0	0	0	4.00	4.00	4.33	4.69	4.19	4.45	4.70
4	I had a strong desire to take this course.	2	2	0	0	0	0	4.50	3.60	4.08	4.58	4.10	4.40	4.67
140	I deepened my interest in the subject matter of this course.	0	4	0	0	0	0	4.00	3.80	4.17	4.50			
201	The instructor gave clear explanations.	2	2	0	0	0	0	4.50	4.05	4.50	4.75			
203	The instructor stressed important points in lectures/discussions.	2	2	0	0	0	0	4.50	4.11	4.50	4.75			
207	The instructor appeared to have a thorough knowledge of the subject.	3	1	0	0	0	0	4.83	4.50	4.80	4.92			
216	The instructor acknowledged all questions insofar as possible.	2	2	0	0	0	0	4.50	4.27	4.58	4.80			
218	The instructor encouraged constructive criticism.	1	3	0	0	0	0	4.17	4.17	4.50	4.78			
228	The instructor followed an outline closely.	0	2	2	0	0	0	3.50	4.08	4.50	4.81			
229	The instructor used class time well.	1	3	0	0	0	0	4.17	4.09	4.50	4.75			
230	The instructor seemed well prepared for each class.	2	2	0	0	0	0	4.50	4.30	4.67	4.86			
232	Work requirements and grading system were clear from the beginning.	0	3	1	0	0	0	3.83	4.00	4.33	4.67			
239	The amount of work required was appropriate for the credit received.	0	4	0	0	0	0	4.00	3.94	4.19	4.50			
240	The amount of material covered in the course was reasonable.	0	4	0	0	0	0	4.00	4.00	4.25	4.50			
318	Writing assignments seemed carefully chosen.	1	3	0	0	0	0	4.17	3.83	4.13	4.50			
331	The laboratory was a valuable part of this course.	0	0	0	1	0	3	2.00	3.83	4.25	4.67			
332	Laboratory assignments seemed carefully chosen.	0	0	0	1	0	3	2.00	3.83	4.04	4.50			
336	Laboratory assignments required a reasonable amount of time and effort.	0	0	1	0	0	3	3.00	3.80	4.07	4.30			
337	Laboratory assignments were relevant to what was presented in class.	0	1	0	0	0	3	4.00	4.11	4.33	4.61			
340	The textbook made a valuable contribution to the course.	0	0	2	1	1	0	2.50	3.43	4.00	4.33			
356	Examinations covered the important aspects of the course.	0	1	1	0	0	2	3.50	4.07	4.31	4.64			
365	Grades were assigned fairly and impartially.	1	3	0	0	0	0	4.17	4.00	4.25	4.60			
366	The grading system was clearly explained.	0	3	1	0	0	0	3.83	4.00	4.33	4.64			

* The quartiles are calculated from Fall 2011 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.

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

Winter 2011 Final
14 students responded out of the total enrolled 20

Instructor Report

2011-04-13 - 2011-04-20 Report ID: MSR04732

Instructor: Winter,Donald C
ENGR 599 001

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	8	6	0	0	0	0	4.63	3.90	4.25	4.67	4.07	4.29	4.58
2	Overall, the instructor was an excellent teacher.	9	4	1	0	0	0	4.72	4.08	4.56	4.83	4.20	4.50	4.75
3	I learned a great deal from this course.	8	5	1	0	0	0	4.63	4.00	4.30	4.67	4.08	4.32	4.63
4	I had a strong desire to take this course.	10	3	1	0	0	0	4.80	3.67	4.10	4.59	4.10	4.33	4.63
712	This course helped me understand the rewards and challenges of being an engineer.	8	5	0	1	0	0	4.63	n/a	n/a	n/a			
713	This course deepened my interest in a career in engineering.	8	5	1	0	0	0	4.63	n/a	n/a	n/a			
714	This course helped me understand the range of skills/disciplines needed in engineering.	9	4	0	1	0	0	4.72	n/a	n/a	n/a			
715	This course helped me understand social & economic considerations in engineering.	8	5	0	0	0	1	4.69	n/a	n/a	n/a			
716	This course helped me understand environmental implications of engineering decisions.	7	6	0	1	0	0	4.50	n/a	n/a	n/a			
717	I feel more a part of the North Campus engineering community as a result of this class.	4	4	4	0	1	0	3.88	n/a	n/a	n/a			
718	I enhanced my technical knowledge in at least one area of engineering in this class.	5	7	1	0	0	0	4.29	n/a	n/a	n/a			
719	I have a sense of pride and accomplishment as a result of completing my projects.	4	9	0	1	0	0	4.17	n/a	n/a	n/a			
720	I have become more aware of the responsibilities engineers have as professionals.	6	8	0	0	0	0	4.38	n/a	n/a	n/a			
721	I will think more carefully about engineering's impact on society because of this course.	6	7	1	0	0	0	4.36	n/a	n/a	n/a			
722	I gained an understanding of the fundamentals of technical writing.	1	4	7	2	0	0	3.21	n/a	n/a	n/a			
723	I gained an understanding of the fundamentals of oral & visual communication	2	7	4	1	0	0	3.79	n/a	n/a	n/a			
724	I understand how to design and implement a technical report and oral presentation.	3	10	1	0	0	0	4.10	n/a	n/a	n/a			
725	I understand that technical communication has multiple audiences and purposes.	3	11	0	0	0	0	4.14	n/a	n/a	n/a			
726	Writing assignments helped me develop my skill as a writer.	0	10	2	1	0	0	3.85	n/a	n/a	n/a			
727	I believe that team skills are important for engineers.	10	4	0	0	0	0	4.80	n/a	n/a	n/a			
728	My team performed effectively.	9	3	1	1	0	0	4.72	n/a	n/a	n/a			
729	The team work was a positive experience.	9	2	2	1	0	0	4.72	n/a	n/a	n/a			
730	I found the guest lecturers valuable.	2	2	0	0	0	10	4.50	n/a	n/a	n/a			
731	The discussion sections were valuable.	6	3	0	0	0	5	4.75	n/a	n/a	n/a			
732	The amount of work required was appropriate for the 4 credit hours received.	6	2	2	1	0	3	4.58	n/a	n/a	n/a			
733	I developed some skill in using the University Library and its resources.	2	3	2	1	1	4	3.67	n/a	n/a	n/a			
734	I developed my skill in finding, evaluating, and citing information resources.	2	6	6	0	0	0	3.67	n/a	n/a	n/a			
735	Grades were assigned fairly and appropriately.	6	5	1	1	0	1	4.40	n/a	n/a	n/a			
736	I attended class regularly.	11	2	0	0	0	0	4.91	n/a	n/a	n/a			
737	I used all the learning opportunities provided in this class.	9	3	1	0	1	0	4.72	n/a	n/a	n/a			

* The quartiles are calculated from Winter 2011 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.

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

Fall 2010 Final
20 students responded out of the total enrolled 25

Instructor Report

2010-12-03 - 2010-12-14 Report ID: MSR04732

Instructor: Winter,Donald C
ENGR 599 001

		Responses from your Students**							Other Users of This Item*					
									University Wide			School/College		
		5 SA	4 A	3 N	2 D	1 SD	NA	Your Median	75% Above	50% Above	25% Above	75% Above	50% Above	25% Above
1	Overall, this was an excellent course.	11	8	1	0	0	0	4.59	3.83	4.19	4.60	4.08	4.33	4.68
2	Overall, the instructor was an excellent teacher.	11	8	1	0	0	0	4.59	4.00	4.50	4.80	4.13	4.53	4.79
3	I learned a great deal from this course.	8	9	3	0	0	0	4.28	3.94	4.28	4.67	4.14	4.49	4.71
4	I had a strong desire to take this course.	11	8	1	0	0	0	4.59	3.50	4.06	4.50	4.17	4.42	4.64
140	I deepened my interest in the subject matter of this course.	8	10	1	1	0	0	4.30	3.75	4.13	4.50			
201	The instructor gave clear explanations.	12	7	0	0	0	0	4.71	4.00	4.38	4.73			
203	The instructor stressed important points in lectures/discussions.	12	8	0	0	0	0	4.67	4.10	4.50	4.77			
207	The instructor appeared to have a thorough knowledge of the subject.	18	2	0	0	0	0	4.94	4.40	4.75	4.91			
216	The instructor acknowledged all questions insofar as possible.	13	7	0	0	0	0	4.73	4.20	4.56	4.79			
218	The instructor encouraged constructive criticism.	11	9	0	0	0	0	4.59	4.07	4.50	4.75			
228	The instructor followed an outline closely.	7	8	4	0	0	1	4.19	4.13	4.56	4.79			
229	The instructor used class time well.	9	11	0	0	0	0	4.41	4.00	4.38	4.70			
230	The instructor seemed well prepared for each class.	12	8	0	0	0	0	4.67	4.25	4.63	4.83			
232	Work requirements and grading system were clear from the beginning.	6	8	4	2	0	0	4.00	4.00	4.29	4.60			
239	The amount of work required was appropriate for the credit received.	6	11	2	0	1	0	4.14	3.89	4.13	4.50			
240	The amount of material covered in the course was reasonable.	8	10	1	1	0	0	4.30	4.00	4.20	4.50			
318	Writing assignments seemed carefully chosen.	8	10	0	0	0	0	4.40	3.88	4.15	4.50			
331	The laboratory was a valuable part of this course.	3	0	0	0	0	17	5.00	3.83	4.17	4.67			
332	Laboratory assignments seemed carefully chosen.	2	1	0	0	0	17	4.75	3.63	3.95	4.33			
336	Laboratory assignments required a reasonable amount of time and effort.	2	1	0	0	0	17	4.75	3.75	4.00	4.25			
337	Laboratory assignments were relevant to what was presented in class.	1	2	0	0	0	17	4.25	4.00	4.25	4.59			
340	The textbook made a valuable contribution to the course.	1	4	4	7	1	2	2.63	3.50	4.00	4.34			
356	Examinations covered the important aspects of the course.	8	9	2	0	0	0	4.33	4.00	4.25	4.60			
365	Grades were assigned fairly and impartially.	7	9	1	0	0	3	4.33	4.00	4.24	4.56			
366	The grading system was clearly explained.	2	7	4	5	0	1	3.50	4.00	4.29	4.64			

* The quartiles are calculated from Fall 2010 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
College Curriculum Committee, 1420 Lurie Engineering Center Building

Form Number: 2396
Date: 3/8/2013
Effective Term: Fall 2013
Course Offer Freq: ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department / Course Number	Home Department: NERS Nuclear Engin & Radiolog Sci / Course Number: 211
☐ Cross Listed Course Information	Cross Listed Course Information: ENSCEN Environmental Sciences & Engin 211
☐ Course Title	Course Title: Introduction to Nuclear Engineering and Radiological Sciences
TITLE ABBREVIATION — Time Sched Max = 19 Spaces; Transcript Max = 20 Spaces	TITLE ABBREVIATION — Time Sched Max = 19 Spaces: Intro to NERS; Transcript Max = 20 Spaces: Intro to NERS
☐ Course Description	Course Description for Official Publication (Max = 50 words): This course will discuss different forms of energy, the history of nuclear energy, the fundamentals of fission and fusion nuclear power, radiological health applications, and electromagnetic radiation in the environment. Current topics in the media such as radon, radioactive waste, and nuclear proliferation will also be covered.
PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k	PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k
Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective	Degree Requirements: ○ Degree Requirement ◉ Free Elective ○ Other ○ Core Course ○ Tech Elective
Prereq: Preceded or accompanied by Math 216 — ○ Enforced ◉ Advised	Prereq: Math 116 — ◉ Enforced ○ Advised
☐ Credit Restrictions	Credit Restrictions
Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad; ☐ Ugrad or Non-Rckhm Grad ☐ All Credit Types ☐ Rckhm Grad w/oDiss Work. Credit Hours Min Max. Contact Hrs/Wk ____ Number of Wks ____	Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad; ☐ Ugrad or Non-Rckhm Grad ☐ All Credit Types ☐ Rckhm Grad w/oDiss Work. Credit Hours Min 4 Max 4. Contact Hrs/Wk 4 Number of Wks 14

Repeatability (Indl Research, Dir. Study, Dissertation): Is this course repeatable? ○ Yes ◉ No. Max Hours? ____ Max Times? ____ Can it be repeated in the same term? ○ Yes ○ No

C.

☐ Class Type(s): ☒ Lec ☐ Sem ☐ Dis ☐ Other ____ ☐ Rec ☐ Lab ☐ Ind
Graded Section: ☒ Lec ☐ Sem ☐ Dis ☐ Other ____ ☐ Rec ☐ Lab ☐ Ind

Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U
Course is Y Graded ☐

Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Cognizant Faculty Member: Ronald Gilgenbach — Title: Dept Chair

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info — Approved by Name — Approved Date
☐ Curriculum Comm.
☐ Faculty
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Nuclear Engin & Radiolog Sci	
Cross-listed Dept(s).	Environmental Sciences & Engineering	

Form Number

2396

SUPPORTING STATEMENT

Prerequisites are being changed in order to better match the content of the course. This will also allow students to enroll earlier in their academic career.

Are any special resources or facilities required for this course? ☐ Yes ☐ 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: 2395
Date: 3/8/2013
Effective Term: Fall 2013
Course Offer Freq: ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING	B. REQUESTED LISTING
Home Department:	Home Department: NERS Nuclear Engin & Radiolog Sci
Course Number:	Course Number: 499
☐ Cross Listed Course Information:	Cross Listed Course Information:
☐ Course Title:	Course Title: Research in Nuclear Engineering and Radiological Sciences
TITLE ABBREVIATION — Time Sched Max = 19 Spaces:	Research in NERS
TITLE ABBREVIATION — Transcript Max = 20 Spaces:	Research in NERS
☒ Course Description: Individual or group research in a field of interest to the student under the direction of a faculty member of the Nuclear Engineering and Radiological Sciences Department.	Course Description for Official Publication (Max = 50 words): This course offers a research or directed study experience to third- and fourth- students in an area of mutual interest to the student and a NERS faculty member. The technical challenges will be comparable with other 400 level NERS classes. For each hour of credit, the student is expected to work three to four hours per week. An oral presentation and/or written report is due at the end of the term.
PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k	PROGRAM OUTCOMES: ☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k
Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective	Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ◉ Tech Elective
☐ Prereq: ○ Enforced ○ Advised	Prereq: None ○ Enforced ◉ Advised
☐ Credit Restrictions:	Credit Restrictions:
☒ Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☒ Ugrad or Rckhm Grad; ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work	Level of Credit: ☒ Undergrad only ☐ Rackham Grad ☐ Non-Rckhm Grad ☐ Ugrad or Rckhm Grad; ☐ Ugrad or Non-Rckhm Grad ☐ All Credit types ☐ Rckhm Grad w/add'l Work
Credit Hours Min 1 Max 3; Contact Hrs/Wk 1-3; Number of Wks 14	Credit Hours Min 1 Max 3; Contact Hrs/Wk 4-12; Number of Wks 14

C.

Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? ◉ Yes ○ No; Max Hours? ; Max Times? ; Can it be repeated in the same term? ○ Yes ◉ No

☐ Class Type(s): ☐ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☒ Ind

Graded Section: ☐ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☒ Ind

Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U

Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Course Is Y Graded ☐

Cognizant Faculty Member: Ronald Gilgenbach
Title: Dept Chair

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Nuclear Engin & Radiolog Sci	
Cross-listed Dept(s).		

Form Number

2395

SUPPORTING STATEMENT

Change in description is being made in order to be consistent with other independent study courses in NERS.

Are any special resources or facilities required for this course? ☐ Yes ☒ 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: 2396
Date: 3/8/2013
Effective Term: Fall 2013
Course Offer Freq: ☒ Indefinitely ☐ One term only

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

A. CURRENT LISTING

Home Department / Course Number:

Cross Listed Course Information:

Course Title:

TITLE ABBREVIATION — Time Sched Max = 16 Spaces:
Transcript Max = 20 Spaces:

Course Description:

PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k

Degree Requirements: ○ Degree Requirement ○ Free Elective ○ Other ○ Core Course ○ Tech Elective

Prereq: Preceded or accompanied by Math 216
☒ ○ Enforced ◉ Advised

Credit Restrictions:

Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rackham Grad ☐ Ugrad or Rackham Grad ☐ Ugrad or Non-Rackham Grad ☐ All Credit Types ☐ Rackham Grad w/addn'l Work

Credit Hours Min / Max:
Contact Hrs/Wk:
Number of Wks:

B. REQUESTED LISTING

Home Department: NERS Nuclear Engin & Radiolog Sci
Course Number: 211

Cross Listed Course Information: ENSCEN Environmental Sciences & Engin 211

Course Title: Introduction to Nuclear Engineering and Radiological Sciences

TITLE ABBREVIATION — Time Sched Max = 16 Spaces: Intro to NERS
Transcript Max = 20 Spaces: intro to NERS

Course Description for Official Publication (Max = 50 words):
This course will discuss different forms of energy, the history of nuclear energy, the fundamentals of fission and fusion nuclear power, radiological health applications, and electromagnetic radiation in the environment. Current topics in the media such as radon, radioactive waste, and nuclear proliferation will also be covered.

PROGRAM OUTCOMES: ☐a ☐b ☐c ☐d ☐e ☐f ☐g ☐h ☐i ☐j ☐k

Degree Requirements: ○ Degree Requirement ◉ Free Elective ○ Other ○ Core Course ○ Tech Elective

Prereq: Math 116
◉ Enforced ○ Advised

Credit Restrictions:

Level of Credit: ☐ Undergrad only ☐ Rackham Grad ☐ Non-Rackham Grad ☐ Ugrad or Rackham Grad ☐ Ugrad or Non-Rackham Grad ☐ All Credit Types ☐ Rackham Grad w/addn'l Work

Credit Hours Min: 4 Max: 4
Contact Hrs/Wk: 4
Number of Wks: 14

C.

Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? ○ Yes ◉ No — Max Hours? — Max Times? — Can it be repeated in the same term? ○ Yes ○ No

Class Type(s): ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind

Graded Section: ☒ Lec ☐ Sem ☐ Dis ☐ Other ☐ Rec ☐ Lab ☐ Ind

Grading: ☒ A-E ☐ CR/NC ☐ P/F ☐ S/U

Location: ☒ Ann Arbor ☐ Biological Station ☐ Camp Davis ☐ Extension

Course is Y Graded ☐

Cognizant Faculty Member: Ronald Gilgenbach
Title: Dept Chair

Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty

Approval Info	Approved by Name	Approved Date
☐ Curriculum Comm.		
☐ Faculty		
☐ Cross listed Unit 1		
☐ Cross listed Unit 2		

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.

	Department Chair Name	Chair Signature
Home Dept.	Nuclear Engin & Radiolog Sci	
Cross-listed Dept(s).	Environmental Sciences & Engin Engineering	

Form Number

2396

SUPPORTING STATEMENT

Prerequisites are being changed in order to better match the content of the course. This will also allow students to enroll earlier in their academic career.

Are any special resources or facilities required for this course? ☐ Yes ☐ No

Detail the Special requirements