The University of Michigan
College of Engineering
Curriculum Committee

Agenda
October 24, 2006
1:30-3:30 p.m.
GM Room
Fourth Floor Lurie Engineering Center

1. Approval of Minutes from September 19, 2006 Meeting
2. Curriculum Committee Guidelines and Procedures Revisited
3. Biology 163 as a Requirement for Engineering Students
4. Physics 135 and 235 as Substitutes for Physics 140 and 240
5. Course Approvals

University of Michigan
College of Engineering
Curriculum Committee Meeting
Tuesday September 19, 2006
1:30-3:30 p.m.
Lurie Engineering Center GM Room
Minutes

Richard Robertson called the meeting to order at 1:40 p.m.

Members Present: R.Robertson, A.Hunt, G.Hulbert, D.Karr, K.Kearfott, C.Lastoskie, Y.Liu, P.Mazumder, K.Patel, H.Peng, R Rogers, M.Solomon, R.Sulewski, T.Teorey, A.Yagle

Members Absent: J.Barker, L.Bernal, G.Herrin, S.Pang

Opening Remarks

Toby Teorey spoke on behalf of Dave Munson and Gary Herrin to welcome and thank everyone in advance for their service for this new semester on the CoE Curriculum Committee.
The new model for Engineering 100 and 101 will begin this fall. A proposal for this will be submitted to this Committee in a few weeks.
Jeanne Murabito wanted to share some information regarding the ABET (Accrediation Board for Engineering and Technology) visit. Some of the strengths noted were the outstanding faculty in all departments, the College alumni have moved into high leadership positions and the College also has above average freshman retention. All the departments are accredited, but two need to do interim reports.
A one page audit is now available to Engineering students and has been met with wide acceptance from the students.
There is a University wide emphasis on transfer students and there is the possibility of adding a course for transfer students similar to Engineering 100.

Motion to approve the minutes of the last meeting

The minutes of the last meeting were approved

Curriculum Committee Guidelines and Procedures

Richard Robertson asked the Committee to look at the handout regarding: Curriculum Committee Guidelines and Procedures. This is a policy statement that appears on the Curriculum Committee website. It was written a few years ago. He would like the Committee to review this to see what, if any changes may need to be made. This will be brought up again at the next meeting.

Independent Studies Review – Jeanne Murabito

Jeanne Murabito talked about a request that was sent to Dean Munson from the Provost's Office regarding evaluating practices around independent study courses. Jeanne will send an e-mail to

each individual department to conduct a review for independent study courses within each program and respond to her. This is University wide, not just the College of Engineering.
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Course Approval Forms

Richard Robertson called for a motion to approve the following courses. This was moved and seconded.

These Courses Were Tabled:

AOSS 102 (X-Listed with GEOSCI 122) Modification – Adding X-Listing with ENVIRON 102
EECS 578(X-Listed with CS 578) Modification – Removing X-listing; Changing Prerequisites from: EECS 478 ***to: EECS 478 or Graduate Standing***; Changing credit hours from: 3 ***to: 4***.
EECS 579(X-Listed with CS 579) Modification – Removing X-Listing; Changing credit hours From: 3 ***to: 4***.

The following courses were approved:

AOSS 105 (X-Listed with CHEM 105 & ENSCEN 105) Modification – Added X-Listing with ENVIRON 105
AOSS 551 Modification – Changed Title from: Advanced Geophysical Fluid Dynamics ***to: Fluid Dynamics for Atmospheric and Space Sciences***; Changed Description; Changed prerequisites from: AOSS 451 ***to: Math 215, Math 216, Math 450***; Changed Level of Credit from: Rackham Grad ***to: Rackham Grad & Non-Rackham Grad***; Changed credit hours from: 3 ***to: 4***.
BME 221 Modification – Changed Prerequisites from: Chem 130 and Math 116 ***to: Chem 130 and Math 116 and Chem 210/211***
BME 552 New Course
BME 800 Deletion
CHE 695 Modification – Added Prerequisite: ***Graduate students and admitted SGUS students with graduate advisor's permission***; Changed Credit Restrictions from: Graduate credit only ***to: Graduate and undergraduate credit only***; Changed level of credit from: Rackham Grad, Non-Rackham grad ***to: All credit types***
EECS 181 Deletion
EECS 574 Modification – Changed Prerequisites from: EECS 376 enforced ***to: EECS 376 or Graduate standing advised***; Changed Class type from: Lec ***to: Lec and Dis***.
NAME 562 (X-Listed with MFG 563) Modification – Changed Prerequisites from: Graduate Standing (enforced) ***to: NA 260 or P.I. or Graduate Standing (enforced)***
NAME 592 Modification – Added "Y" grading capability.

Adjournment: Motion to adjourn was made and seconded
Motion carried (approved)

Next Meeting October 3, 2006
GM Room – Fourth Floor LEC

THE UNIVERSITY OF MICHIGAN
COLLEGE OF ENGINEERING

CURRICULUM COMMITTEE GUIDELINES AND PROCEDURES

October 23, 2002

Creating a New Course

The proposal for a new course should contain justification for the establishment of and an assessment of the course's likelihood of success.

a) it is encouraged that the proposed new course be first prototyped before complete documentation is submitted to the CoE Curriculum Committee for their action.

b) documentation for submission of a new course will consist of:
   a. completed Course Approval Form (CAF) (including appropriate signatures)
   b. course outline, with details to show weekly subject matter
   c. required/recommended texts/course packs, grading and exam details

c) documentation that needs to accompany undergraduate CAF are as follows:
   a. courses that are requirements or technical electives that will be selected from a list of courses or technical electives at the 400-level or lower that are required for the degree:
      i. ABET documentation (e.g., Step II, Outcomes and Assessments, Program Mapping)
      ii Sample Schedule as it is to appear in the Bulletin

d) supporting documentation should be as complete as possible. In the case of a CAF that was partially approved at an earlier CoE Curriculum Committee Meeting, the earlier meeting date should be referenced in the current documentation.

Existing Course

The level of documentation needed for modifying an existing course is as follows:

a) modifications to undergraduate courses in the area of program requirements or technical electives refer to "c)" under "Creating a New Course."

b) all other modifications to an undergraduate course, only a CAF is needed

c) modifications to a graduate course, only a CAF is needed

d) supporting documentation should be as complete as possible. In the case of a CAF that was partially approved at an earlier CoE Curriculum Committee meeting, the earlier meeting date should be referenced in the current documentation.

Cross Listing of a Course
The explanation how the cross listing will meet "a) through c)" listed below, should be put on the CAF under "Supporting Statement." Criteria for approval of cross-listing a course, in order of importance, is as follows:

a) the course will be taught by faculty in cross listed departments

b) all cross listed departments actively review and assess curriculum, along with the cross listed courses consistent with departmental practices

c) course content is relevant to all departments cross listed

Establishment of a Division(Subject)
Based on D. Assanis, Automotive Engineering Program, "Rationale and Proposed Guidelines for Creating a Division in InterPro," November 29, 2000.

The following guidelines are proposed when demonstrating a need for the creation of an academic Division:

a) "Successful incubation of the interdisciplinary academic Program under one of the existing Divisions that would serve as the academic home for an interim period of at least three years."

b) "Successful development of a number of Program-specific courses that would not have been created if the proposed Division did not exist. Offering of such courses for at least two times under experimental numbers in one of the existing Divisions with satisfactory enrollment."

c) (Successful) "achievement of appropriate metrics consistent with Program goals and expectations, such as reaching a steady-state enrollment of x full-time and y part-time students, graduation of z students, etc."

d) Establishment of a curriculum committee for that division. The form and organization of the committee should be consistent with the norm of the other divisions in the CoE.

e) "Demonstrated identity of the Program, as evidenced by external recognition of Program need and objectives."

f) "Careful assessment of the pros and cons of the creation of a prospective Division by the Program's faculty council or the Program's Curriculum Committee, and approval of the proposal by at least 2/3 of the faculty council members."

g) "Approval of the proposal to create a Division by the CoE Curriculum Committee." (The CoE Curriculum Committee will evaluate the curricular aspects of the proposal.)

h) "Approval of the proposal by the CoE Faculty Assembly."

March 25, 2004

After extensive discussion within the committee and several colleagues from all departments, we have reached a consensus that a biology requirement for our undergraduates is desirable. The influence of modern biology is pervasive in every aspect of daily and business life. Understanding at some level is imperative for every engineer.

In terms of what would be taught in such a required biology course, discussion centered on modification of a new offering that has received considerable attention. Biology 163 was developed and is taught by Prof. Klionsky in an active learning environment. It is thus envisioned that the biology course would include the following topics:

1) biological molecules
2) cell biology including cell structure, cell division, genetics and energy metabolism
3) ecology & evolution
4) issues in multicellular systems

Biology 163 now has a limit of 50 students and thus scalability is a valid discussion. The current intention is to scale Biology 163 to 250 students.

Resistance to adding another component to the already packed curriculum appears when the question of what will be displaced arises. Three actions were discussed.

a) Continue as we are with each department choosing what is required for their students once department election has occurred. Some departments such as Chemical Engineering and Biomedical Engineering already have a biology requirement. Interest from other departments might be higher if there was an engineering orientation to a biology offering. Engineers do well in biology courses already offered and would be welcome.
b) Develop a unified science curriculum that merges elements of Math, Physics, Chemistry, and Biology. (UBC has a program like this for a limited number of students. Their program still uses their classical courses in math, physics, chemistry and biology with a computer science option. The program uses coordinating sessions to weave the concepts together)
c) Convert a free elective into a biology requirement.

All three alternatives have consequences but (b) captured the interest of the committee members since it is the only one that offers integration of knowledge by design. It is also the most complex in implementation. If one more science course is to be added with out increasing the total credit load, some form of merger is required. No complete merger of Math, Physics, Chemistry and Biology seemed conceivable but there was some discussion of a Chemistry and Biology combination that would take 2 terms.

Any of these choices that result in more biology being taught to engineers would have a large impact on the department delivering a course or courses to meet the needs of the College. It was uniformly agreed that the LSA Biology Program should be responsible for the implementation with consultation from COE.

David Anderson
Robert Denver
Henry Wang
Peter Adriaens
Edgar Meyhafer
Alan Hunt
Jennifer Linderman
Gary Herrin

Notes on the life sciences course

Effective term: Fall 2005
Duration: Indefinitely

Course Title: Physics for the Life Sciences I and II
Repeatability: No

Short Course Description:

> This two course sequence is an introduction to physics from the perspective of the life sciences. It introduces many of the physical processes which govern the workings of life, and teaches students how to analyze the physical circumstances of life in a quantitative way. In addition to traditional exactly solvable introductory problems, these courses will examine how quantitative analysis can be applied to the substantially more complex systems encountered in living organisms.

Course Career: Undergraduate Only

Full Term 4 min, 4 max

Credit type: regular
Grading Scheme: A-E
Campus Location: Ann Arbor

Class components: Lecture

Advisory Prerequisites: High school physics
Enforced Prerequisites: MATH 115, 175, 185, or 295 with a C or better
Credit Exclusions: Can’t get both this and 125, 126 or 140, 240, or 160, 260

Extended course description:

Term #1:

> This course introduces the main principles of physics which influence the workings of life. The course begins with biomechanics, the study of living structures. We will learn about forces and equilibrium, and how organisms support themselves and the loads they carry. We will learn how forces cause changes in momentum, and study in particular the way in which a restoring force produces oscillatory motion. Natural frequencies of oscillation and the phenomenon of resonance will also be described.

We will then introduce the concepts of work and energy. We will learn about the conservation of energy, and about the various forms in which it appears, including potential energy and thermal energy. The random thermal motion of atoms and molecules gives rise to diffusion, an important process in life on cellular scales.

Life exists embedded in fluids (air and water), and the next part of the course will consider the physical properties of fluids and fluid flow, with an emphasis on ways in which properties of fluids affect life. After introducing idealized fluids, we will study how the features of real fluids, viscosity, surface tension, and turbulence, affect organisms.

Term #2:

This course begins with a discussion of both sound and light waves. The properties of wave motion, including interference, reflection, and refraction will be worked out. We will work out some details of optics, with application to optical imaging in the eye, optical microscopy, and ultrasound imaging.

We will then learn the basics of electricity, introducing electrical forces, fields, and potentials. Electrical current, resistance, and RC circuits will also be developed. An emphasis will be placed on biomedical measurements, including electrocardiograms.

The remainder of the course will introduce features of modern physics which are important for living systems. Quantum mechanics and energy levels will be introduced, along with spectroscopy from a quantum viewpoint. X-ray production, absorption, and scattering, and its use for medical imaging and the determination of molecular structure will be described. Other forms of microscopy will be discussed as well, including electron, scanning tunneling, and atomic force microscopes.

Course requirements:

Grades will be based on a combination of homework, three midterm exams, a research paper, and a final exam.

Class format:

Class will meet four hours per week in lecture/discussion format with a single faculty member. A part time GSI will be used as a grader.

Intended Audience:

This course is intended as a rigorous, calculus based, introduction to physics for life sciences majors. It is most appropriate for those intending to major in all fields of biology, biological engineering, biophysics, or biochemistry. It is also an appropriate

course for those planning on training in medical school, especially if they are planning careers in medical research.

Instructor name: Tim McKay

Syllabus for Physics 135/235: Fall 2006 and Winter 2007

Physics 135

Week 1: The physical world and life
Week 2: Newton's laws and statics
Week 3: Describing motion: kinematics
Week 4: Newton's laws and dynamics
Week 5: Work and energy Exam 1
Week 6: Oscillatory motion
Week 7: Forms of energy and conservation laws
Week 8: Temperature and heat
Week 9: Kinetic theory and diffusion
Week 10: Transfer of heat Exam 2
Week 11: Fluid statics
Week 12: Fluid dynamics
Week 13: Real fluids: viscosity and surface tension
Week 14: Life in fluids Exam 3

Physics 235

Week 1: Waves with sound and light as examples
Week 2: Superposition and interference waves
Week 3: Reflection and the formation of images
Week 4: Waves in media: refraction and images
Week 5: Optical and acoustic imaging Exam 1
Week 6: Electric forces and fields
Week 7: Electric potential energy and potential
Week 8: Electric circuits
Week 9: Magnetic forces and fields
Week 10: Electromagnetic induction and generation Exam 2
Week 11: Wave particle duality
Week 12: Quantum mechanics and the periodic table
Week 13: Nuclear physics and radioactivity
Week 14: Radiation and life Exam 3

COURSE APPROVAL FORMS

For October 24, 2006 CoE CC Meeting

AERO 549 New Course

CEE 428(X-Listed with ENSCEN 428) Modification – Changing Description; Changing prerequisites from: Jr. Standing ***to: CEE 260 and CEE 325 or equivalent***

CEE 508 New Course

ENGR 599 New Course

IOE 548 Modification – Changing Description; Changing Prerequisites from: Graduate Standing. Co-req OM 548 and Permission of Instructor ***to: Graduate Standing. Co-reg with OMS 548, Permission of TMI***

IOE 802 Modification – Changing Title from: Research Presentation ***to: Written and Oral Academic Presentations***; Changing Prerequisites from: IOE 800; concurrent with IOE 801 ***to: IOE 800 and IOE 801***; Changing credit hours from: 1 ***to: 2***.

MSE 532 Modification – Changing Prerequisites from: MSE 430 or equivalent ***to: MSE 330 or equivalent***

MSE 535 Modification – Changing Prerequisites from: MSE 430 or equivalent ***to: MSE 330 or equivalent***

MSE 559(X-Listed with ChemE 559 and MacroE 559 New Course

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

Print

Form Number 1734

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

Date 4/19/2006
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

Course Description

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

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

Prerequisites ○ Enforced ○ Advised

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 ____

B. REQUESTED LISTING

Home Department: AEROSP | Div # | Course Number: 549

Cross Listed Course Information

Course Title: Orbital Analysis and Determination

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	Orbital Analysis
	Transcript Max = 20 Spaces	Orbital Analysis

Course Description for Official Publication (Max = 50 words)
The analysis, characterization and determination of space trajectories from a dynamical systems viewpoint. The general formulation and solution of the spacecraft trajectory design and navigation problem. Computation of periodic orbits and their stability. Estimation of model parameters from spacecraft tracking data (e.g., gravity field estimation). Elements of precision modeling and precision orbit determination.

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

Degree Requirements ○ Degree Requirement ○ Core Course ○ Free Elective (●) Tech Elective ○ Other

Prerequisites Either: AE 548. 540. or 573 -- Permission of Instructor
○ Enforced (●) Advised

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 3 Max 3
Contact Hrs/Wk 3
Number of Wks 16

C.

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

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

Graded Section (●) Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ☐ I ☒ II ☐ IIIa ☐ IIIb ☐ III
☐ Yearly ☐ Alter Years ☐ Even Years ☒ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Daniel J.Scheeres **Title** Associate Professor

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

Approval
☐ Curriculum Comm.
☐ Faculty
☐ Rackham
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. [signature] 10/2/06
Cross-listed Dept(s).

Form Number

1734

SUPPORTING STATEMENT

SEE ATTACHMENT

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

Detail the Special requirements

Department of Aerospace Engineering Course Announcement
AERO 549 Orbital Analysis and Determination
Winter Terms
Prof. Dan Scheeres, Instructor, scheeres@umich.edu

The analysis, characterization, and determination of space trajectories from a dynamical systems viewpoint. The general formulation and solution of the spacecraft trajectory design and navigation problem. Computation of periodic orbits and their stability. Estimation of model parameters from spacecraft tracking data (e.g., gravity field estimation). Elements of precision modeling and precision orbit determination.

Preq: Either AE 540, 548, 573, or a graduate course in dynamical systems.

Specific Topics to be covered include:

Lagrangian and Hamiltonian dynamical systems
- Variational derivation of Lagrange's and Hamilton's equations
- Properties of Hamiltonian systems and their relation to Lagrangian systems
- Statement of the main problems in astrodynamics

Solution characterization and computation
- Existence and uniqueness of solutions
- Surfaces of Section and Poincare´ Maps
- Periodic and Quasi-periodic Orbits
- Local and global solution flows
- Analytic continuation

Local and global properties of solutions
- Integral invariants
- Stability definitions and bifurcations
- Motion on manifolds
- Liapunov Characteristic Exponents
- Chaotic motion
- Parameter dependence

Orbit determination
- Orbit covariance, information, and sensitivity
- Trajectory observables and modeling
- Epoch and current state trajectory estimation
- Parameter estimation
- Orbit prediction

Homework and Grading:

Select HW problems will be assigned throughout the term, with an emphasis on the detailed derivation of topics covered in class (25%).

A unique HW problem will be assigned to each student, requiring them to choose and develop a simulation for a particular problem of interest applying a computational method of interest (15%).

A single term project will be assigned to each student, to be completed by the end of the semester. The project will nominally be based on their chosen simulation HW problem. The project must provide detailed computations and simulations relevant to one of the course topics, and use course methods to investigate specific aspects of the problem (45%).

Twice during the course, once during the term and then at the regularly scheduled final time, each student must make a presentation of their initial and final project to other members of the course (15%).

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

Print

Form Number **1657**

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

Date 12/2/2005
Effective Fall 2006

A. CURRENT LISTING

Home Department	Div #	Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

[X] Course Description
Importance and occurrence of groundwater; chemical and physical properties of the groundwater environment; basic principles of groundwater flow; measurement of parameters; pump test design and analysis; transport of contaminants; use of computer models for the simulation of flow and transport problems.

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

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

[X] Prerequisites Junior Standing
○ Enforced ○ Advised

Credit Restrictions

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

Credit Hours Min	Max	Contact Hrs/Wk	Number of Wks

B. REQUESTED LISTING

Home Department	Div #	Course Number
Civil and Environmental Engineering	248	428

Cross Listed Course Information

ENSCEN	260	428

Course Title
Introduction to Groundwater Hydrology

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	Intr. Gd. Wtr.
	Transcript Max = 20 Spaces	Intr. Gd. Wtr.

Course Description for Official Publication (Max = 50 words)
Basic principles which govern the flow of water in the subsurface. Development and solution of groundwater flow and contaminant transport equations, in presence and absence of pumping wells, for both confined and phreatic aquifers. Measurement and estimation of parameters governing flow and transport, including methods such as pump tests and moment analysis. Remediation of contaminated groundwater.

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

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

Prerequisites CEE 260 and CEE 325 or equivalent
○ Enforced ⊙ Advised

Credit Restrictions

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

Credit Hours Min	Max	Contact Hrs/Wk	Number of Wks
3	3	5	14

C.

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

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

Graded Section ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ☒ I ☐ II ☐ IIIa ☐ IIIb ☐ III
☒ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years

Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Avery Demond **Title** Associate Professor

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

Approval
☐ Curriculum Comm. ____
☐ Faculty ____
☐ Rackham ____
☐ Cross listed Unit 1 ____
☐ Cross listed Unit 2 ____

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. Nikolaos Katopodes, CEE
Cross-listed Dept(s). ____

Form Number

1657

SUPPORTING STATEMENT

The course has a new cognizant faculty. The changes are requested so that the description and prerequisites reflect the way the course is taught.

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

Print

Form Number 1434

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

Date 9/9/2004
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

Course Description

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

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

Prerequisites ○ Enforced ○ Advised

Credit Restrictions

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

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

B. REQUESTED LISTING

Home Department: Civil and Environmental Engineering | Div #: 248 | Course Number: 508

Cross Listed Course Information: N/A

Course Title: Design of Masonry Structures

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	Des Masonry Struct
	Transcript Max = 20 Spaces	Des Masonry Struct

Course Description for Official Publication (Max = 50 words)
Use and design of masonry in structural applications. Topics include ancient masonry, masonry materials and how their properties affect performance, reinforced beams and lintels, masonry walls (reinforced and unreinforced), masonry columns and pilasters, and shear walls. Students will be exposed to both working stress and strength analysis/design provisions.

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

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

Prerequisites CEE 412 ⊙ Enforced ○ Advised

Credit Restrictions None

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

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
Maximum Hours? ___ Maximum Times? ___
Can it be repeated in the same term? ○ Yes ○ No

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

Graded Section ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ☐ I ☒ II ☐ IIIa ☐ IIIb ☐ III ☐ Yearly ☒ Alter Years ☐ Even Years ☐ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: James K. Wight **Title** Professor

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

Approval
☐ Curriculum Comm. ___
☐ Faculty ___
☐ Rackham ___
☐ Cross listed Unit 1 ___
☐ Cross listed Unit 2 ___

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. Nikolaos Katopodes, CEE
Cross-listed Dept(s). ___

Form Number

1434

SUPPORTING STATEMENT

In most structural engineering programs design courses are focused on either reinforced concrete or steel structures. Two other major materials used in structural design are timber and masonry. A course in timber engineering is available from the School of Architecture, but a masonry design course is not currently available at the University of Michigan. Most structural engineers will need to design or analyze masonry structural elements at some point during their career. Many non-residential buildings have masonry exteriors (so-called "brick and block" exteriors). In addition there are many buildings that have primary structural systems composed of masonry elements, such as load-bearing masonry walls, or structural walls for resisting lateral loads due to wind or earthquakes. Thus, it is important for the CEE Department to have a masonry design course in the curriculum. This course will focus on introducing the material properties and strength of reinforced and unreinforced masonry elements, and how to design those elements for structural applications.

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

Detail the Special requirements

Support Statement:

In most structural engineering programs design courses are focused on either reinforced concrete or steel structures. Two other major materials used in structural design are timber and masonry. A course in timber engineering is available from the School of Architecture, but a masonry design course is not currently available at the University of Michigan. Most structural engineers will need to design or analyze masonry structural elements at some point during their career. Many non-residential buildings have masonry exteriors (so-called "brick and block" exteriors). In addition there are many buildings that have primary structural systems composed of masonry elements, such as load-bearing masonry walls, or structural walls for resisting lateral loads due to wind or earthquakes. Thus, it is important for the CEE Department to have a masonry design course in the curriculum. This course will focus on introducing the material properties and strength of reinforced and unreinforced masonry elements, and how to design those elements for structural applications.

Design of Masonry Structures

UNIVERSITY OF MICHIGAN

Department of Civil and Environmental Engineering

Prerequisite: CEE 412 – Theory of Structures or equivalent

Suggested Pre- Or Co-requisite CEE 415 – Design of Reinforced Concrete Structures or equivalent

Textbook: Drysdale, Robert G., Hamid, Ahmad A. and Baker, Lawrie R., *Masonry Structures: Behavior and Design*, Second Edition, Boulder, Colorado, The Masonry Society, 1999.

ACI 530-02/ASCE 5-02/TMS 402-02 (*Building Code Requirements for Masonry Structures*) and ACI 530.1-02/ASCE 6-02/TMS 602-02 (*Specifications for Masonry Structures*) (MSJC 2002). (Will be supplied by the Masonry Institute of Michigan to the students)

Reference Books: *Masonry Designer's Guide*, Forth Edition, The Masonry Society, 2004?.

Amrhein, James E., *Reinforced Masonry Engineering Handbook*, Fifth Edition, CRC Press, 1998.

International Building Code, 2000 Edition (IBC 2000). (Will be available through the instructor)

Design of Masonry Structures

Department of Civil and Environmental Engineering

***Tentative* Course Outline:**

Week	Chapter	Topic
01		Introduction
	01	Ancient Masonry
	02	Contemporary Masonry
	04	Masonry Materials
02	04	Masonry Materials (cont.)
	05	Masonry Assemblages
	12,15	Movement Joints/Construction
03	12,15	Movement Joints/Construction (cont.)
	06	Reinforced Beams and Lintels
04	06	Reinforced Beams and Lintels (cont.)
05	06	Reinforced Beams and Lintels (cont.)
	07	Flexural Walls
06	07	Flexural Walls (cont.)
07	07	Flexural Walls (cont.)
	08	Loadbearing Walls Under Axial Loadings and Out-of-Plane Bending
08	--	Midterm Exam
	08	Loadbearing Walls Under Axial Loadings and Out-of-Plane Bending (cont.)
09	08	Loadbearing Walls Under Axial Loadings and Out-of-Plane Bending (cont.)
10	09	Columns and Pilasters
	10	Shear Walls
11	10	Shear Walls (cont.)
12	10	Shear Walls (cont.)
	16	Design of Loadbearing Single-Story Masonry Buildings
13	16	Design of Loadbearing Single-Story Masonry Buildings
14	--	Final Exam

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

Form Number **1774**

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

Date 10/17/2006
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

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

Course Description

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

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

Prerequisites: ○ Enforced ○ Advised

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 ___

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

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

Graded Section: ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

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

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

B. REQUESTED LISTING

Home Department: ENG | Div #: 258 | Course Number: 599

Cross Listed Course Information

Course Title: Special Topics in Engineering

TITLE ABBREVIATION		
	Time Sched Max = 19 Spaces	SPCTOPICSENGR
	Transcript Max = 20 Spaces	SPECITOPICSENGR

Course Description for Official Publication (Max = 50 words)
Special topics in interdisciplinary engineering

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

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

Prerequisites: Graduate standing or permission of instructor ○ Enforced ◐ Advised

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 1 Max 4

Contact Hrs/Wk 4 Number of Wks 17

Printing Information (Optional): ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering: ☒ I ☒ II ☒ IIa ☒ IIb ☒ III ☒ Yearly ☐ After Years ☐ Even Years ☐ Odd Years
Half term: ☐ 1st ☐ 2nd

Cognizant Faculty Member: S. Jack Hu Title: Professor

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

Approval
- ☐ Curriculum Comm. ___
- ☐ Faculty ___
- ☐ Rackham ___
- ☐ Cross listed Unit 1 ___
- ☐ Cross listed Unit 2 ___

Submitted By: ☐ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department:
Home Dept.
Cross-listed Dept(s).

Form Number

1774

SUPPORTING STATEMENT

The request to establish a special topics course in Engineering (ENGR 599) is to allow us to develop collaborative and interdisciplinary courses across disciplines (e.g. engineering/business) that will be accessible to all students in the College. Attached please find the course syllabus that will be offered this coming winter term if the request is approved. The different departments/cognizant faculty will approve students enrollment in the course.

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

Detail the Special requirements

NEW COURSE OFFERING FOR GRADUATE STUDENTS IN COE

Winter 2007 Semester

ENG 599 - ENTREPRENEURIAL BUSINESS FUNDAMENTALS FOR ENGINEERS & SCIENTISTS

You know the science, but do you know how the managers weighing the corporate future of your science make decisions? Understanding the business framework beyond "cost" is key to both creating value for the organization—from small entrepreneurial to large corporate organizations—and having that organization understand the value of your efforts. Transcending from a "cost" to a "value" proposition requires understanding and quantifying how the elements of your efforts impact revenue, top line effects. Accomplishing this requires a broader understanding of

- Innovation
- Strategy
- Finance
- Marketing

and how your research efforts link to them.

Entrepreneurial Business Fundamentals for Engineers & Scientists is a 3-credit, semester-long, graduate-level elective. The class format is highly interactive and will vary from session to session. You should expect to encounter:

- Content-specific presentations by a variety of instructors, including those from the Ross School of Business.
- Full-class application discussions based on case-studies: both written cases and guest-speaker provided presentations/experiences.

The perspective provided in this course will be valuable for students that are both looking to form or join startup companies as well as for those that are looking to create corporate value via industrial research.

ELIGIBILITY

This semester course is open to graduate students from College of Engineering. This course will be a pre-requisite for engineering students for many other entrepreneurial studies courses offered at the Ross School of Business.

PRIMARY INSTRUCTORS

Tim Faley, Ph.D., MBA

Dr. Faley, adjunct professor of Strategy at the Ross School of Business, is the managing director of Michigan's Zell Lurie Institute for Entrepreneurial Studies. Throughout his career he has leveraged his engineering and business degrees across the innovation continuum: from creating new technology to providing venture funding for early-stage technology-based businesses.

Peter Adriaens, Ph.D., P.E.

Dr. Adriaens is a professor in Civil and Environmental Engineering - Program of Environmental and Water Resources Engineering. His research on 'flask-to-field' multidisciplinary technology development projects and consulting experience emphasizes industrial sustainability issues, including site remediation pollution prevention, and corporate value creation along the water-energy nexus.

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

Print

Form Number 1765

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

Date 9/13/2006
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

X Course Description
Cross-disciplinary teams compete to design, manufacture, plan mass production and market a defined project. Major objectives are integration of engineering and business aspects of these issues.

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

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

X Prerequisites Graduate Standing, Co-req OM 548 and Permission of Instructor
○ Enforced ◉ Advised

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 ___

B. REQUESTED LISTING

Home Department: IOE 548 | Div #: 272 | Course Number: 548

Cross Listed Course Information

Course Title: Integrated Product Development

TITLE ABBRE-VIATION	Time Sched Max = 19 Spaces	Integ Product Devel
	Transcript Max = 20 Spaces	Integ Product Devel

Course Description for Official Publication (Max = 50 words)
This is a TMI-sponsored graduate elective. The course is structured so that students form into teams of four, each with mixed disciplinary backgrounds. A product category is announced, and each team acts as an independent firm competing in that product market. Each team must independently work through an integrated exercise of market research, product design, product development and manufacture, pricing, forecasting, inventory policy and competition with their product against other firms.

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

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

Prerequisites Graduate Standing; Co-reg with OMS 548; Permission of TMI
○ Enforced ◉ Advised

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 3 Max 3
Contact Hrs/Wk 3
Number of Wks 14

C.

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

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

Graded Section ○ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ■ I ☐ II ☐ IIIa ☐ IIIb ☐ III
☐ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Yavuz Bozer **Title** Professor

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

Approval
☐ Curriculum Comm. ___
☐ Faculty ___
☐ Rackham ___
☐ Cross listed Unit 1 ___
☐ Cross listed Unit 2 ___

Submitted By: ■ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. Lawrence Seiford
Cross-listed Dept(s). ___

Form Number

1765

SUPPORTING STATEMENT

Students electing IOE 548 also elect OMS 548. This change is to make both the OMS 548 and IOE 548 course descriptions the same.

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

Print

Form Number 1764

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

Date 9/13/2006
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

[X] Course Title: Research Presentation

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

[X] Course Description
Students present oral and written technical material, including research in IOE801.

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

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

[X] Prerequisites IOE 800; concurrent with IOE 801
○ Enforced ◉ Advised

[ ] 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 Worl

Credit Hours Min 1 Max 1
Contact Hrs/Wk 1
Number of Wks 14

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

[ ] **Class Type(s)** ☐ Lec ☐ Rec ☒ Sem ☐ Lab ☐ Dis ☐ Ind ☐ Other ____

Graded Section ○ Lec ○ Rec ⊙ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☐ A-E ☐ CR/NC ☒ S/U ☐ P/F ☐ Y

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

B. REQUESTED LISTING

Home Department: IOE | Div #: 272 | Course Number: 802

Cross Listed Course Information

Course Title: Written and Oral Academic Presentations

TITLE ABBREVIATION		
	Time Sched Max = 19 Spaces	Written & Oral Present
	Transcript Max = 20 Spaces	Written & Oral Present

Course Description for Official Publication (Max = 50 words)
The Dissertation Proposal is used as a platform for developing written and oral presentation skills as students prepare for the IOE Preliminary exam. Topics and assignments include: key elements of NIH and NSF proposals, writing the dissertation proposal and preparing/delivering oral presentations.

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

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

Prerequisites IOE 800 and IOE801
○ Enforced ◉ Advised

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 2 Max 2
Contact Hrs/Wk 2
Number of Wks 14

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ☐ I ☒ II ☐ IIIa ☐ IIIb ☐ III
☒ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: W. Monroe Keyserling Title Professor

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

Approval
☐ Curriculum Comm. ____
☐ Faculty ____
☐ Rackham ____
☐ Cross listed Unit 1 ____
☐ Cross listed Unit 2 ____

Submitted By: ☒ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. Larry Seiford
Cross-listed Dept(s). ____

Form Number

1764

SUPPORTING STATEMENT

This course is intended for second-year Ph.D. students as they prepare for their Preliminary Examination. The primary goals are: 1) to provide a structured experience for writing the dissertation proposal, and 2) to develop presentation skills for professional meetings and oral examinations. It is expected that students will concurrently register for IOE 990 (Dissertation Research: Pre-Candidate) and work closely with their advisor(s) while writing the dissertation proposal.

Course content includes lectures and discussions on writing unsolicited research proposals using NIH and NSF format and content guidelines. The final course "deliverable" is a 15-page dissertation proposal (the selection of NIH or NSF format is determined by the student and advisor) that will be included in materials submitted for the IOE Preliminary Exam. In addition, each student will present a series of oral presentations, culminating in a 20-minute oral summary of the dissertation proposal.

Additional course activities include attending oral presentations of papers previously presented by 4th and 5th year IOE Ph.D. students at national/international conferences, and attending "job talks" by IOE faculty candidates.

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

Detail the Special requirements

IOE 802 – Ph.D. Research Presentation
COURSE SYLLABUS (Vers. 1.0) -- Winter 2007

Instructors -- W. Monroe Keyserling, Ph.D. and Lawrence G. Seiford, Ph.D.

Date	Topic(s)	Reading(s)
Jan. 8	Introduction to Course Expectations and Deliverables Key Elements of a Dissertation Proposal Abstract Oral Presentation of Technical Information I	Abstract Template Effective Oral Presentations
Jan. 15	NO CLASS: Martin Luther King Holiday	
Jan. 22	2-minute Oral Presentation of Abstract (students) Group Discussion of Abstracts **DUE in Advance: Written Abstract** **DUE in Advance: Visual Aids**	See submissions on C-tools
Jan. 29	Continued Discussion of Abstracts (students) Oral Presentation of Technical Information II	See submissions on C-tools
Feb. 5	Key Elements of a Dissertation Pre-proposal: -- Specific Aims -- Significance -- Qualifications of Investigator	
Feb. 12	Key Elements of an NIH Research Proposal	
Feb. 19	Key Elements of an NSF Research Proposal **DUE in Advance: Dissertation Pre-proposal**	
Mar. 26	NO CLASS: Spring Break	
Mar. 5	Preliminary Oral Presentations (5 minutes videotaped) **DUE IN ADVANCE: Copy of Visual Aids**	See submissions on C-tools
Mar. 12	Preliminary Oral Presentations (5 minutes videotaped) **DUE IN ADVANCE: Copy of Visual Aids**	See submissions on C-tools
Mar. 19	Examples of Professional/Research Oral Presentations: --4th and 5th year Ph.D. students present previously-delivered oral presentations from national/international conferences	
Mar. 26	Examples of Academic "Job Talks" --Students must attend and critique a minimum of 3 presentations by candidates for faculty positions in IOE and other departments. Note: March 26 is an open date in the class schedule that should be used to prepare for the final oral presentation.	

Apr. 2	Final Oral Presentation (20 minutes with advisor in audience) **DUE IN ADVANCE: Copy of Visual Aids**	See submissions on C-tools
Apr. 9	Final Oral Presentation (20 minutes with advisor in audience) **DUE IN ADVANCE: Copy of Visual Aids**	See submissions on C-tools
Apr. 16	Final Oral Presentation (20 minutes with advisor in audience) **DUE IN ADVANCE: Copy of Visual Aids**	See submissions on C-tools
Apr. 20 (Friday)	**DUE: Final Draft of 15-page Dissertation Proposal**	

GENERAL INFORMATION

WEB PAGE:	http://ioe.engin.umich.edu/ioe802
CLASS MEETS:	Monday: 3:00 -- 5:00 PM (Room 1680 IOE)
GRADING:	S/U
INSTRUCTORS:	W. Monroe Keyserling, Ph.D. IOE Building, Rm. G620
	Lawrence G. Seiford, Ph.D. IOE Building, Rm. 1877
Office Hours:	Monday: 1:00 – 3:00 PM
Phone:	763-0563 (Keyserling) 764-7894 (Seiford)
E-MAIL:	wmkeyser@umich.edu seiford@umich.edu
TEXT:	None. A number of useful oral presentation guides can be found on the web. Go to the Links page

REQUIREMENTS:	**DUE DATE:**
Dissertation Abstract	January 22
Two-minute Oral Presentation of Abstract	January 22
2-page Dissertation Pre-proposal	February 19
Five-minute Preliminary Oral Presentation (videotaped)	March 5 and 12
20-minute Final Oral Presentation	April 2, 9, 16
15-page Dissertation Proposal	April 20
Critiques of IOE Faculty Candidates (3 required)	TBD

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

Print

Form Number 1761

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

Date 8/28/2006
Effective Fall 2006

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

Course Description

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

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

X Prerequisites MSE 430 or equivalent
○ Enforced ⊙ Advised

Credit Restrictions

Level of Credit
☐ Undergrad only ☐ All Credit types
☐ Rackham Grad ☐ Rckhm Grad w/add'l Worl
☐ Non-Rckhm Grad
☐ Ugrad or Rckhm Grad
☐ Ugrad or Non-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
Maximum Hours? ___ Maximum Times? ___
Can it be repeated in the same term? ○ Yes ○ No

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

Graded Section ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

B. REQUESTED LISTING

Home Department: Materials Science & Engineering - MATSCIE | Div #: 281 | Course Number: 532

Cross Listed Course Information

Course Title: Advanced Thermodynamics of Materials

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	Adv Thrm-Mat
	Transcript Max = 20 Spaces	Adv Thrm-Mat

Course Description for Official Publication (Max = 50 words)
Classical and statistical thermochemisry with emphasis on topics important in Materials Science & Engineering; including thermodynamics of solids, solution thermochemistry, heterogeneous equilibria of stable and metastable phases, multi-component systems, coherent equilibria and strain effects, interfaces and adsorption, polymer alloys and solutions.

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

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

Prerequisites MSE 330 or equivalent
○ Enforced ⊙ Advised

Credit Restrictions

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

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ■ I ☐ II ☐ IIIa ☐ IIIb ☐ III ■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Anton Van der Ven **Title** Asst. Professor

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

Approval
☐ Curriculum Comm. ___
☐ Faculty ___
☐ Rackham ___
☐ Cross listed Unit 1 ___
☐ Cross listed Unit 2 ___

Submitted By: ■ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. MS&E-Peter F. Green
Cross-listed Dept(s). ___

Form Number

1761

SUPPORTING STATEMENT

This change is to correct the prerequisite course number. MSE 440 was re-numbered to MSE 330 several years ago, and this change was missed being made at that time.

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

Print

Form Number 1762

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

Date 8/28/2006
Effective Fall 2006

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	
	Transcript Max = 20 Spaces	

Course Description

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

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

Prerequisites MSE 430 or equivalent
○ Enforced ○ Advised

Credit Restrictions

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

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

B. REQUESTED LISTING

Home Department: Materials Science & Engineering - MATSCIE | Div #: 281 | Course Number: 535

Cross Listed Course Information

Course Title: Kinetics,, Phase Transformations and Transport

TITLE ABBRE-VIATION		
	Time Sched Max = 19 Spaces	Kin, PhTrnsfm&Trnsp
	Transcript Max = 20 Spaces	Kin, Ph Trnsfm&Trnsp

Course Description for Official Publication (Max = 50 words)
Fundamentals of phase change, diffusion, heat transport, nucleation, and growth applied to solidification; ordering, spinodal decomposition, coarsening, reactions, massive transformations, diffusion-limited transformations and glass transitions.

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

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

Prerequisites MSE 330 or equivalent
○ Enforced ⊙ Advised

Credit Restrictions

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

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
Maximum Hours? ___ Maximum Times? ___
Can it be repeated in the same term? ○ Yes ○ No

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

Graded Section ⊙ Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

Terms & Freq. of Offering ☐ I ■ II ☐ IIIa ☐ IIIb ☐ III
■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years
Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: John Kieffer **Title** Professor

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

Approval
☐ Curriculum Comm.
☐ Faculty
☐ Rackham
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ■ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. MS&E - Peter F. Green
Cross-listed Dept(s).

Form Number

1762

SUPPORTING STATEMENT

This change is to correct the prerequisite course number. MSE 440 was re-numbered to MSE 330 several years ago, and this change was missed at that time.

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

Print

Form Number 1760

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

Date 8/23/2006
Effective Winter 2007

A. CURRENT LISTING

Home Department | Div # | Course Number

Cross Listed Course Information

Course Title

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

Course Description

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

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

Prerequisites ○ Enforced ○ Advised

Credit Restrictions

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

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

B. REQUESTED LISTING

Home Department	Div #	Course Number
Materials Science & Engineering (MATSCIE)	281	559

Cross Listed Course Information

ChemE	245	559
MacroE	425	559

Course Title
Foundations of Nanotechnology II

TITLE ABBREVIATION		
	Time Sched Max = 19 Spaces	FOUNDATIONS NANO II
	Transcript Max = 20 Spaces	FOUNDATIONS NANO II

Course Description for Official Publication (Max = 50 words)
This course will cover the synthesis and processing of nano sized metal, metal oxide, and semiconductor powders. It will also include organic/inorganic and nanobiomaterials. Emphasis will be on particle properties and their use in making nanostructured materials with novel properties.

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

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

Prerequisites senior or graduate standing. ○ Enforced ● Advised

Credit Restrictions

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

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
Maximum Hours? ___ Maximum Times? ___
Can it be repeated in the same term? ○ Yes ○ No

Printing Information (Optional) ☒ Print the course in the Bulletin ☒ Print the course in the Time Schedule

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

Graded Section ● Lec ○ Rec ○ Sem ○ Lab ○ Dis ○ Ind ○ Other

Grading ☒ A-E ☐ CR/NC ☐ S/U ☐ P/F ☐ Y

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

Terms & Freq. of Offering ☐ I ■ II ☐ IIIa ☐ IIIb ☐ III ■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years

Half term ☐ 1st ☐ 2nd

Cognizant Faculty Member: Richard M. Laine **Title** Professor

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

Approval
☐ Curriculum Comm.
☐ Faculty
☐ Rackham
☐ Cross listed Unit 1
☐ Cross listed Unit 2

Submitted By: ■ Home Dept. ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. MATSCIE: Peter F. Green
Cross-listed Dept(s). ChemE: Ron Larson
MacroE: Rick Laine

Form Number

1760

SUPPORTING STATEMENT

This course is the second half of ChemE 558, and differs in that it deals with the synthesis, processing, and properties of nanopowders rather than basic physics of their interactions with light, electricity, and response to mechanical stimuli covered in the first half of this year-long course.

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

Detail the Special requirements

Course Title	CAT#	CR	PREREQ	CROSSLIST	LAB FEE

Class#	CODE	CMP	SEC	DAYS	CLASS TIME	LOCATION	INSTRUCTOR

Crit Path Meth 536 3.00 SR/G.STD. X

10998	P R	LEC	001	TTH	1130-1PM	2305 GGBL	Ioannou, Srisuwanrat

Occ Safety Eng 539 3.00 SEE BULLETIN X

10999	P	LEC	001	TTH	130-3PM	1680 IOE	Keyserling

Inv Anly&Cntrl 541 3.00 SEE BULLETIN X

27166	P R	LEC	001	TTH	3-430PM	1680 IOE	Aydin

Mat Eng Dsgn 551 3.00 CEE 351/P.I. X

28029	P	LEC	001	TTH	430-6PM	1363 GGBL	Li

Electromech Des 552 3.00 E E C S 210 X

28645	P W	LEC	001	W	1030-130PM	2166 DOW	Gillespie

Disc Des Opt 558 3.00 SR/G.STD. X

31320	P W	LEC	001	WF	130-3PM	2166 DOW	Saitou

Time Ser Anlys 561 3.00 IOE366/ME401 X

11000	P	LEC	001	TTH	9-1030	2150 DOW	Ni

Marine Sys Productn 563 4.00 X

11001	P R	LEC	001	MW	11-1230PM	107 EPB	Spicknall
	P R	LEC	001	F	11-12PM	107 EPB	

Adv Quality Control 569 3.00 I&OE 466 X

31569	P	LEC	001	TTH	1030-12PM	1680 IOE	Shi

Ship Des Proj 571 1.00-16.00 PER.INSTR. X

	I	IND	+		ARR	ARR	

GPD 574 3.00 G.STD. X

29823	P	LEC	001	TTH	8-930	DC	Patil, Dutta
30384	P	LEC	881	TTH	8-930	ARR	Dutta, Malen

Marine CAD Project 575 2.00-6.00 X

		IND	+		ARR	ARR	

Opt,Mgt Marine Syst 578 4.00 N A 500 X

28117	P	LEC	001	MW	2-4PM	107 EPB	Perakis

Rheology & Fracture 580 3.00 ME 382 X

11004	P W	LEC	001	MW	330-5PM	1014 DOW	Pan

Met-Form Plast 582 3.00 M E 211 X

31775	P W	LEC	001	MW	5-630PM	165 CHRYS	
32053	P	LEC	881	MW	5-630PM	ARR	

Directed Stdy&Res 590 1.00-3.00 PER.INSTR.

	D	IND	+		ARR	ARR	

Laser Mat Process 591 3.00 SR/G.STD. X

25017	P W	LEC	001	TTH	830-10	185 EWRE	Kannatey-Asibu Jr

formerly set as ME599-03

Spec Topics in Mfg 599 1.00-3.00 SEE BULLETIN

28170	P	LEC	003	TH	6-9PM	ARR	Pasek, Hu

Industrial Org Design for Resp

36876	P	LEC	004	MW	11-1155	ARR	Gianchandani

Micromanufacturing Processes

Mfg&Supply Ops 605 3.00 OMS 551&552 X

31322	P W	REC	001	M	630-930PM	D1279 BUS	Kapuscinski
31323	P W	REC	451	M	630-930PM	ARR	Kapuscinski

Section 451 meets with section 001 in room D1279.

Dissertat Pre-Cand 990 2.00-8.00 SEE BULLETIN

	I	IND	+		ARR	ARR	

Dissertation-Cand 995 8.00 SEE BULLETIN

	R	IND	+		ARR	ARR	

Materials Science Engineering (MATSCIE)

Intro Mat & Man 220 4.00

STUDENTS ARE AUTO-ENROLLED IN LECTURE WHEN THEY ELECT A DISCUSSION.

11064	A R	LEC	100	MWF	1130-1230PM	1504 GGBL	Filisko
11065	P R	DIS	101	TH	1030-1130	1014 DOW	Knapp
11066	P R	DIS	102	TH	1130-1230PM	1014 DOW	Kim
11067	P R	DIS	103	TH	130-230PM	1010 DOW	Yang
11068	P R	DIS	104	TH	1030-1130	1303 EECS	Jongpaiboonkit
11069	P R	DIS	105	TH	1130-1230PM	1010 DOW	Kryscio
11070	P R	DIS	106	TH	130-230PM	1018 DOW	Cao

Prin Engr Matl 250 4.00

STUDENTS ARE AUTO-ENROLLED IN LECTURE WHEN THEY ELECT A DISCUSSION.

Course Title	CAT#	CR	PREREQ	CROSSLIST	LAB FEE

Class#	CODE	CMP	SEC	DAYS	CLASS TIME	LOCATION	INSTRUCTOR
11071	A R	LEC	100	MWF	930-1030	1504 GGBL	Mirecki-Millunchick
11072	P R	DIS	101	TH	1030-1130	1005 DOW	Wynarsky
11073	P R	DIS	102	TH	1130-1230PM	1006 DOW	Wynarsky
11074	P R	DIS	103	TH	130-230PM	1005 DOW	Gupta

MSE Ugrad Res Opp 280 1.00-3.00 SEE BULLETIN

	I	IND	+		ARR	ARR	

Thermo of Matrls 330 4.00

11081	P R	LEC	001	MWF	1130-1230PM	3150 DOW	Kieffer
	P R	LEC	001	TH	1130-1230PM	2166 DOW	

Prin Eng Matls 350 4.00

11075	P R	LEC	001	TTH	830-930	3150 DOW	Halloran
	P R	LEC	001	F	930-1130	3150 DOW	

Materials Lab I 360 3.00

11076	S R	LEC	001	M	230-330PM	2150 DOW	Yalisove
11077	P R	LAB	002	T	130-530PM	ARR	Yalisove, Azurdia
11078	P R	LAB	003	TH	1230-430PM	ARR	Yalisove, Wickramanayake
19013	P R	LAB	004	W	130-530PM	ARR	Yalisove, Lee

EMO Mod Dev Tech 400 3.00

11079	P R	LEC	001	MW	10-1130	3150 DOW	Pan

Biomaterials 410 4.00 X

22034	PDR	LEC	001	MW	8-10	1010 DOW	Kim

Polymeric Materials 412 3.00 X

11080	P R	LEC	001	TTH	930-11	3150 DOW	Martin

Mech Behavior Matrls 420 3.00

22359	P R	LEC	001	MWF	130-230PM	1005 DOW	Ghosh

Design Problems 485 1.00-4.00 X

	DR	IND	+		ARR	ARR	

Matls Proc Design 489 3.00 X

26290	P R	LEC	001	MWF	230-330PM	1006 DOW	Shtein

Research Problems 490 1.00-16.00

	DR	IND	+		ARR	ARR	

Special Topics 493 1.00-16.00

	DR	IND	+		ARR	ARR	

Materials Chem 510 3.00 X

23904	P	LEC	100	TTH	9-1030	1628 CHEM	Banaszak Holl

Comp Matrls 514 3.00 M S E 350 X

31510	P	LEC	001	MW	430-6PM	2150 DOW	Robertson

Films-Layered Matls 516 3.00 311/G.STD. X

31681	P W	LEC	001	TTH	3-430PM	1018 DOW	Thouless

Met-Form Plast 523 3.00 M E 211 X

31776	P W	LEC	001	MW	5-630PM	165 CHRYS	
32054	P	LEC	881	MW	5-630PM	ARR	

Adv Therm Matrls 532 3.00 MSE 430/EQ.

24717	P	LEC	001	MWF	930-1030	2150 DOW	Van der Ven

Mse Design Problems 585 2.00 480/CH E 486

	D	IND	+		ARR	ARR	

Research Problems 690 1.00-16.00

	D	IND	+		ARR	ARR	

Special Topics 693 3.00

30650	P	LEC	001	TTH	430-6PM	2166 DOW	Laine

Nano Materials

*

Diss-Precand 990 1.00-8.00 ADV.DOC.STU.

	D	IND	+		ARR	ARR	

Diss-Cand 995 8.00 DOC. CAND.

	DR	IND	+		ARR	ARR	

Mechanical Engineering (MECHENG)

Intro to Solid Mech 211 4.00 PHYS140&M116

24835	A	LEC	010	MWF	1030-1130	1001 EECS	Barber

must enroll in one section of 014-019

24836	P W	DIS	014	W	1130-1230PM	1005 DOW	Tayeh
24837	P W	DIS	016	W	1230-130PM	1010 DOW	Tayeh

MSE 559 — Foundations of Nanotechnology II

Course topics

1. Intellectual and commercial impetus for producing nanopowders and nanostructured materials.
2. Synthesis of nanopowders of metals, metal oxides, semiconductors.
3. Chemical, physical, electronic and photonic properties of nanopowders
4. Processing of nanopowders to nanostructured materials.
5. Properties optimization as a function of starting nanopowders and methods of processing.
6. Rationales for processing nanocomposites
7. Processing ceramic/ceramic nanocomposites
8. Processing of organic/inorganic nanocomposites and properties optimization
9. Myths and realities in nanomaterials.
10. Theoretical modeling of nanomaterials and structures

Course objectives

1. Teach fundamental science driving the development of nanomaterials
2. Teach fundamentals of nanopowder synthesis and processing
3. Teach fundamentals of nanopowder properties as a function of processing.
4. General methods of handling nanomaterials, toxicology, myths and realities.
5. General comparison of properties of nanostructured vs microstructured materials.
6. Introduction of organic/inorganic nanocomposite materials
7. Introduction concepts of properties arising from interfacial interactions in nanocomposites

Course Outcomes

1. General concepts of the kinetics and mechanisms that drive formation of nanopowders in gas, liquid and solid phases.
2. Basic knowledge of the thermodynamics that drive formation of nanopowders in gas, liquid and solid phases.
3. General knowledge of the methods of producing free flowing metal, metal oxide and semiconductor nanopowders.
4. General understanding of how particle size and surface chemistry affect photonic, electronic and electrical properties of nanopowders.
5. An understanding of how to process nanopowders to nanostructured materials.
6. An understanding of the values obtained in developed nanocomposite materials.
7. A general understanding of the role interfaces play in nanostructured materials.

Assessment tools

1. 8-9 homework assignments 15% of grade
2. Three tests, two in class 25% each; and one take home mid-term at 35%.

Winter Semester: Foundations of Nanotechnology II: Weekly Schedule

Instructor: Richard M Laine
Office: 2114 HH Dow
Phone: 734-764-6203
email: talsdad@umich.edu

This course extends ChemE 558 which focuses on the basic science that drives research in nanomaterials. Here we will focus on the practical issues including the synthesis, properties and processing of nanosized metal, metal oxide and semiconductor powders. It will also include some organic/inorganic and nanobio materials. The emphasis will be on particle properties and the use of these particles to make nanostructured shapes.

Course Outline

Framework Weeks 1 and 2.

- What is nano?
  - S/V ratio/Surface curvature
  - High Energy Surfaces
  - Passive properties
  - Active properties
    - Electrical, Heat conductivity
    - Photophysics
    - Catalytic
  - Passive properties
    - Just small
    - Sintering behavior

Synthesis of Metal Nanoparticles-Week 3

- Gas Phase
- Solution Phase
- Solid State
- Phases formed
- Single metal
- Mixed-metal
- Particular properties e.g. NLO, quantum magnets…
- Defect and vacancies in..
- Modeling studies of

Synthesis of Metal Oxide Particles-Week 4

- Solution Phase
- Gas Phase
- Solid State
- Phases formed
- Single metal
- Mixed-metal
- Particular properties/applications e.g. Anderson localized lasing, upconversion—*differs from optical properties in first semester* biomolecular taggants, electricity from light.

Synthesis of Semiconductor Nanoparticles—Week 5

- Solution Phase
- Gas Phase
- Solid State
- Phases formed
- Single metal
- Mixed-metal
- Particulproperties/applications e.g. taggants, nanophosphors
- Particular properties e.g. NLO, quantum magnets…
- Defect and vacancies in..

Processing metal nanopowders-Week 6

- Rationale
- Methods
- Properties Targeted
- Phase Transformations
- Particular properties/applications

Processing metal oxide nanopowders-Weeks 7 and 8

- Rationale
- Methods
- Properties Targeted
- Phase Transformations
- Particular properties/applications

Processing semiconductor nanopowders—Week 9

- Rationale
- Methods
- Properties Targeted
- Phase Transformations
- Particular properties/applications

Processing Ceramic-Ceramic Nanocomposites—Week 10

- Mixed-phase materials
- Transparency
- Multifunctional
- Fracture toughness (prosthetics)

Organic/Inorganic Hybrid Composites—Week 11

- Clay
- Silsesquioxanes
- Nanocomposites

Nanocomposite coatings (not electronics)—Week 12

- Processing
- Properties
- Biomaterials

Evaluation of Nanotechnology for real life applications—Week 13.

- Three tests: 90%
- One take home
- Five homework sets. 10% Work together in groups of 4-5

Total	100 %

Book: None

Introduction to Nanotechnology, C. P. Poole Jr and F. J. Owens. *Possible reference?*