

**The University of Michigan
College of Engineering
Curriculum Committee**

Agenda

September 30, 2003

1:30-3:30 p.m.

GM ROOM

Fourth Floor Lurie Engineering Center

1. Approval of Minutes from September 16, 2003 Meeting
2. NAME Program Changes
3. Course Approval Forms

**University of Michigan
College of Engineering
Curriculum Committee Meeting
Tuesday September 16, 2003
1:30-3:30 p.m.
Lurie Engineering Center GM Room
Minutes**

Greg Hulbert called the meeting to order at 1:45 p.m.

Members Present: G.Hulbert, E. Chan, J.Fessler, W. Hansen, J. Holloway, S. Montgomery, M. Parsons, J. Patel, H. Peng, R. Robertson, S. Takayama, L. Thompson

Members Absent: C. Cesnik, V. Chung, S. Pang, P. Samson

Curricular Overview – Greg Hulbert

Greg Hulbert talked about HU/SS, enforced pre-requisites and re-convening the course approval sub-committee.

He noted that the CoE Curriculum Committee changed a number of years ago from an elected body to an appointed body. It is very helpful to have a person from each department to clarify and/or defend their issues. Some, but not all issues go to the Faculty Committee for vote: the main focus for that committee is course approvals, which range from additions to deletions to modifications.

The CoE Curriculum Committee is responsible for the CoE bulletin, liaison with LSA, Engineering Division Curriculum Committee (at present, since one hasn't been formed yet) and oversight for the accreditation process (ABET).

Motion to approve the minutes of the last meeting

It was decided to change the word 'chairman' to chair. This appears at the end of the minutes.

The minutes of the last meeting were approved

HU/SS Minor Wording Change

Greg Hulbert passed out the Humanities and Social Sciences policy as it appears in the CoE Bulletin. Discussion. What if a course doesn't fall into 1, 2, 3 or 4 of the **Definitions and Exceptions**? Susan Montgomery stated that LS&A has a new division: **Interdisciplinary** counts as HU and falls under number 4.

Susan also noted that: intro. Composition should be added to number 3.

A vote was held on adding these changes, and the changes were approved.

Enforced/Advised Pre-requisites

Jeanne Murabito sent a list to all the CoE CC members (also in the meeting packet) of *Frequently Asked Prerequisite Questions* which originated from the Registrar's Office.

Discussion. Does this need to come to this Committee for vote?

Jeff Fessler stated that he is not in favor of this. He thinks that students should be trusted. He noted that what happens is that the advising staff has to sort through student's that have overrides. Jignesh Patel is in favor of this new system of enforcement.

Susan Montgomery added that Chemical Engineering is interested in enforcing Pre-requisites.

Greg Hulbert asked if equivalent courses change from 'advised' to 'enforced' does the Curriculum Committee need to approve this.

Course Approvals

Greg Hulbert called for a motion to approve the following courses. This was moved and seconded.

Motion Carried (approved)

CEE 534 Modification – Changed Course Number from CEE 432, Changed Title, Changed Description It was noted that the focus area and concentration template needed to be changed.

EECS 495 – New Course

ME 587 (X-Listed with MFG 587) Modification – Added OMS 587 as X-Listed Course, Changed Title, Changed Description. *This was approved with 2 absentions.*

NAME 331 – New Course

NAME 332 – New Course

NAME 431 – New Course

NAME 531 – New Course

This was moved and seconded.

Greg Hulbert announced that we will begin having a sub-committee again to review course approval forms. This committee will rotate as it did last year.

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

Next Meeting

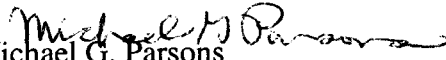
Tuesday, September 30, 2003

1:30-3:30 p.m.

GM Room-LEC

Department of Naval Architecture and Marine Engineering
University of Michigan
September 23, 2003

MEMORANDUM

From: 
Michael G. Parsons
Academic Affairs Committee Chair
Department of Naval Architecture and Marine Engineering
University of Michigan

To: Gregory M. Hulbert
Curriculum Committee Chair
College of Engineering
University of Michigan

Subject: Approval of Program Change

The Department of Naval Architecture and Marine Engineering requests College approval of a Program Change to reflect the revision of the marine engineering sequence of courses to accomplish the following:

1. introduce a new course in Marine Electrical Engineering (NA332, 3 credits);
2. modify NA330 (4 credits) to NA331 (3 credits) to accommodate the movement of some electrical content to NA332 and accommodate the loss of heat transfer in the revision of the first course in thermodynamics (ME235);
3. modify NA430 (4 credits) to NA431 (3 credits) to accommodate the movement of some electrical content to NA332;
4. modify NA391 (4 credits) to NA491 (4 credits) to reflect movement from the junior to the senior year to balance the study load of the students with the above changes.

The introduction of a course in marine electrical engineering has been needed since the elimination of EECS315 as part of the Curriculum 2000 modifications. Further, the need for a stronger education in this area is necessitated by the recent shift to increased electrical propulsion of ships and the movement of the Navy to "all electrical ships" for most non-nuclear applications. The introduction of NA332 at this time has been made possible by the addition of Dr. Jing Sun to the NAME faculty this semester. Prof. Sun's background is in electrical engineering and advanced engine control. She will be introducing the new NA332 course during Winter 2004. Courses NA331, NA332, and NA431 were approved by the College Curriculum Committee at its meeting on September 16, 2003. The NA491 course change has already been submitted for action at the next Curriculum Committee meeting. Courses NA391, NA330, and NA430 will be deleted at the end of the transition period.

The revised sample schedule for the new curriculum is attached.

Encl. (1)

Sample Schedule

B.S.E. (NAVAL ARCHITECTURE & MARINE ENGINEERING)

	Credit Hours	Terms							
		1	2	3	4	5	6	7	8
Subjects required by all programs (55 hrs.)									
Mathematics 115, 116, 215, and 216	16	4	4	4	4	-	-	-	-
Engr 100, Intro to Engineering.	4	4	-	-	-	-	-	-	-
Engr 101, Intro to Computers	4	-	4	-	-	-	-	-	-
¹ Chemistry 125/126 and 130 or Chemistry 210 and 211	5	5	-	-	-	-	-	-	-
² Physics 140 with Lab 141; Physics 240 with Lab 241	10	-	5	5	-	-	-	-	-
Humanities and Social Sciences	16	4	4	-	-	-	-	4	4
³ Advanced Mathematics (3 hrs.)	3	-	-	-	-	3	-	-	-
Related Technical Core Subjects (11 hrs.)									
ME 211, Intro to Solid Mechanics	4	-	-	4	-	-	-	-	-
ME 240, Intro to Dynamics	4	-	-	-	4	-	-	-	-
ME 235, Thermodynamics I	3	-	-	-	3	-	-	-	-
Program Subjects (42 hrs.)									
NA 270, Marine Design	4	-	-	4	-	-	-	-	-
NA 276, Marine Systems Manufacturing	2	-	-	-	2	-	-	-	-
NA 277, Intro to Probability and Statistics with Marine Applications	2	-	-	-	2	-	-	-	-
NA 310, Marine Structures I	4	-	-	-	-	4	-	-	-
NA 320, Marine Hydrodynamics I	4	-	-	-	-	4	-	-	-
NA 321, Marine Hydrodynamics II	4	-	-	-	-	-	4	-	-
NA 331, Marine Engineering I	3	-	-	-	-	3	-	-	-
NA 332, Marine Electrical Engineering	3	-	-	-	-	-	3	-	-
NA 340, Marine Dynamics I	4	-	-	-	-	-	4	-	-
NA 491, Marine Engr. Laboratory	4	-	-	-	-	-	-	4	-
NA 470, Foundations of Ship Design	4	-	-	-	-	-	-	4	-
NA 475, Marine Design Team Project	4	-	-	-	-	-	-	-	4
Technical Electives (7 or 8 hrs.)	7 or 8	-	-	-	-	-	-	4	4
Choose two from the following list. At least one must come from the 1 st four on the list:									
NA 410, Marine Structures II									
NA 420, Environmental Ocean Dynamics									
NA 431, Marine Engineering II									
NA 440, Marine Dynamics II									
NA 401, Small Craft Design									
NA 403, Sailing Craft Design Principles									
NA 455, Environmental Nearshore Dynamics									
NA 460, Marine Production Engineering, Planning and Control									
Unrestricted Electives (10 or 9 hrs.)	10 or 9	-	-	-	-	2	4	-	3
Total	128	17	17	17	15	16	15	16	15

Notes:

¹ Chemistry: 125, 130 or 210, 211 will count for 5 total credits, 1 of which will be applied according to individual program directives.

² Physics: 140, 141; 240, 241 will count for 10 total credits, 2 of which will be applied according to individual program directives.

³ Approved courses: CEE/ENG303, EECS401, MA/ENG371, MA417, MA/STAT425, MA450, MA454, MA471, STAT412

COURSE APPROVAL FORMS

For September 30, 2003 CoE CC Meeting

CEE 432

Deletion

CEE 500 (X-Listed with CHE 500 and ENSCEN 500)

New Course

EECS 420 Modification – Changing Course Title, Changing Description

NAME 491

New Course

SUPPORTING STATEMENT

CEE 432 is being replaced by CEE 534. The following is the supporting statement for CEE 534. This request is to change the course number and title for CEE432 Construction Engineering to CEE534 Construction Engineering, Equipment, and Methods. The course content and bulletin description will remain unchanged. The proposed title change is to more accurately describe the actual content. The proposed numbering change is to accurately reflect the actual status of the course within the undergraduate and graduate curricula.

Undergraduate curriculum. Changes in the CEE undergraduate curriculum in recent years have made CEE 431 Construction Contracting a required course for all undergrads. Undergrads choosing Construction Engineering and Management as a "focus area" must take two of the following three "technical electives": CEE432 Construction Engineering, CEE536 Critical Path Methods, and CEE537 Construction of Buildings.

Graduate curriculum. There are two graduate degrees offered in Construction Engineering and Management: MEng(CE&M) and MSE(CE&M). In both programs, all students must take two of the following seven "graduate civil engineering construction courses": CEE432 Construction Engineering, CEE533 Advanced Construction Systems, CEE537 Construction of Buildings, CEE538 Concrete Construction, CEE547 Soils Engineering and Pavement Systems, CEE553 Advanced Concrete Materials, and CEE631 Construction Decisions Under Uncertainty.

The two original construction courses, CEE431 and CEE432, have evolved to assume different roles in the undergraduate and graduate curricula. Today, CEE431 is a required undergraduate course, and is appropriately a 400 level course. CEE432 has been redesigned so that it is now equivalent in all respects to a 500 level course in difficulty of material, work load, mix of undergrad and grad students taking the course, suitability as an undergraduate technical elective, and suitability as a graduate civil engineering construction course. By retaining its historic 400 level number, CEE432 falls into a second-class status among analogous courses. Undergraduates do not get the appropriate recognition on their academic records for taking a 500 level technical elective. Graduate students are limited in the number of 400 level courses they are allowed to take (12 hours). Taking CEE432 as a 400 level course consumes some of that allowance, when 500 level credit is appropriate.

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

Detail the Special requirements

.....
.....
.....
.....
.....

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 7/2/2003
 Effective Fall 2003

A. CURRENT LISTING

B. REQUESTED LISTING

<p>Home Department _____ Div # _____ Course Number _____</p> <p>Cross Listed Course Information _____</p> <p>Course Title _____</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">TITLE ABBREVIATION</td> <td style="width: 30%;">Time Sched Max = 19 Spaces Transcript Max = 20 Spaces</td> <td style="width: 40%;"></td> </tr> </table> <p>Course Description _____</p>	TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces		<p>Home Department Civil and Environmental Engineering Div # 248 Course Number 500</p> <p>Cross Listed Course Information ChE 500 , ENSEEN 500</p> <p>Course Title Environmental Systems and Processes I</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">TITLE ABBREVIATION</td> <td style="width: 30%;">Time Sched Max = 19 Spaces Transcript Max = 20 Spaces</td> <td style="width: 40%;">Envir. Syst. Proc. I</td> </tr> <tr> <td style="width: 30%;">TITLE ABBREVIATION</td> <td style="width: 30%;">Time Sched Max = 19 Spaces Transcript Max = 20 Spaces</td> <td style="width: 40%;">Envir. Syst. Proc I</td> </tr> </table> <p>Course Description for Official Publication (Max = 50 words) Concepts of environmental systems and principles of related transport and transformation phenomena and processes; development of fundamental models for articulation of relevant process dynamics; system and process scaling factors and methods; extension of process models to ideal and nonideal natural and engineered homogeneous environmental systems</p>	TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Envir. Syst. Proc. I	TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Envir. Syst. Proc I
TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces									
TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Envir. Syst. Proc. I								
TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Envir. Syst. Proc I								

<p>PROGRAM OUTCOMES</p> <p><input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k</p> <p>Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Free Elective <input type="radio"/> Other <input type="radio"/> Core Course <input type="radio"/> Tech Elective</p> <p>Prerequisites <input type="radio"/> Enforced <input type="radio"/> Advised</p> <p>Credit Restrictions</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Level of Credit</td> <td style="width: 30%;">Credit Hours Min Max</td> <td style="width: 40%;">Contact Hrs/Wk Number of Wks</td> </tr> <tr> <td><input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad</td> <td><input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work</td> <td></td> </tr> </table>	Level of Credit	Credit Hours Min Max	Contact Hrs/Wk Number of Wks	<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad	<input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work		<p>PROGRAM OUTCOMES</p> <p><input checked="" type="checkbox"/> a <input checked="" type="checkbox"/> b <input checked="" type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input checked="" type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input checked="" type="checkbox"/> j <input checked="" type="checkbox"/> k</p> <p>Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Free Elective <input type="radio"/> Other <input type="radio"/> Core Course <input type="radio"/> Tech Elective</p> <p>Prerequisites CEE 460 <input type="radio"/> Enforced <input checked="" type="radio"/> Advised</p> <p>Credit Restrictions</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Level of Credit</td> <td style="width: 30%;">Credit Hours Min Max</td> <td style="width: 40%;">Contact Hrs/Wk Number of Wks</td> </tr> <tr> <td><input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input checked="" type="checkbox"/> Ugrad or Rackham Grad</td> <td><input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work</td> <td>3 3 3</td> </tr> </table>	Level of Credit	Credit Hours Min Max	Contact Hrs/Wk Number of Wks	<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input checked="" type="checkbox"/> Ugrad or Rackham Grad	<input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	3 3 3
Level of Credit	Credit Hours Min Max	Contact Hrs/Wk Number of Wks											
<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad	<input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work												
Level of Credit	Credit Hours Min Max	Contact Hrs/Wk Number of Wks											
<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input checked="" type="checkbox"/> Ugrad or Rackham Grad	<input type="checkbox"/> Ugrad or Non-Rackham Grad <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	3 3 3											

<p>Repeatability (Indi Research, Dir. Study, Dissertation): Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No Maximum Hours? _____ Maximum Times? _____ Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No</p> <p>Class Type(s) <input checked="" type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____</p> <p>Graded Section <input type="radio"/> Lec <input type="radio"/> Rec <input type="radio"/> Sem <input type="radio"/> Lab <input type="radio"/> Dis <input type="radio"/> Ind <input type="radio"/> Other _____</p> <p>Grading <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y</p> <p>Location <input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension</p>	<p>Printing Information <input checked="" type="checkbox"/> Print the course in the Bulletin (Optional) <input checked="" type="checkbox"/> Print the course in the Time Schedule</p> <p>Terms & Freq. of Offering <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> IIIb <input type="checkbox"/> III <input type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years</p> <p>Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd</p> <p>Cognizant Faculty Member: Walter J. Weber, Jr. Title Professor</p> <p>Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty</p>
---	---

<p>Approval</p> <p><input type="checkbox"/> Curriculum Comm. _____</p> <p><input type="checkbox"/> Faculty _____</p> <p><input type="checkbox"/> Rackham _____</p> <p><input type="checkbox"/> Cross listed Unit 1 _____</p> <p><input type="checkbox"/> Cross listed Unit 2 _____</p>	<p>Submitted By: <input checked="" type="checkbox"/> Home Dept. <input type="checkbox"/> Cross-listed Dept.</p> <p>Name, Signature & Department <i>Walter J. Weber, Jr.</i> Home Dept. Civil and Environmental Engineering Cross-listed Dept(s) Chemical Engineering Env. Sci. & Eng.</p>
--	---

SUPPORTING STATEMENT

The need for diligent stewardship of our environment has never been as clearly and compellingly documented as it is today. Fortunately, we are also better positioned than ever before to exercise such stewardship, at least in terms of relevant science and technology. This course is about that science and technology, and the manner of its use to preserve, sustain, and improve our environment and its ecosystems. Environmental processes have two dominant characteristics by which they can be commonly identified and quantified. The first is the form and amount of energy available to make them occur, and the second is the speed or rate at which that energy is exercised to effect change. The latter of these common process features depends on many things. It depends upon the numbers (or masses) and the reactivities (or stabilities) of the "energy rich" and "energy poor" partners of a process, and on the pathways available to these partners for effecting their interaction in the context of a given system. In more pointed terms, all environmental processes depend upon: i) the availability of energy; ii) a means for that energy to be exercised in the time frame of interest; and, iii) a system of such spatial and physical characteristics that it allows the reactants to "communicate" for purposes of reaction. These are the three tenets of environmental systems. For successful descriptions and/or designs of such systems, these tenets must be: i) understood on the basis of fundamental principles; ii) represented rigorously in functional form; and, iii) integrated accurately with the functional forms of other pertinent governing principles in appropriate system models. For the complex systems with which we must deal ultimately in practice, empiricism and judgment are required to bridge gaps in absolute knowledge. It is therefore often necessary that we make assumptions in applying the above tenets. If we understand the functions and constraints embodied in the principles involved, our assumptions will be rational.

Are any special resources or facilities required for this course?

Yes No

Detail the Special requirements

.....

.....

.....

.....

.....

Course Syllabus
CEE 500: Environmental Systems and Processes I
Walter J. Weber, Jr.
Fall 2003

A. Definitions of Environmental Systems and Processes

A.1 ENVIRONMENTAL PROCESSES

- A.1.1 Processes and Systems
- A.1.2 Process Categories
- A.1.3 Transformation Processes
- A.1.4 Transport Processes

A.2 ENVIRONMENTAL SYSTEMS

- A.2.1 Natural and Engineered
- A.2.2 Character and Scale
- A.2.3 Measures of Quantity and Quality
- A.2.4 Nature and Dynamics of Change

B. Process and System Characterization

B.1 SYSTEM CHARACTERIZATION

- B.1.1 Intuition and Common Sense
- B.1.2 Defining Boundaries
- B.1.3 Water Mass Balances
- B.1.4 Constituent Mass Balances

B.2 PROCESS CHARACTERIZATION

- B.2.1 Transformation Processes
- B.2.2 Transport Processes
- B.2.3 Intuition and More Common Sense
- B.2.4 Processes and Reactors

C. Process and System Modeling

C.1 A RATIONAL APPROACH

C.2 MATERIAL BALANCE EQUATIONS

- C.2.1 Control Volumes and Material Balances
- C.2.2 Point and Integral Forms
- C.2.3 Configurational Alternatives

C.3 FRAMES OF REFERENCE

C.3.1 Reactions, Processes, and Microscale Transport

C.3.2 Macroscale Transport and Reactors

C.4 PRINCIPLES, PLATFORMS, PROTOCOLS, AND PHILOSOPHY

C.4.1 Types and Levels of Analysis

C.4.2 Models Based on Material Balance Equations

C.4.3 Initial and Boundary Conditions

C.4.4 Alternative Modeling Approaches

C.4.5 Evaluation Criteria

C.4.6 Philosophical Approach

D. Fluid Flow and Mass Transport

D.1 TRANSPORT PROCESSES

D.1.1 Macroscale

D.1.2 Microscale

D.1.3 Transport Modeling

D.2 ADVECTIVE MASS TRANSPORT

D.2.1 Flow Characterization

D.2.2 Conservation of Mass, Energy, and Momentum

D.2.3 Fluid Mass Balance

D.2.4 Energy and Momentum Balances

D.2.5 Dimensionless Transport Numbers

D.3 DISPERSIVE MASS TRANSPORT

D.3.1 Dispersion Mechanism and Effects

D.3.2 Dispersion Coefficients and Numbers

E. Elementary Process Equilibria

E.1 CONCEPTS

E.2 WATER AND THE AQUEOUS PHASE

E.2.1 Process Roles

E.2.2 Constituent Character Behaviors

E.2.3 Structure and Properties

E.3 CHEMICAL STRUCTURE AND REACTIVITY

E.3.1 Electrons and Oxidation States

E.3.2 Reactivity and Reactions

- E.3.3 Some Important Types of Reactions
- E.4 CHEMICAL STATES AND PROCESS STABILITY

- E.4.1 Stability
- E.4.2 Types and Change
- E.4.3 Equilibrium and Steady States

F. Process Energy Relationships

F.1 THERMODYNAMIC LAWS AND FUNCTIONS

- F.1.1 Fundamental Laws
- F.1.2 Characteristic Functions
- F.1.3 Free Energy Concepts
- F.1.4 Reaction Free Energy Change
- F.1.5 Reference State Free Energies
- F.1.6 Biologically Mediated Reactions

F.2 THERMODYNAMICS AND REACTIVITY

- F.2.1 Reaction Energies and System Composition
- F.2.2 Reaction Energies and Equilibrium Constants
- F.2.3 Reaction Energies and Electrode Potentials
- F.2.4 Reaction Feasibility
- F.2.5 Enthalpy and the Temperature Dependence of Equilibrium

G. Elementary Process Rates

G.1 CONCEPTS

- G.1.1 Terms and Conditions
- G.1.2 Measurements
- G.1.3 Mass Law Relationships
- G.1.4 Monomolecular Reactions
- G.1.5 Reaction Orders
- G.1.6 Nonelementary Reactions

G.2 FIRST-ORDER RATE EQUATIONS

G.3 ANALYSIS OF REACTION RATES

- G.3.1 Data
- G.3.2 Integral Method of Analysis
- G.3.3 Differential Method of Analysis
- G.3.4 alternative Experimental Methods
- G.3.5 Precautions

H. Complex Process Rates

H.1 COMPLEX REACTION RATES

- H.1.1 Sequential Reactions
- H.1.2 Parallel Reactions
- H.1.3 Reversible Reactions
- H.1.4 Reaction Rates and Thermodynamics
- H.1.5 Modified First-Order Expressions

H.2 TEMPERATURE AND ACTIVATION ENERGY

- H.2.1 Arrhenius Equation
- H.2.2 Activation Energy
- H.2.3 Reactive Collisions
- H.2.4 Temperature-Rate Approximations

H.3 CATALYSIS

- H.3.1 Homogeneous
- H.3.2 Heterogeneous

H.4 BIOLOGICAL CATALYSIS

- H.4.1 Enzymes
- H.4.2 Michaelis-Menten Model
- H.4.3 Monod Model

I. Ideal System Modeling and Design

I.1 INTRODUCTION

I.2 REACTOR CONCEPTS

- I.2.1 Definition
- I.2.2 Flow and Residence Times
- I.2.3 Frame of Reference Reactors

I.3 IDEAL REACTORS

- I.3.1 Completely Mixed Batch Reactors
- I.3.2 Completely Mixed Flow Reactors
- I.3.3 Plug Flow Reactors
- I.3.4 Comparison of Reactor Performances

I.4 REACTION RATE MEASUREMENTS IN CMFRs

- I.4.1 Concepts
- I.4.2 Applications

J. Hybrid System Modeling and Design

- J.1 INTRODUCTION
- J.2 SEQUENCING BATCH REACTORS
 - J.2.1 Concept
 - J.2.2 Process Design Options
- J.3 CMFRs IN SERIES
 - J.3.1 Design Relationships
- J.4 REACTORS WITH RECYCLE
 - J.4.1 Recycle Objectives
 - J.4.2 Recycle Equalization
 - J.4.3 PFRs with Flow Recycle
 - J.4.4 CMFRs with Flow Recycle
 - J.4.5 CMFRs with Solids Recycle

K. Nonideal System Modeling and Design

- K.1 NONIDEAL REACTOR BEHAVIOR
- K.2 CHARACTERIZING REACTOR BEHAVIOR
 - K.2.1 Characteristic *C* and *E* Curves
 - K.2.2 Characteristic *F* Curves
- K.3 RESIDENCE TIME DISTRIBUTION ANALYSIS
 - K.3.1 RTDs for Ideal CMFRs
 - K.3.2 RTDs for Ideal PFRs
- K.4 PFR-WITH-DISPERSION REACTOR (PFDR) MODEL

 - K.4.1 An Ideal Model for Nonideal Behavior
 - K.4.2 The Dispersion Number
 - K.4.3 Variance-Dispersion Relationships
 - K.4.4 Design Relationships

Identification of the text to be used in CEE/Che 500 will be “Environmental Systems and Processes; Principles, Modeling, and Design” by W.J. Weber, Jr., Wiley-Interscience, 2001, ISBN 0-471-40518-3.



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 3/26/2003
 Effective Winter 04

A. CURRENT LISTING

B. REQUESTED LISTING

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Home Department Electrical Engineering and Computer Science</td> <td style="width: 10%;">Div # 252</td> <td style="width: 30%;">Course Number 420</td> </tr> <tr> <td colspan="3">Cross Listed Course Information</td> </tr> <tr> <td colspan="3">Course Title Introduction to Quantum Electronics</td> </tr> <tr> <td style="width: 20%;">TITLE ABBREVIATION</td> <td style="width: 20%;">Time Sched Max = 19 Spaces Transcript Max = 20 Spaces</td> <td style="width: 60%;">INT QUANT ELECT QUANT ELECT</td> </tr> <tr> <td colspan="3">Course Description Introduction to quantum mechanics of electrons and photons. Electrons in crystals. Metals, semiconductors and insulators. Effective mass, holes, valence and conduction band. Quantum wells, wires and dots. Tunneling effects and applications. Introduction to scattering theory. Charge transport, mobilities in semiconductors. Optical absorption and gain in semiconductors. Physical phenomena discussed in this course will be related to important microelectronic devices.</td> </tr> <tr> <td colspan="3">PROGRAM OUTCOMES: <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k</td> </tr> <tr> <td colspan="3">Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective</td> </tr> <tr> <td colspan="3">Prerequisites EECS 320, and EECS 330 or equivalent <input type="radio"/> Enforced <input checked="" type="radio"/> Advised</td> </tr> <tr> <td colspan="3">Credit Restrictions</td> </tr> <tr> <td style="width: 60%;">Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad</td> <td style="width: 10%;">Credit Hours Min Max 4 4</td> <td style="width: 30%;">Contact Hrs/Wk 4 Number of Wks 14</td> </tr> </table>	Home Department Electrical Engineering and Computer Science	Div # 252	Course Number 420	Cross Listed Course Information			Course Title Introduction to Quantum Electronics			TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	INT QUANT ELECT QUANT ELECT	Course Description Introduction to quantum mechanics of electrons and photons. Electrons in crystals. Metals, semiconductors and insulators. Effective mass, holes, valence and conduction band. Quantum wells, wires and dots. Tunneling effects and applications. Introduction to scattering theory. Charge transport, mobilities in semiconductors. Optical absorption and gain in semiconductors. Physical phenomena discussed in this course will be related to important microelectronic devices.			PROGRAM OUTCOMES: <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k			Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective			Prerequisites EECS 320, and EECS 330 or equivalent <input type="radio"/> Enforced <input checked="" type="radio"/> Advised			Credit Restrictions			Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	Credit Hours Min Max 4 4	Contact Hrs/Wk 4 Number of Wks 14	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Home Department EECS</td> <td style="width: 10%;">Div # 252</td> <td style="width: 30%;">Course Number 420</td> </tr> <tr> <td colspan="3">Cross Listed Course Information</td> </tr> <tr> <td colspan="3">Course Title Physical Principles Underlying Smart devices</td> </tr> <tr> <td style="width: 20%;">TITLE ABBREVIATION</td> <td style="width: 20%;">Time Sched Max = 19 Spaces Transcript Max = 20 Spaces</td> <td style="width: 60%;">Phys. Princ. Smart Dev. Phys. Princ. Smart Dev.</td> </tr> <tr> <td colspan="3">Course Description for Official Publication (Max = 50 words) Structural properties of materials. Basic quantum mechanics of electrons in solids. Band theory and trap states. Charge transport, band conduction and hopping conduction. Optical properties of materials. Piezoelectric and ferroelectric phenomena. Magnetic effects in materials. Physical phenomena will be related to transistors, light emitters, sensors and memory devices.</td> </tr> <tr> <td colspan="3">PROGRAM OUTCOMES: <input checked="" type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input checked="" type="checkbox"/> h <input checked="" type="checkbox"/> i <input checked="" type="checkbox"/> j <input checked="" type="checkbox"/> k</td> </tr> <tr> <td colspan="3">Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective</td> </tr> <tr> <td colspan="3">Prerequisites (EECS 320 and EECS 330) or Graduate Standing <input checked="" type="radio"/> Enforced <input type="radio"/> Advised</td> </tr> <tr> <td colspan="3">Credit Restrictions</td> </tr> <tr> <td style="width: 60%;">Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad</td> <td style="width: 10%;">Credit Hours Min Max 4 4</td> <td style="width: 30%;">Contact Hrs/Wk 4 Number of Wks 14</td> </tr> </table>	Home Department EECS	Div # 252	Course Number 420	Cross Listed Course Information			Course Title Physical Principles Underlying Smart devices			TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Phys. Princ. Smart Dev. Phys. Princ. Smart Dev.	Course Description for Official Publication (Max = 50 words) Structural properties of materials. Basic quantum mechanics of electrons in solids. Band theory and trap states. Charge transport, band conduction and hopping conduction. Optical properties of materials. Piezoelectric and ferroelectric phenomena. Magnetic effects in materials. Physical phenomena will be related to transistors, light emitters, sensors and memory devices.			PROGRAM OUTCOMES: <input checked="" type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input checked="" type="checkbox"/> h <input checked="" type="checkbox"/> i <input checked="" type="checkbox"/> j <input checked="" type="checkbox"/> k			Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective			Prerequisites (EECS 320 and EECS 330) or Graduate Standing <input checked="" type="radio"/> Enforced <input type="radio"/> Advised			Credit Restrictions			Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	Credit Hours Min Max 4 4	Contact Hrs/Wk 4 Number of Wks 14
Home Department Electrical Engineering and Computer Science	Div # 252	Course Number 420																																																											
Cross Listed Course Information																																																													
Course Title Introduction to Quantum Electronics																																																													
TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	INT QUANT ELECT QUANT ELECT																																																											
Course Description Introduction to quantum mechanics of electrons and photons. Electrons in crystals. Metals, semiconductors and insulators. Effective mass, holes, valence and conduction band. Quantum wells, wires and dots. Tunneling effects and applications. Introduction to scattering theory. Charge transport, mobilities in semiconductors. Optical absorption and gain in semiconductors. Physical phenomena discussed in this course will be related to important microelectronic devices.																																																													
PROGRAM OUTCOMES: <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k																																																													
Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective																																																													
Prerequisites EECS 320, and EECS 330 or equivalent <input type="radio"/> Enforced <input checked="" type="radio"/> Advised																																																													
Credit Restrictions																																																													
Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	Credit Hours Min Max 4 4	Contact Hrs/Wk 4 Number of Wks 14																																																											
Home Department EECS	Div # 252	Course Number 420																																																											
Cross Listed Course Information																																																													
Course Title Physical Principles Underlying Smart devices																																																													
TITLE ABBREVIATION	Time Sched Max = 19 Spaces Transcript Max = 20 Spaces	Phys. Princ. Smart Dev. Phys. Princ. Smart Dev.																																																											
Course Description for Official Publication (Max = 50 words) Structural properties of materials. Basic quantum mechanics of electrons in solids. Band theory and trap states. Charge transport, band conduction and hopping conduction. Optical properties of materials. Piezoelectric and ferroelectric phenomena. Magnetic effects in materials. Physical phenomena will be related to transistors, light emitters, sensors and memory devices.																																																													
PROGRAM OUTCOMES: <input checked="" type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input checked="" type="checkbox"/> h <input checked="" type="checkbox"/> i <input checked="" type="checkbox"/> j <input checked="" type="checkbox"/> k																																																													
Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective																																																													
Prerequisites (EECS 320 and EECS 330) or Graduate Standing <input checked="" type="radio"/> Enforced <input type="radio"/> Advised																																																													
Credit Restrictions																																																													
Level of Credit <input type="checkbox"/> Undergrad only <input checked="" type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Rackham Grad w/add'l Work <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	Credit Hours Min Max 4 4	Contact Hrs/Wk 4 Number of Wks 14																																																											
<p>C.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="3">Repeatability (Incl Research, Dir. Study, Dissertation): Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No Maximum Hours? _____ Maximum Times? _____ Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No</td> </tr> <tr> <td style="width: 30%;">Class Type(s) <input checked="" type="checkbox"/> Lec <input checked="" type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____</td> <td style="width: 30%;">Graded Section <input type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____</td> <td style="width: 40%;">Grading <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y</td> </tr> <tr> <td colspan="3">Location <input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension</td> </tr> </table>	Repeatability (Incl Research, Dir. Study, Dissertation): Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No Maximum Hours? _____ Maximum Times? _____ Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No			Class Type(s) <input checked="" type="checkbox"/> Lec <input checked="" type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	Graded Section <input type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	Grading <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y	Location <input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension			<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Printing Information (Optional) <input checked="" type="checkbox"/> Print the course in the Bulletin <input checked="" type="checkbox"/> Print the course in the Time Schedule</td> </tr> <tr> <td>Terms & Freq. of Offering <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> IIIb <input type="checkbox"/> III <input checked="" type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years</td> <td>Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd</td> </tr> <tr> <td>Cognizant Faculty Member: _____ Jaspritt Singh</td> <td>Title Professor</td> </tr> <tr> <td colspan="2">Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty</td> </tr> </table>	Printing Information (Optional) <input checked="" type="checkbox"/> Print the course in the Bulletin <input checked="" type="checkbox"/> Print the course in the Time Schedule		Terms & Freq. of Offering <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> IIIb <input type="checkbox"/> III <input checked="" type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years	Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd	Cognizant Faculty Member: _____ Jaspritt Singh	Title Professor	Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty																																												
Repeatability (Incl Research, Dir. Study, Dissertation): Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No Maximum Hours? _____ Maximum Times? _____ Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No																																																													
Class Type(s) <input checked="" type="checkbox"/> Lec <input checked="" type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	Graded Section <input type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	Grading <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y																																																											
Location <input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension																																																													
Printing Information (Optional) <input checked="" type="checkbox"/> Print the course in the Bulletin <input checked="" type="checkbox"/> Print the course in the Time Schedule																																																													
Terms & Freq. of Offering <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> IIIb <input type="checkbox"/> III <input checked="" type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years	Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd																																																												
Cognizant Faculty Member: _____ Jaspritt Singh	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. EECS Jeff Fessler *Jeff Fessler* 2003-6-4
 Cross-listed Dept(s). _____

Form Number

1089

SUPPORTING STATEMENT

This is the main course in EECS on physical properties of materials. At present it focuses on semiconductors, the basis of most information technology. However, in view of recent developments in intelligent device technology we would like cover materials like ferroelectrics, piezoelectrics, polymers etc. Students learn about materials that are used not only for the usual chips and communication applications, but also in smart cards, sensors, polarizers, microwave elements etc. The title of the course will change to reflect the new content.

Approved by ECE faculty by email vote in May 2003

Are any special resources or facilities required for this course?

Yes No

Detail the Special requirements



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 9/9/2003
 Effective Fall 2004

A. CURRENT LISTING

B. REQUESTED LISTING

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Home Department</td> <td style="width: 10%;">Div #</td> <td style="width: 60%;">Course Number</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td colspan="3">Cross Listed Course Information</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="3">Course Title</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td style="width: 15%;">TITLE ABBREVIATION</td> <td style="width: 15%;">Time Sched Max = 19 Spaces</td> <td style="width: 70%;"> </td> </tr> <tr> <td> </td> <td>Transcript Max = 20 Spaces</td> <td> </td> </tr> <tr> <td colspan="3">Course Description</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="3" style="background-color: #cccccc;">PROGRAM OUTCOMES:</td> </tr> <tr> <td colspan="3"> <input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k </td> </tr> <tr> <td colspan="3"> Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective </td> </tr> <tr> <td colspan="3">Prerequisites</td> </tr> <tr> <td colspan="3"> <input type="radio"/> Enforced <input checked="" type="radio"/> Advised </td> </tr> <tr> <td colspan="3">Credit Restrictions</td> </tr> <tr> <td style="width: 15%;">Level of Credit</td> <td style="width: 15%;">All Credit types</td> <td style="width: 70%;">Credit Hours</td> </tr> <tr> <td> <input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad </td> <td> <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work </td> <td> Min Max _____ </td> </tr> <tr> <td colspan="2"> </td> <td>Contact Hrs/Wk</td> </tr> <tr> <td colspan="2"> </td> <td>Number of Wks</td> </tr> <tr> <td colspan="2"> </td> <td>_____</td> </tr> </table>	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:			<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k			Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective			Prerequisites			<input type="radio"/> Enforced <input checked="" type="radio"/> Advised			Credit Restrictions			Level of Credit	All Credit types	Credit Hours	<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	<input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	Min Max _____			Contact Hrs/Wk			Number of Wks			_____	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Home Department</td> <td style="width: 10%;">Div #</td> <td style="width: 60%;">Course Number</td> </tr> <tr> <td>Naval Architecture & Marine Engineering</td> <td>284</td> <td>491</td> </tr> <tr> <td colspan="3">Cross Listed Course Information</td> </tr> <tr> <td colspan="3"> </td> </tr> <tr> <td colspan="3">Course Title</td> </tr> <tr> <td colspan="3">Marine Engineering Laboratory</td> </tr> <tr> <td style="width: 15%;">TITLE ABBREVIATION</td> <td style="width: 15%;">Time Sched Max = 19 Spaces</td> <td style="width: 70%;">Marine Engin Lab</td> </tr> <tr> <td> </td> <td>Transcript Max = 20 Spaces</td> <td>Marine Engin Lab</td> </tr> <tr> <td colspan="3">Course Description for Official Publication (Max = 50 words)</td> </tr> <tr> <td colspan="3"> Instruction in laboratory techniques and instrumentation. Use of computers in data analysis. Technical report writing. Investigation of fluid concepts, hydro-elasticity, marine dynamics, propeller forces, wave mechanics, ship hydrodynamics, and extrapolation of model tests to full scale. </td> </tr> <tr> <td colspan="3" style="background-color: #cccccc;">PROGRAM OUTCOMES:</td> </tr> <tr> <td colspan="3"> <input checked="" type="checkbox"/> a <input checked="" type="checkbox"/> b <input checked="" type="checkbox"/> c <input checked="" type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input checked="" type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input checked="" type="checkbox"/> k </td> </tr> <tr> <td colspan="3"> Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective </td> </tr> <tr> <td colspan="3">Prerequisites</td> </tr> <tr> <td colspan="3"> NA 310, NA 320, NA 321, NA 331, NA 332, NA 340 <input type="radio"/> Enforced <input checked="" type="radio"/> Advised </td> </tr> <tr> <td colspan="3">Credit Restrictions</td> </tr> <tr> <td style="width: 15%;">Level of Credit</td> <td style="width: 15%;">All Credit types</td> <td style="width: 70%;">Credit Hours</td> </tr> <tr> <td> <input checked="" type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad </td> <td> <input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work </td> <td> Min Max _____ </td> </tr> <tr> <td colspan="2"> </td> <td>Contact Hrs/Wk</td> </tr> <tr> <td colspan="2"> </td> <td>Number of Wks</td> </tr> <tr> <td colspan="2"> </td> <td>5.5</td> </tr> <tr> <td colspan="2"> </td> <td>4 4</td> </tr> <tr> <td colspan="2"> </td> <td>14</td> </tr> </table>	Home Department	Div #	Course Number	Naval Architecture & Marine Engineering	284	491	Cross Listed Course Information						Course Title			Marine Engineering Laboratory			TITLE ABBREVIATION	Time Sched Max = 19 Spaces	Marine Engin Lab		Transcript Max = 20 Spaces	Marine Engin Lab	Course Description for Official Publication (Max = 50 words)			Instruction in laboratory techniques and instrumentation. Use of computers in data analysis. Technical report writing. Investigation of fluid concepts, hydro-elasticity, marine dynamics, propeller forces, wave mechanics, ship hydrodynamics, and extrapolation of model tests to full scale.			PROGRAM OUTCOMES:			<input checked="" type="checkbox"/> a <input checked="" type="checkbox"/> b <input checked="" type="checkbox"/> c <input checked="" type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input checked="" type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input checked="" type="checkbox"/> k			Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective			Prerequisites			NA 310, NA 320, NA 321, NA 331, NA 332, NA 340 <input type="radio"/> Enforced <input checked="" type="radio"/> Advised			Credit Restrictions			Level of Credit	All Credit types	Credit Hours	<input checked="" type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	<input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	Min Max _____			Contact Hrs/Wk			Number of Wks			5.5			4 4			14
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:																																																																																																																																					
<input type="checkbox"/> a <input type="checkbox"/> b <input type="checkbox"/> c <input type="checkbox"/> d <input type="checkbox"/> e <input type="checkbox"/> f <input type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input type="checkbox"/> k																																																																																																																																					
Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective																																																																																																																																					
Prerequisites																																																																																																																																					
<input type="radio"/> Enforced <input checked="" type="radio"/> Advised																																																																																																																																					
Credit Restrictions																																																																																																																																					
Level of Credit	All Credit types	Credit Hours																																																																																																																																			
<input type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	<input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	Min Max _____																																																																																																																																			
		Contact Hrs/Wk																																																																																																																																			
		Number of Wks																																																																																																																																			

Home Department	Div #	Course Number																																																																																																																																			
Naval Architecture & Marine Engineering	284	491																																																																																																																																			
Cross Listed Course Information																																																																																																																																					
Course Title																																																																																																																																					
Marine Engineering Laboratory																																																																																																																																					
TITLE ABBREVIATION	Time Sched Max = 19 Spaces	Marine Engin Lab																																																																																																																																			
	Transcript Max = 20 Spaces	Marine Engin Lab																																																																																																																																			
Course Description for Official Publication (Max = 50 words)																																																																																																																																					
Instruction in laboratory techniques and instrumentation. Use of computers in data analysis. Technical report writing. Investigation of fluid concepts, hydro-elasticity, marine dynamics, propeller forces, wave mechanics, ship hydrodynamics, and extrapolation of model tests to full scale.																																																																																																																																					
PROGRAM OUTCOMES:																																																																																																																																					
<input checked="" type="checkbox"/> a <input checked="" type="checkbox"/> b <input checked="" type="checkbox"/> c <input checked="" type="checkbox"/> d <input checked="" type="checkbox"/> e <input type="checkbox"/> f <input checked="" type="checkbox"/> g <input type="checkbox"/> h <input type="checkbox"/> i <input type="checkbox"/> j <input checked="" type="checkbox"/> k																																																																																																																																					
Degree Requirements <input type="radio"/> Degree Requirement <input type="radio"/> Tech Elective <input type="radio"/> Core Course <input type="radio"/> Other <input type="radio"/> Free Elective																																																																																																																																					
Prerequisites																																																																																																																																					
NA 310, NA 320, NA 321, NA 331, NA 332, NA 340 <input type="radio"/> Enforced <input checked="" type="radio"/> Advised																																																																																																																																					
Credit Restrictions																																																																																																																																					
Level of Credit	All Credit types	Credit Hours																																																																																																																																			
<input checked="" type="checkbox"/> Undergrad only <input type="checkbox"/> Rackham Grad <input type="checkbox"/> Non-Rackham Grad <input type="checkbox"/> Ugrad or Rackham Grad <input type="checkbox"/> Ugrad or Non-Rackham Grad	<input type="checkbox"/> All Credit types <input type="checkbox"/> Rackham Grad w/add'l Work	Min Max _____																																																																																																																																			
		Contact Hrs/Wk																																																																																																																																			
		Number of Wks																																																																																																																																			
		5.5																																																																																																																																			
		4 4																																																																																																																																			
		14																																																																																																																																			
<p>C.</p> <p>Repeatability (incl. Research, Dir. Study, Dissertation):</p> <p>Is this course repeatable? <input type="radio"/> Yes <input checked="" type="radio"/> No</p> <p>Maximum Hours? _____ Maximum Times? _____</p> <p>Can it be repeated in the same term? <input type="radio"/> Yes <input checked="" type="radio"/> No</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Class Type(s)</td> <td style="width: 15%;">Graded Section</td> <td style="width: 15%;">Lec</td> <td style="width: 15%;">Grading</td> <td style="width: 40%;">Location</td> </tr> <tr> <td> <input checked="" type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____ </td> <td> <input type="radio"/> Lec <input type="radio"/> Rec <input type="radio"/> Sem <input type="radio"/> Lab <input type="radio"/> Dis <input type="radio"/> Ind <input type="radio"/> Other _____ </td> <td> <input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y </td> <td> <input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension </td> <td> </td> </tr> </table>	Class Type(s)	Graded Section	Lec	Grading	Location	<input checked="" type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	<input type="radio"/> Lec <input type="radio"/> Rec <input type="radio"/> Sem <input type="radio"/> Lab <input type="radio"/> Dis <input type="radio"/> Ind <input type="radio"/> Other _____	<input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y	<input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension		<p>Printing Information <input checked="" type="checkbox"/> Print the course in the Bulletin (Optional) <input checked="" type="checkbox"/> Print the course in the Time Schedule</p> <p>Terms & Freq. of Offering <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> IIIa <input type="checkbox"/> IIIb <input type="checkbox"/> III Half term <input type="checkbox"/> 1st <input type="checkbox"/> 2nd</p> <p><input checked="" type="checkbox"/> Yearly <input type="checkbox"/> Alter Years <input type="checkbox"/> Even Years <input type="checkbox"/> Odd Years</p> <p>Cognizant Faculty Member: <u>Guy A. Meadows</u> Title <u>Professor</u></p> <p>Grad Course: Attach nomination if Cognizant Faculty is not a regular graduate faculty</p>																																																																																																																										
Class Type(s)	Graded Section	Lec	Grading	Location																																																																																																																																	
<input checked="" type="checkbox"/> Lec <input type="checkbox"/> Rec <input type="checkbox"/> Sem <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Dis <input type="checkbox"/> Ind <input type="checkbox"/> Other _____	<input type="radio"/> Lec <input type="radio"/> Rec <input type="radio"/> Sem <input type="radio"/> Lab <input type="radio"/> Dis <input type="radio"/> Ind <input type="radio"/> Other _____	<input checked="" type="checkbox"/> A-E <input type="checkbox"/> CR/NC <input type="checkbox"/> S/U <input type="checkbox"/> P/F <input type="checkbox"/> Y	<input checked="" type="checkbox"/> Ann Arbor <input type="checkbox"/> Biological Station <input type="checkbox"/> Camp Davis <input type="checkbox"/> Extension																																																																																																																																		

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

Submitted By: Home Dept. Cross-listed Dept.

Name, Signature & Department: Michael G. Parsons, NA&ME

Home Dept. _____

Cross-listed Dept(s). _____

