# 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 |

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

Form Number **1153**

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** 9/23/2003
**Effective** Winter 2004

## A. CURRENT LISTING

| Home Department | Div # | Course Number |
|---|---|---|
| [X] Civil and Environmental Engineering | 248 | 432 |

Cross Listed Course Information

[X] Course Title
Construction Engineering

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 ○ Free Elective ○ Other ○ Core Course ○ Tech 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 (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

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

## B. REQUESTED 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 for Official Publication (Max = 50 words)

PROGRAM OUTCOMES
[ ]a [ ]b [ ]c [ ]d [ ]e [ ]f [ ]g [ ]h [ ]i [ ]j [ ]k

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

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 ____

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 G. Everett Title Lecturer

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

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

Name, Signature & Department

Home Dept. Nikolaos Katopodes, CEE

Cross-listed Dept(s). _____

Form Number

1153

## 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 X No

Detail the Special requirements

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

Form Number 1110

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

| 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: O Degree Requirement O Free Elective O Other O Core Course O Tech Elective

Prerequisites: ◌ Enforced ◌ Advised

Credit Restrictions

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

Credit Hours Min ____ Max ____

Contact Hrs/Wk ____ Number of Wks ____

C. Repeatability (Indi Research, Dir. Study, Dissertation:
Is this course repeatable? ◌ Yes (•) No
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

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

## B. REQUESTED LISTING

| Home Department | Div # | Course Number |
|---|---|---|
| Civil and Environmental Engineering | 248 | 500 |

Cross Listed Course Information
ChE 500 , ENSCEN 500

Course Title
Environmental Systems and Processes I

| TITLE ABBREVIATION | Time Sched Max = 19 Spaces | Envir. Syst. Proc. I |
|---|---|---|
| | Transcript Max = 20 Spaces | Envir. Syst. Proc I |

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

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

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

Prerequisites CEE 460
◌ Enforced (•) Advised

Credit Restrictions

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

Credit Hours Min 3 Max 3

Contact Hrs/Wk 3 Number of Wks ____

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: Walter J. Weber, Jr. Title Professor

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

Submitted By: ■ Home Dept ☐ Cross-listed Dept.
Name, Signature & Department
Home Dept. Civil and Environmental Engineering
Cross-listed Dept(s). Chemical Engineering
Env. Sci. & Eng.

Form Number

1110

## 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 tents. 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 Realtionships

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.

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

Print

Form Number **1089**

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

| Home Department | Div # | Course Number |
|---|---|---|
| Electrical Engineering and Computer Science | 252 | 420 |

Cross Listed Course Information:

Course Title: Introduction to Quantum Electronics

| | | |
|---|---|---|
| TITLE ABBREVIATION | Time Sched Max = 19 Spaces | INT QUANT ELECT |
| | Transcript Max = 20 Spaces | 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:**
☐ a ☐ b ☐ c ☐ d ☐ e ☐ f ☐ g ☐ h ☐ i ☐ j ☐ k

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

Prerequisites: EECS 320, and EECS 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 4 Max 4
Contact Hrs/Wk 4
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 | Div # | Course Number |
|---|---|---|
| EECS | 252 | 420 |

Cross Listed Course Information:

Course Title: Physical Principles Underlying Smart devices

| | | |
|---|---|---|
| TITLE ABBREVIATION | Time Sched Max = 19 Spaces | Phys. Princ. Smart Dev. |
| | Transcript Max = 20 Spaces | 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:**
☒ a ☐ b ☐ c ☐ d ☒ e ☐ f ☐ g ☒ h ☒ i ☒ j ☒ k

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

Prerequisites: (EECS 320 and EECS 330) 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 4 Max 4
Contact Hrs/Wk 4
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
Half term ☐ 1st ☐ 2nd
■ Yearly ☐ Alter Years ☐ Even Years ☐ Odd Years

Cognizant Faculty Member: Jasprit 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 ferrolelectrics, 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

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

Print

Form Number 1123

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

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

## B. REQUESTED LISTING

Home Department: Naval Architecture & Marine Engineering | Div #: 284 | Course Number: 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:**
☒a ☒b ☒c ☒d ☒e ☐f ☒g ☐h ☒i ☐j ☒k

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

Prerequisites: NA 310, NA 320, NA 321, NA 331, NA 332, NA 340
○ 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 4 Max 4

Contact Hrs/Wk 5.5

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: Guy A. Meadows 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. MGP Michael G. Parsons, NA&ME

Cross-listed Dept(s). _____

Form Number

1123

## SUPPORTING STATEMENT

Laboratory course is being moved to the senior year to accommodate other changes in the marine engineering sequence. This new course will replace NA 391, which will eventually be deleted.

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

Detail the Special requirements