REQUEST FOR ADDITION, EXPANSION, OR REVISION OF AN UNDERGRADUATE COURSE (10000-40000 LEVEL)

DEPARTMENT: Environmental and Ecological Engineering
EFFECTIVE SESSION: Fall 2012 (201310)

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- New course with supporting documents
- Add existing course offered at another campus
- Expiration of a course
- Change in course number
- Change in course title
- Change in course credit/type
- Change in course attributes (department head signature only)
- Change in instructional hours
- Change in course description
- Change in course requisites
- Change in semesters offered (department head signature only)
- Transfer from one department to another

PROPOSED: Subject Abbreviation: EEE
Course Number: 25000
Long Title: Environmental, Ecological, and Engineering Systems
Short Title: Envir. Ecol. and Engr. Syst.

EXISTING: Subject Abbreviation
Course Number

TERMS OFFERED: Check All That Apply:
- Fall
- Spring
- Summer

CAMPUS(ES) INVOLVED:
- Calumet
- Cont Ed
- Ft. Wayne
- N. Central
- Tech Statewide
- Indianapolis
- W. Lafayette

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

CREDIT TYPE

1. Fixed Credit: Cr. Hrs.: 3
2. Variable Credit Range:
   Minimum Cr. Hrs. (Check One)
   - To
   - Or
   Maximum Cr. Hrs.: Yes

Schedule Type
- Lecture
- Recitation
- Prerequisite
- Lab
- Lao Prep
- Studio
- Distance
- Clinic
- Experiential
- Research
- Ind. Study
- Pract/Observe

Minutes Per Mtg. 50 Meetings Per Week 3 Weeks Offered 16 % of Credit Allocated 100

COURSE ATTRIBUTES: Check All That Apply

- 1. Pass/Not Pass Only
- 2. Satisfactory/Unsatisfactory Only
- 3. Repeatable
- 4. Credit by Examination
- 5. Special Fees
- 6. Registration Approval Type
- Department
- Instructor
- 7. Variable Title
- 8. Honors
- 9. Full Time Privilege
- 10. Off Campus Experience

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

An overview of systems thinking and examples, and applications to environmental, ecological, and engineering systems. Students will develop an understanding of complex and global systems, along with the tools and analysis methods required to deal with them. Basic environmental and ecological science concepts are also included. Prerequisite: sophomore standing (30+ credit hours).

*COURSE LEARNING OUTCOMES:

Successful students in this course will develop: (1) an understanding of the types of relationships and dynamics common in complex systems, including environmental systems, ecological systems, and engineering systems; (2) the ability to apply fundamental systems tools and modeling approaches to a wide variety of engineering, environmental, and ecological problems; (3) an understanding of the foundational concepts and vocabulary of global environmental and ecological systems; and (4) an appreciation of the complexity of contemporary issues related to society and EEE, including an understanding of the roles and responsibilities of stakeholders.

Calumet Department Head Date
Calumet School Dean Date

Fort Wayne Department Head Date
Fort Wayne School Dean Date

Indianapolis Department Head Date
Indianapolis School Dean Date

Central Faculty Senate Chair Date
Vice Chancellor for Academic Affairs Date

West Lafayette Department Head Date
West Lafayette College/School Dean Date

West Lafayette Registrar Date

OFFICE OF THE REGISTRAR
TO: The Faculty of the College of Engineering
FROM: The Division of Environmental and Ecological Engineering
SUBJECT: New Undergraduate Course, EEE 25000, Environmental, Ecological, and Engineering Systems

The Curriculum Committee of the Division of Environmental and Ecological Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

EEE 25000: Environmental, Ecological, and Engineering Systems
Sem. 1, Lecture 3, Credits 3
Prerequisite: Sophomore standing

Course description:
An overview of systems thinking and examples, and applications to environmental, ecological, and engineering systems. Students will develop an understanding of complex and global systems, along with the tools and analysis methods required to deal with them. Basic environmental and ecological science concepts are also included.

Reasons:
This course is planned as a foundational core course in the proposed Environmental and Ecological Engineering undergraduate curriculum. It is anticipated that students will typically take this course in the fall semester of their second year; it therefore represents the first introduction to the discipline of EEE. The course will be required for the BSEE degree and will be recommended to all students pursuing the EEE Minor.

The course introduces students to the complexity of environmental, ecological, and engineering systems and tools required for understanding these systems. Primary learning objectives include helping students develop:
- an understanding of the types of relationships and dynamics common in complex systems, including environmental systems, ecological systems, and engineering systems, and their interactions
- the ability to apply systems tools and approaches to a variety of engineering, environmental, and ecological problems (and to problems that combine more than one of these), including
  - the ability to model, including semi-quantitative and temporal relationships
  - the ability to describe and diagram systems, and understand connections and feedbacks
- an understanding of the foundational concepts and vocabulary of global environmental and ecological systems
- an appreciation of the complexity of contemporary issues related to society and EEE, including an understanding of the roles and responsibilities of stakeholders.

John W. Sutherland, Head, Division of Environmental and Ecological Engineering
EEE 25000: Environmental, Ecological, and Engineering Systems (EFD 39-11)

Level: Undergraduate

Course instructor(s): TBD

Course Outline:

Part 1: Systems and tools (four weeks)
- Introduction to systems; importance and failures of systems
- Systems diagramming and structures, feedbacks, models and modes of systems
- Graphical behavior of systems, stability and oscillations, delays
- Thresholds, chaos, systems failure, and limits
- Policy implications of systems and systems thinking

Part 2: Environmental systems (five weeks)
- Introduction to atmospheric systems and behavior
- Fundamentals of environmental water systems
- Chemical and biological cycling
- Current environmental system changes
- Modeling environmental system changes using systems diagramming tools

Part 3: Ecological systems (two weeks)
- Ecological system fundamentals
- Limits to growth, lessons from ecosystem collapse
- Ecological cycles, models, and thought experiments

Part 4: Engineering systems and synthesis (four weeks)
- Industrial ecology, and applying environ./ecol. systems to industrial systems
- Energy systems
- Risk and uncertainty in engineering systems
- Introduction to sustainable manufacturing
- Applying modeling and systems diagramming tools to integrated systems

Textbooks:

Grading:
- 30% Homework (approximately weekly), including calculations, short answer questions on concepts, and reflection assignments.
- 20% Projects (about two in the semester): team projects that use modeling and systems tools to produce complex analysis
- 20% Mid-term exam
- 30% Final exam

Previous Teaching:
The course was offered for the first time as EEE 49500 in Fall 2010, Prof. John Sutherland and Dr. Stephen Hoffmann co-taught the course, though they will likely not be teaching it regularly in the future. Enrollment was 14 students.