Office of the Registrar
FORM 40 REV. 11/09

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

Print Form

EFD 4/-11

DEPARTMENT Environmental and Ecological Engineering

EFFECTIVE SESSION Spring 2012 (201220)

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

- [X] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [ ] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	EEE	Subject Abbreviation	
Course Number	43000	Course Number	
Long Title	Industrial Ecology and Life Cycle Analysis		
Short Title	Indus. Ecol. and LCA		

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

TERMS OFFERED
Check All That Apply:
[ ] Summer [ ] Fall [X] Spring

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [X] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1. Fixed Credit: Cr. Hrs. 3
2. Variable Credit Range:
Minimum Cr. Hrs
(Check One) To [ ] Or [ ]
Maximum Cr. Hrs.
3. Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
Maximum Repeatable Credit: [ ]
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 [ ]

ScheduleType	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	3	16	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

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COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

The outputs and processes associated with industrial systems are examined, with special emphasis placed on interactions of these systems with environmental and ecological systems. A full product life cycle perspective is stressed, including energy and material flows, processes used to produce materials and realize products, and the management of end-of-life of products. Prerequisites: [EEE 25000 or EEE 30000 or CE 35000 or CE 35500] and [MA 16200 or MA 16600 or MA 22400 or equivalent] and Junior standing (60+ credits).

*COURSE LEARNING OUTCOMES:

Successful students in this course will develop: (1) an understanding of the principles of industrial ecology and an ability to apply these principles to specific engineering and manufacturing systems in order to create designs with reduced environmental and ecological impact; (2) knowledge of life cycle analysis (LCA), its different forms, its limitations, its endpoints, and the common tools, techniques, and databases available to assis in LCA; (3) the ability to perform a limited life cycle analysis on an industrial product or process, with a defined analysis goal; and (4) an understanding of the complex interactions between industrial and environmental systems.

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
North Central Department Head	Date	North Central Chancellor	Date
West Lafayette Department Head 9/15/11	Date	West Lafayette College/School Dean 9/15/11	Date
		West Lafayette Registrar 9/23/11	Date

OFFICE OF THE REGISTRAR

VS 9/22/11

EEE 43000

Engineering Faculty Document 41-11
April 5, 2011

TO: The Faculty of the College of Engineering
FROM: The Faculty of the Division of Environmental and Ecological Engineering
SUBJECT: New Undergraduate Course: EEE 43000, Industrial Ecology and Life Cycle Analysis

The faculty 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 43000: Industrial Ecology and Life Cycle Analysis
Sem. 2, Class 3, cr. 3.
Prerequisites: [EEE 25000 or EEE 30000 or CE 35000 or CE 35500], [MA 16200 or MA 16600 or MA 22400], Junior Standing

Course description:
The outputs and processes associated with industrial systems are examined, with special emphasis placed on interactions of these systems with environmental and ecological systems, and on computer-based dynamic modeling of these systems. A full product life cycle perspective is stressed, including energy and material flows, processes used to produce materials and realize products, and the management of end-of-life of products.

Reasons:
The study of the interaction of industrial material and energy flows with the environment is termed *industrial ecology*; it is generally understood that the field is concerned with reducing the impact of industrial systems on the ecosphere. The industry portion of the economy consists of a process network that extracts resources and transforms them into materials and products for the benefit of humankind. Industrial ecology describes the material/energy flows of industrial process, and how they impact natural resources, and lead to environmental contamination. One of they key aspects of industrial ecology is life cycle thinking. Since products and materials interact with the environment through energy and material flows at every stage of their life cycle, from raw material extraction to end of life disposal, life cycle thinking is needed to design/develop products for improved environmental performance. Tools have been developed to provide a comprehensive assessment of product life cycle environmental impacts. The principles behind life cycle assessment are introduced in this course. The course also introduces students to the concept of societal sustainability and corporate social responsibility. This course serves as the fundamental building block for the "Sustainable Industrial Systems" theme within the BSEEE curriculum.

John W. Sutherland

John W. Sutherland, Head
Division of Environmental and Ecological Engineering

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE

ECC Minutes #1
Date 8/31/11
Chairman ECC R. Cipra

EEE 43000

EEE 43000: Industrial Ecology and Life Cycle Analysis

Level: Undergraduate

Course Instructor(s): John W. Sutherland and others

Course Outline:

Proposed Schedule of Class Periods:

Class Period	Topic	Class Period	Topic
1	Course Introduction – Overview	24	Environmental measures
2	Societal needs	25	Environmental measures
3	Review environmental challenges	26	Life cycle assessment – basics
4	Understanding the industrial sector	27	Life cycle inventory
5	Traditional energy production	28	LCA impact
6	Alternative energy production	29	Input-output modeling
7	Materials	30	Economic I/O modeling
8	Material and energy balances	31	EIO-LCA
9	Materials extraction	32	Environmental laws & regulations
10	Materials processing	33	Recycling
11	Resource Limits	34	Remanufacturing 1
12	Industrial processes - 1	35	Remanufacturing 2 (disassembly)
13	Industrial processes - 2	36	Business: mkt. share, econ., risk
14	Assembly, packaging, distribution	37	Design process
15	Life cycles	38	Design for the environment (DFX)
16	Consumption & Use	39	Life cycle design
17	Maintenance and end-of-life	40	Industrial ecology
18	Product design	41	Sys. design, industrial ecosystems
19	**Midterm Exam**	42	End-of-life management
20	Process design	43	Services and the environment
21	Facilities and industrial enterprise	44	Societal sustainability
22	Supply chain issues		**Final Exam** (during exam week)
23	Industry and the environment		

Textbook and readings:

— Graedel, T.E., and B.R. Allenby, *Industrial Ecology and Sustainable Engineering*, 2010, Prentice-Hall.

— Other materials (including primary literature) will be made available electronically

Grading:

Homework	25%
Midterm exam	30%
Final exam	45%

EEE 43000

Previous Teaching:

This course will be offered for the first time in Spring 2011, using the EEE 49500 Special Topics number. It will be a recommended elective in both the EEE Plan of Study (within Multidisciplinary Engineering) and the EEE Minor, so it is expected that the enrollment will be 15-20 students in the first offering, and potentially 50 students at steady state as a required course within the BS EEE curriculum. Dr. Sutherland has offered similar courses at his previous institution (Michigan Tech).