TO: The Engineering Faculty

FROM: The Faculty of the School of Mechanical Engineering

RE: ME 52900 Sustainable Energy Options and Analysis

The Faculty of the School of Mechanical Engineering has approved the following experimental course for a permanent course number. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ME 52900 Sustainable Energy Options and Analysis, Sem. 1 (alternate years), Class 3, cr. 3.
Prerequisite: ME 300, ME 315

This course develops an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics. A range of different technologies and approaches are presented for meeting future energy needs. Students learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics and gain experience in assessing different energy technologies for specific case studies.

Reason: ME 52900 has been taught three times on an experimental basis with the following enrollments: Fall 2009 – 36 students, Fall 2011 - 36 students, and Fall 2013 – 36 students. The course provides students with a basic understanding of energy options and analysis approaches necessary to assess alternatives. The course draws students from a variety of Engineering departments and programs, including Mechanical Engineering, Architectural Engineering, Agricultural and Biological Engineering, Environmental and Ecological Engineering, and Ecological Sciences and Engineering.

Details of the course are provided below in the two-page course profile.

4/15/16

James D. Jones, Associate Head/Professor
School of Mechanical Engineering

Approved for the faculty of the Schools of Engineering by the Engineering Curriculum Committee
ECC Minutes #3 Date 10-13-16
Chairman ECC

Office of the Registrar
FORM 40G REV. 9/06

PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF A GRADUATE COURSE
(500-600 LEVEL)

Print Form

DEPARTMENT Mechanical Engineering

EFFECTIVE SESSION Spring 2017

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

- [X] 1. New course with supporting documents (complete proposal form)
- [ ] 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
- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered
- [ ] 12. Transfer from one department to another

PROPOSED:

Subject Abbreviation ME

Course Number 52900

Long Title Sustainable Energy Options and Analysis

Short Title

Abbreviated title will be entered by the Office of the Registrar if omitted. (22 CHARACTERS ONLY)

EXISTING:

Subject Abbreviation

Course Number

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

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [ ] 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 [ ]
4. Thesis 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. Designator Required
6. Special Fees
7. Registration Approval Type Department [ ] Instructor [ ]
8. Variable Title
9. Remedial
10. Honors
11. Full Time Privilege
12. Off Campus Experience

Instructional Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated	Delivery Method (Asyn. Or Syn.)	Delivery Medium (Audio, Internet, Live, Text-Based, Video)
Lecture	50	3	16	100		
Recitation						
Presentation						
Laboratory						
Lab Prep						
Studio						
Distance						
Clinic						
Experiential						
Research						
Ind. Study						
Pract/Observ						

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES):

Calumet Department Head	Date	Calumet School Dean	Date	Calumet Undergrad Curriculum Committee	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date	Fort Wayne Chancellor	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date	Undergrad Curriculum Committee	Date
North Central Department Head	Date	North Central Chancellor	Date	Date Approved by Graduate Council	
West Lafayette Department Head Amit Bajaj/JPJ	4/15/16 Date	West Lafayette College/School Dean	10/21/16 Date	Graduate Council Secretary	Date
Graduate Area Committee Convener	Date	Graduate Dean	Date	West Lafayette Registrar	Date

OFFICE OF THE REGISTRAR

To: Purdue University Graduate Council

From: Faculty Member: James Jones

Department: Mechanical Engineering

Campus: West Lafayette

Date:

For Reviewer's comments only
Select One
Reviewer:
Comments:

Subject: Proposal for New Graduate Course-Documents Supporting Registrar's Form 40

Contact information if questions arise

Name: James Jones

Phone Number : 765-494-5691

E-mail: jonesjd@purdue.edu

Course Number: 52900

Campus Address:

Course Title: Sustainable Energy Options and Analysis

A. Justification for the Course

☒ Explain how this course relates to other courses offered in the department or other departments and how this course fulfills a recognized need.

☒ This course is intended primarily for students Choose one: from within this department

B. Level of the course:

☒ Justify request for graduate course level by indicating anticipated enrollments of undergraduate and graduate students.

Anticipated Undergraduate Student Enrollment: 0-10%

Anticipated Graduate Student Enrollment: 75-100%

C. **Prerequisites:** (If none, please explain reasons for absence)

☒ ME 30000
ME 31500

D. **Course Instructor:**

☒ Instructor's Name Jim Braun

E1. **Course Outline:**

☒ (An outline of topics to be covered and an indication of the relative emphasis or time devoted to each topic is necessary. If laboratory or field experience is involved, the nature of this component should be explained as well).

E2. ☒ Method of Evaluation or Assessment:

1. Comprehensive Homework
2. Mid-term and final exams
3. Project report and presentation

F. **Reading List:**

☒ A reading list or bibliography should be limited to material the students will be required to read in order to successfully complete the course. It should not be a compilation of general reference material.

ME 52900
SUSTAINABLE ENERGY OPTIONS AND ANALYSIS

Course Outcomes

1. Gain an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics.
2. Gain an understanding of alternative technologies for meeting future energy needs.
3. Learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics.
4. Gain experience in assessing different energy technologies.

Introduction (2 weeks)

1. Overview of current energy production and consumption
2. Environmental impacts of energy
3. Sustainable energy options

→

Analyzing Energy Options (2 weeks)

1. Life-cycle assessment of energy and environmental impacts
2. Life-cycle economics

→

Energy Storage, Distribution, and End Use (2 weeks)

1. Chained efficiencies
2. Distribution and storage
3. Power production
4. Transportation
5. Industrial
6. Buildings

→

Energy Supply Technologies (8 weeks)

1. Fossil Fuels
2. Solar
3. Wind
4. Geothermal
5. Ocean
6. Nuclear
7. Biomass

Sample Projects

1. Life-Cycle Assessment of Gasoline, Hybrid, and Electric Vehicles
2. Evaluation of Solar and Wind Technologies for Residential Buildings in Indiana
3. Potential for Geothermal Power Production in the U.S.
4. Assessment of Wave Energy off the Coast of Northern Europe
5.

COURSE NUMBER: ME 52900

COURSE TITLE: Sustainable Energy Options and Analysis

REQUIRED COURSE OR ELECTIVE COURSE: Elective

TERMS OFFERED: Spring

TEXTBOOK/REQUIRED MATERIAL: Hodge, B.K., Alternative Energy Systems & Applications, Wiley (2010) plus extensive notes handed out in class

PRE-REQUISITES: ME 30000 Thermodynamics II, ME 31500 Heat and Mass Transfer

COORDINATING FACULTY: Jim Braun

COURSE DESCRIPTION: This course develops an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics. A range of different technologies and approaches are presented for meeting future energy needs. Students learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics and gain experience in assessing different energy technologies for specific case studies.

COURSE OUTCOMES:

1. Gain an understanding of the current energy situation and impacts of energy choices on economics and sustainability metrics.
2. Gain an understanding of alternative technologies for meeting future energy needs.
3. Learn how to assess the potential for alternative energy technologies in terms of economic and sustainability metrics.
4. Gain experience in assessing different energy technologies.

ASSESSMENTS TOOLS:

1. Comprehensive homework
2. Mid-term and final exams
3. Project report and presentation

PROFESSIONAL COMPONENT:

1. Engineering Topics: Engineering Science –2 credits (67%)
   Engineering Design – 1 credits (33%)

RELATED ME PROGRAM OUTCOMES: N/A

NATURE OF DESIGN CONTENT: Use of analysis and computer tools to assess sustainable energy options for a specific case study

COMPUTER USAGE: Energy Equation Solver (EES) and specific software for renewable energy analysis

COURSE STRUCTURE/SCHEDULE:

1. Lecture – 3 days per week at 50 minutes.

PREPARED BY: Jim Braun

REVISION DATE: November 26, 2013