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.

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

Approved for the faculty of the Schools of Engineering by the Engineering Curriculum Committee

EGC Minutes #2
Date: 10-12-16
Chairman EOC
**PURDUE UNIVERSITY**  
REQUEST FOR ADDITION, EXPIRATION,  
OR REVISION OF A GRADUATE COURSE  
(500-600 LEVEL)  

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:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th>ME</th>
</tr>
</thead>
</table>

| Course Number | 52900 |

<table>
<thead>
<tr>
<th>Long Title</th>
<th>Sustainable Energy Options and Analysis</th>
</tr>
</thead>
</table>

**EXISTING:**

<table>
<thead>
<tr>
<th>Subject Abbreviation</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Course Number</th>
<th></th>
</tr>
</thead>
</table>

**TERMS OFFERED:**

- Check All That Apply:  
  - Summer
  - Fall
  - [x] Spring

**CAMPUS(ES) INVOLVED:**

- Calumet
- Cont Ed
- N. Central
- Fl. Wayne
- Tech Statewide
- Indianapolis
- W. Lafayette

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

### CREDIT TYPE

<table>
<thead>
<tr>
<th>1. Fixed Credit: Cr. Hrs.</th>
<th>n</th>
</tr>
</thead>
</table>

| 2. Variable Credit Range:  
  Minimum Cr. Hrs. | (Check One) To Or |
|------------------|------------------|

<table>
<thead>
<tr>
<th>Maximum Cr. Hrs.</th>
<th></th>
</tr>
</thead>
</table>

| 3. Equivalent Credit: Yes No |
|-----------------------------|---|

| 4. Thesis Credit: Yes No |
|--------------------------|---|

**INSTRUCTIONAL TYPE**

<table>
<thead>
<tr>
<th>Minutes Per Mg 50</th>
<th>Meetings Per Week 3</th>
<th>Weeks Offered 16</th>
<th>% of Credit Allocated 100</th>
</tr>
</thead>
</table>

| Lecture  
Reitation  
Presentation  
Laboratory  
Lab Prep  
Studio  
Distance  
Clinic  
Experiential  
Research  
Ind. Study  
Prad/Obsrv |
|----------------|----------------|----------------|------------------------|

**COURSE ATTRIBUTES:**

- 7. Registration Approval Type  
  - Department  
  - Instructor

- 8. Variable Title

- 9. Remedial

- 10. Honors

- 11. Full Time Privilege

- 12. Off Campus Experience

**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

Indiana Department Head  
Date  
Indiana School Dean  
Date  
Undergrad Curriculum Committee  
Date

North Central Department Head  
Date  
North Central Chair  
Date  
Date Approved by Graduate Council  
Date

West Lafayette Department Head  
Date  
West Lafayette College School Dean  
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

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

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 30900
     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.
<table>
<thead>
<tr>
<th>COURSE NUMBER:</th>
<th>ME 52900</th>
</tr>
</thead>
<tbody>
<tr>
<td>COURSE TITLE:</td>
<td>Sustainable Energy Options and Analysis</td>
</tr>
<tr>
<td>REQUIRED COURSE OR ELECTIVE COURSE:</td>
<td>Elective</td>
</tr>
<tr>
<td>COORDINATING FACULTY:</td>
<td>Jim Braun</td>
</tr>
<tr>
<td>COURSE DESCRIPTION:</td>
<td>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.</td>
</tr>
<tr>
<td>PROFESSIONAL COMPONENT:</td>
<td>1. Engineering Topics: Engineering Science – 2 credits (67%) Engineering Design – 1 credit (33%)</td>
</tr>
<tr>
<td>NATURE OF DESIGN CONTENT:</td>
<td>Use of analysis and computer tools to assess sustainable energy options for a specific case study</td>
</tr>
<tr>
<td>COMPUTER USAGE:</td>
<td>Energy Equation Solver (EES) and specific software for renewable energy analysis</td>
</tr>
<tr>
<td>COURSE STRUCTURE/SCHEDULE:</td>
<td>1. Lecture – 3 days per week at 50 minutes.</td>
</tr>
<tr>
<td>TERMS OFFERED:</td>
<td>Spring</td>
</tr>
<tr>
<td>PRE-REQUISITES:</td>
<td>ME 30000 Thermodynamics II, ME 31500 Heat and Mass Transfer</td>
</tr>
<tr>
<td>COURSE OUTCOMES:</td>
<td>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.</td>
</tr>
<tr>
<td>RELATED ME PROGRAM OUTCOMES:</td>
<td>N/A</td>
</tr>
<tr>
<td>PREPARED BY:</td>
<td>Jim Braun</td>
</tr>
<tr>
<td>REVISION DATE:</td>
<td>November 26, 2013</td>
</tr>
</tbody>
</table>