Date: January 25, 2011  
Course Number: ESC 441  
Course Title: Biomass Energy

- [ ] New Course  
- [x] Changes in existing course (check all that apply):
  - Prefix
  - Number
  - Credits
  - Title

- Description
- Pre-requisite(s)
- Co-requisite(s)
- Shared Resources
- Course Format
- Content
- Semester Offered

*This course meets the General Education standards in the following knowledge and skills area (check all that apply):*

- American History
- Humanities
- Other World Civilizations
- The Arts
- Mathematics
- Social Sciences
- Basic Communication
- Natural Sciences
- Western Civilization

**Prequisites or co-requisite requirements:**

- [x] Prerequisites: ESC 325, ESC 335 or consent of instructor  
- Co-requisites:

**Institutional Impact:**

Anticipated Enrollment: 25 per semester

Technology and Classroom Resource Demands: Classroom with computer projection system and chalk or dry erase board.

Computing Resources: Students are required to have access to the internet to complete reading assignments, homework and class projects. Lecture outlines will be made available by email and posted on blackboard.

Library Resources: Students will require access to online journals (e.g., Renewable Energy, Renewable and Sustainable Energy Reviews, Biomass and Bioenergy, Energy) and blackboard.

Transportation Requirements: Buses for field trips

Forest Properties or Field Practicum Facilities Required: None
Health and Safety Considerations:

Conditions or situations present in association with the course?

1. Will substances with any of the following properties be used during instruction: flammability, toxicity, corrosivity, reactivity, registered pesticide, legally controlled, or other characteristics with the potential to cause harm or injury?  
   No

2. Will any physical hazards be present during instruction? (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.).  
   No

3. Will any biological hazards be present during instruction? (e.g., handling animals (rabies or hantavirus); cultures or stocks of infectious agents (fungal spores, viruses, bacteria, etc.).  
   No

4. Will any radiation hazards be present during instruction? (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.).  
   No

5. Will any electrical equipment that, due to its design, location, or method of use, pose any threat to safety during instruction? (Give considerable thought to electrical use outdoors, or any potentially wet location.).  
   No

6. Will there be any personal safety issues related to the class? (e.g., due to time of day or location, at the end of any organized class exercise, will students be in danger of physical assault, etc.).  
   No

7. Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise?  
   No

8. Will any type of personal protective equipment be necessary during class exercises? (e.g., hard-hats, eye/face protection, hearing protection, hand/foot protection, lab coat, visibility clothing, etc.)  
   Yes

If the answer was “Yes” to any of the HEALTH AND SAFETY questions, please explain:

On some field trips to biomass facilities students will be required to wear hard hats, safety glasses and ear protection. This equipment will be provided to students.

CATALOG DESCRIPTION (Please provide using the precise format currently used in the ESF catalog, please do not exceed 1000 characters):

Three hours of lecture per week. Production and use of biomass as a source of renewable energy for the production of bioenergy, biofuels and bioproducts. Characteristics of biomass sources, their conversion to different forms of energy and end products, and an assessments of sustainability. Field trips to regional biomass facilities. Spring
DETAILED COURSE DESCRIPTION

COURSE: ESC 441 – Biomass Energy
       3 Credit Hours – Spring Semester
       3 Hours Lecture Per Week
       Prerequisite(s): ESC 325, ESC 335

SCOPE:

1. Level of Instruction:
   a. ESC 441 is an upper level course intended to fulfill requirements for the renewable energy minor or as an elective

2. Relation to curriculum or to other ESF or Syracuse University courses:
   a. This course was previously taught as BPE 441. Due to issues related to ABET accreditation and the limited engineering focus of this course, it is more suitable as an ESC course. This prefix label change will address the concerns regarding ABET accreditation and limited engineering content and make the course more appropriate for a wide range of students. This is a required course in the Renewable Energy option in Environmental Science and a suggested course in the Renewable Energy minor. The material covered in this course will build on material covered in ESC 325 Energy Systems and ESC 335 Renewable Energy.

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Explain the role that biomass has played as a source of renewable energy, its current status in the U.S. and its projected development.

2. Explain the pros and cons of different sources of biomass for different applications and in different regions of the country.

3. Explain the different conversion processes that are being used and developed to transform biomass into bioenergy, biofuels and bioproducts

4. Critically assess whether different sources of biomass and their associated conversion processes are sustainable using data from a variety of sources such as life cycle analysis, energy return on investment, power production costs.

5. Explain the factors (either barriers or incentives) that are influencing the development of biomass for the production of bioenergy, biofuels and bioproducts in the U.S.

6. Critically analyze both popular and scientific literature about biomass as a source of renewable energy.

MAJOR CONCEPTS OR METHODOLOGIES:

1. Overview of biomass use in the world and the U.S.

2. Overview of chemistry of wood and other sources of biomass

3. Characteristics of biomass feedstocks for bioenergy

4. Assessing supplies of biomass at the local through to the global scale

5. Biomass for heat and power applications
6. Biomass for biofuels and bioproducts
7. The concept and application of biorefineries
8. Sustainability of biomass sources and conversion technologies
9. Steps for the successful implementation of bioenergy systems

CATALOG DESCRIPTION (Please provide using the precise format to be included in the ESF catalog, please do not exceed 50 words)

ESC 441 Biomass Energy (3)

Three hours of lecture per week. Production and use of biomass as a source of renewable energy for the production of bioenergy, biofuels and bioproducts. Characteristics of biomass sources, their conversion to different forms of energy and end products, and an assessment of source sustainability. Field trips to regional biomass facilities. Spring

Prerequisite(s): ESC 325, ESC 335

Credit will not be granted for ESC 441 and ESC 641 (both undergraduate and graduate versions of the same course)

COURSE HISTORY:

This course was previously taught as BPE 441. This was an experimental course in the fall of 2005 and 2006 taught as ERE 596 and in the spring of 2008 as ERE 596 or FOR 496/796.

Last approved: April 2008

Revised Draft: November 10, 2009 (form in protected format: 1/25/11)