ESF Course Proposal Form
Committee on Instruction - ESF Faculty Governance
Office of Instruction & Graduate Studies

Date: September 18, 2013
Course Number: BPE 440
Course Title: Bioprocess Kinetics and Systems Engineering Lab

☐ New Course  OR  ☒ Changes in existing course (check all that apply):

☐ Prefix
☐ Description
☐ Shared Resources
☐ Number
☒ Pre-requisite(s)
☐ Course Format
☐ Credits
☒ Co-requisite(s)
☐ Content
☒ Title
☐ Semester Offered

For new courses only, indicate if you would like approval as a course meeting 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

If changing an existing course, describe the change(s):
__________________________________________________________

List any pre- or co-requisites here:  Pre-requisite BPE 336; BPE 421

Institutional Impact:

Anticipated Enrollment: 25 per semester

Technology and Classroom Resource Demands:  Projector, document camera
Computing Resources:  Computers with Microsoft Office (Excel, Word and Powerpoint), SuperPro, Internet
Library Resources:  Online journals and data base
Transportation Requirements:  No
Forest Properties or Field Practicum Facilities Required:  No

Proposer Contact Information:

Name: __Shijie Liu____________________________  Department: _____PBE_____________
Email: __sliu@esf.edu_________________________  Phone:_________6885___________________
Chair/Coordinator Signature:_____________________________________________________________
Health and Safety Considerations:

Conditions or situations present in association with the course?  
Yes / No

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?  
Yes

2. Will any physical hazards be present during instruction? (e.g., machines that need safety guards; razor blades or syringes; compressed gases, etc.).  
Yes

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.).  
Yes

4. Will any radiation hazards be present during instruction? (e.g., radioisotopes, X-rays, ultraviolet rays, lasers, etc.).  
Yes

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.).  
Yes

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:

The laboratory experiments may last overnight with students in shifts taking samples. It could pose danger to students coming to or leaving class for residence.

Students in this course will use hazardous chemicals, including but not limited to: corrosives and reactive/toxic chemicals (various mineral and organic acids, sodium hydroxide, phenol) as well as biological agents including enzymes, bacteria, and fungi. Students will encounter the following physical hazards either directly or indirectly from working in close proximity to other students in multiple use laboratories: moving mechanical parts, compressed gases and steam heated equipment. Students will encounter working on wet floors and the use of electrical devices (such as mixers and hot plates) in close proximity to wet floors and/or water faucets. Students will be required to wear safety eye glasses/goggles, hearing protection, hand protection and full-skin coverage clothing (no shorts or sandals).

Students will be required to attend both a general safety lecture and a course specific safety lecture given by the course instructor. The course specific safety lecture will provide instructions on: available emergency safety equipment and where to find safe chemical handling information including appropriate personal protective equipment, as well as group travel in industrial facilities. Specific precautions will be given and warning signage pointed out to minimize risks associated while working: on equipment with moving parts (keep hands/feet away, do not wear loose clothing, secure long hair), near compressed gas...
cylinders (avoid close proximity as much as possible while cylinder is in use), with sharp cutting devices (use only for the intended purpose, cut in a direction away from you when possible), with equipment using steam heat (do not touch equipment, avoid close proximity as much as possible) and on wet floors and/or around water fauets with electrical devices (walk carefully and slowly, avoid simultaneous contact with wet surfaces and electrical devices). Appropriate personal protective equipment will be provided.

A detailed course description must accompany the Course Proposal Form
DETAILED COURSE DESCRIPTION

COURSE: BPE 440 – Bioprocess Kinetics and Systems Engineering Laboratory
3 Credit Hours – Spring Semester
1 Hours Lecture Per Week
6 Hours Laboratory Per Week
Prerequisite(s): BPE 336, BPE 421

SCOPE:

1. Level of Instruction:
   a. BPE 440 is a senior level undergraduate course intended to fulfill required laboratory, communication and project leadership requirements in the Bioprocess Engineering program.

2. Relation to curriculum or to other ESF or Syracuse University courses:
   a. BPE 440 is a senior undergraduate course offered by BPE Faculty. This course is open to all disciplines at ESF and SU if space allows.
   b. Shared resource requirements: BPE 640 Bioprocess Experiments and Data Analysis. Independent research project is required on selected projects for graduate students taking this class as BPE 640.

STUDENT LEARNING OUTCOMES:

After completing this course the student should be able to:

1. Conduct experiments in adsorption, chemical and biological reactions / transformations;
2. Perform bioreactor and/or kinetic data (parametric) analysis using modern tools such as excel with visual basic or Matlab;
3. Write laboratory reports;
4. Design, plan and execute a team laboratory project;
5. Communicate and present oral work results to peers in seminar(s);
6. Incorporate biosafety, chemical safety and laboratory safety requirements into laboratory operations;
7. Critiquing fellow students’ work.

MAJOR CONCEPTS OR METHODOLOGIES:

1. Carrying out batch and/or continuous reactor experiments in adsorption, chemical and biological reactions / transformations;
2. Understanding and relating metabolic pathway and/or chemical / biological transformations to kinetics;
3. Understanding the relations and perform analysis based on the stoichiometry of bioreactions;
4. Leading at least one laboratory experiment;
5. Using modern computational tools to analyze experimental data;
6. Presenting experimental findings in writing and seminar;
7. Re-enforcing the biosafety, chemical safety, and laboratory safety requirements

CATALOG DESCRIPTION (Please provide using the precise format to be included in the ESF catalog, please do not exceed 1000 characters)

BPE 440 Bioprocess Kinetics and Systems Engineering Laboratory (3)
One hour of lecture and six hours of laboratory per week. Measurement and analysis of adsorption, chemical and biological transformations, including batch and/or continuous systems. Adsorption and chemical transformation or catalytic reactions may include solid catalyst(s), acid
catalyst(s), base catalysts(s) or other agents. Biological transformation may include enzymes, bacteria, fungi or yeasts. Bioprocess kinetics and mass transfer effects. Data acquisition and parametric analysis. Plan and execute laboratory studies. Student performance will be evaluated against ABET outcomes a through k, plus the two additional program specific outcomes: ability to design, plan and execute a project; and a knowledge of process safety including bio hazards and hazards of reactive systems. Report writing and Seminar presentation. Spring.

Prerequisite(s): BPE 336; BPE 421

Note: Credit will not be granted for both BPE 440 and BPE 640.

COURSE HISTORY:

This course was first proposed: 8/22/2005.
Last approved: 3/10/2008

Revised Draft: 2/8/2013 (form in protected format: 9/18/13)