ETO: The Faculty of the College of Engineering

FROM: The Faculty of Agricultural and Biological Engineering

RE: New Course ABE 30400

The faculty of the Department of Agricultural and Biological Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ABE 30400 Bioprocess Engineering Laboratory
Sem. 2, Class 1. Lab 4. Cr. 3.
Requisites, Restrictions, and Attributes: ABE 30800 [may be taken concurrently]

Description: Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results.

Reason: Previously, Biological Engineering students obtained 1 credit of lab in fluids (via CHE 37700), 1 credit of lab in heat and mass transfer (via CHE 37800) and 1 credit of lab in transport processes (via ABE 45400). These three, 4 credit courses (3 credit lecture + 1 credit lab) were replaced by three, 3 credit lecture courses (ABE 30700, ABE 30800 and ABE 45700). The 3 credit ABE 30400 bioprocess lab was created to cover the remaining 3 credits of lab in these topic areas. The one class hour per week covers lab preparation and introduces students to the procedures that will be used in experiment.

Bernard A. Engel, Professor and Head
Agricultural and Biological Engineering Department

APPROVED FOR THE FACULTY
OF THE SCHOOLS OF ENGINEERING
BY THE ENGINEERING
CURRICULUM COMMITTEE
ECC Minutes #13
Date 5/10/2013
Chairman ECC

EFD 24-13

Office of the Registrar
FORM 40 REV. 10/10

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

DEPARTMENT: Agricultural and Biological Engineering
EFFECTIVE SESSION: ~~Spring 2013~~ (201410)

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/restrictions
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	ABE	Subject Abbreviation	
Course Number	30400	Course Number	
Long Title	Bioprocess Engineering Laboratory		
Short Title	Bioprocess Engr Lab		

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

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

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 [ ]

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	~~50~~	~~1~~		
Recitation				
Presentation				
Laboratory	110	2		
Lab Prep	50	1		
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind Study				
Pract/Observ				

RECEIVED
JUN - 6 2013
OFFICE OF THE REGISTRAR

Cross-Listed Courses
RECEIVED
MAY 23 2013
OFFICE OF THE REGISTRAR

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results.
Requisites, Restrictions, and Attributes: ABE 30800 [may be taken concurrently]

*COURSE LEARNING OUTCOMES

Understand and analyze the flow behavior in biological systems. Understand and analyze enzymatic reactions in biological systems.
Understand and analyze fermentation processes. Understand and analyze mixing and heat transfer in biological systems.
Collect and analyze rheological properties. Design and safely execute experiments in a process laboratory.
Collection and statistical analysis of experimental data. Present the results of analysis in the form of written report and oral presentation.

	Date		Date
Calumet Department Head		Calumet School Dean	
Fort Wayne Department Head		Fort Wayne School Dean	
Indianapolis Department Head		Indianapolis School Dean	
North Central Faculty Spokesperson Chair		Vice Chancellor for Academic Affairs	
West Lafayette Department Head	5/17/13	West Lafayette College/School Dean	5-17-13
West Lafayette Registrar	6/12/13		

OFFICE OF THE REGISTRAR

6/11/13

FORM 40 REV. 10/10

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

EFD 24-13

DEPARTMENT: Agricultural and Biological Engineering

EFFECTIVE SESSION: Spring 2013

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
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- [ ] 8. Change in instructional hours
- [ ] 9. Change in course description
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- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:		EXISTING:	
Subject Abbreviation	ABE	Subject Abbreviation	
Course Number	30400	Course Number	
Long Title	Bioprocess Engineering Laboratory		
Short Title			

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

TERMS OFFERED (Check All That Apply): [ ] Fall [x] Spring [ ] Summer

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

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 [ ]

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	1		
Recitation				
Presentation				
Laboratory	170	1		
Lab Prep	50	1		
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results.
Requisites, Restrictions, and Attributes: ABE 30800 [may be taken concurrently]

*COURSE LEARNING OUTCOMES

Understand and analyze the flow behavior in biological systems. Understand and analyze enzymatic reactions in biological systems. Understand and analyze fermentation processes. Understand and analyze mixing and heat transfer in biological systems. Collect and analyze rheological properties. Design and safely execute experiments in a process laboratory. Collection and statistical analysis of experimental data. Present the results of analysis in the form of written report and oral presentation.

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 Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date
West Lafayette Department Head	Date	West Lafayette College/School Dean	Date
		West Lafayette Registrar	Date

5/13/13

OFFICE OF THE REGISTRAR

ABE 30400 Bioprocess Laboratory

COURSE CONTACT INFORMATION:

Name: Jenna L. Rickus
Phone Number: 765-494-1197
E-mail Address: rickus@purdue.edu
Campus Address: MJIS 2029

Catalog Description. Laboratory course focused on bioprocessing topics such as fluid flow, mixing, rheology, hydrolysis, and fermentation of biomaterials. Students will participate in design of experiments, system set up, data collection, statistical data analysis, and presentation of results.

Concurrent: ABE 30800 Heat & Mass Transfer in Food and Biological Systems

COLLEGE LEARNING OUTCOMES ADDRESSED BY THIS COURSE

__x__ Professional Preparation: Demonstrate proficiency in their chosen discipline that incorporates knowledge skills, technology, and professional conduct.

__x__ Scientific Principles: Demonstrate use of the scientific method to identify problems, formulate and test hypotheses, conduct experiments and analyze data, and derive conclusions.

_____ Critical Thinking: Demonstrate critical thinking by using data and reasoning to develop sound responses to complex problems.

__x__ Communication: Demonstrate the ability to write and speak with effectiveness while considering audience and purpose.

__x__ Teamwork: Demonstrate the ability to work effectively as part of a problem-solving team.

_____ Cultural Understanding: Demonstrate knowledge of a range of cultures and an understanding of human values and points of view of other than their own.

_____ Social Science Principles: Demonstrate ability to apply social, economic, political, and environmental principles to living in a global community.

_____ Civic Responsibility: Demonstrate awareness of civic responsibility to community and society at large.

_____ Lifelong Learning: Demonstrate skills necessary for lifelong learning

DEPARTMENTAL/PROGRAM LEARNING OUTCOMES ADDRESSED BY THIS COURSE

__X__ an ability to apply knowledge of mathematics, science, and engineering

__X__ ability to design and conduct experiments, as well as to analyze and interpret data.

_____ an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

_____ an ability to function on multidisciplinary teams

_____ an ability to identify, formulate, and solve engineering problems

_____ an understanding of professional and ethical responsibility

__X__ an ability to communicate effectively

_____ the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

_____ a recognition of the need for, and an ability to engage in life-long learning

_____ a knowledge of contemporary issues

__X__ an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course outline of Topics/Syllabus

Fluid Flow (3 weeks)
Rheology (3 weeks)
Cellulose Hydrolysis and Fermentation (3 weeks)
Mixing (3 weeks)
Pilot Plant Demos (4 lectures)
pumping, retort, aseptic processing, homogenization
Biological Safety (1-2 lectures)
Lab Notebooks, Data Analysis, Technical Presentations (2 lectures)
Bioprocess Unit Operations (3 lectures)
bioencapsulation, bioseparation, large scale cell culture

Reading List/Textbook

Christie John Geankoplis. Transport Processes and Separation Process Principles. 4th edition.

Example syllabus

ABE 30400 Bioprocess Engineering Laboratory

Course learning objectives:

1. Understand and analyze the flow behavior in biological systems.
2. Understand and analyze enzymatic reactions in biological systems.
3. Understand and analyze fermentation processes.
4. Understand and analyze mixing and heat transfer in biological systems.
5. Collect and analyze rheological properties
6. Design and safely execute experiments in a process laboratory
7. Collection and statistical analysis of experimental data.
8. Present the results of analysis in the form of written report and oral presentation

Evaluation of Student Performance:

The final grades for the course will be determined by a total accumulation of points from all activities and assignments. Individual progress toward course objectives and final grades will be computed based on the following weights:

Assignments	Percentage
Lab Notebooks	10
Laboratory Performance	10
Pre-labs	30
Lab Reports	40
Spontaneous Technical Oral Presentation	10
Total	100

Grading Scale:

Grade	GPA Value	% Range
A	4.0	93-100
A-	3.7	90.0-92.9
B+	3.3	87.0-89.9
B	3.0	83.0-86.9
B-	2.7	80.0-82.9
C+	2.3	77.0-79.9
C	2.0	73.0-76.9
C-	1.7	70.0-72.9
D+	1.3	67.0-69.9
D	1.0	63.0-66.9
D-	0.7	60.0-62.9
F	0.0	<60.0

Course Topical Outline:

Fluid Flow (3 weeks)
Rheology (3 weeks)
Cellulose Hydrolysis and Fermentation (3 weeks)
Mixing (3 weeks)
Pilot Plant Demos (4 lectures)
pumping, retort, aseptic processing, homogenization
Biological Safety (1-2 lectures)
Lab Notebooks, Data Analysis, Technical Presentations (2 lectures)
Bioprocess Unit Operations (3 lectures)
bioencapsulation, bioseparation, large scale cell culture

Lab Notebooks:

Every student will need to purchase a lab notebook from the bookstore. The notebook should be bound (not spiral) and with numbered pages. Carbon copies are not necessary. Lab notebooks will be checked midway through the semester for quality following the rubric distributed in class. Final completed lab notebooks will be collected and evaluated at the end of the semester.

Laboratory performance. A portion of your grade (10%) will also depend on laboratory performance including, but not limited to, any of the following:

- Arriving late to class
- Unexcused absences
- Being unprepared for the lab
- Not engaging with your lab teammates
- Leaving the laboratory before completing the exercise
- Failing to clean up after an experiment
- Violating safety regulations
- Conducting yourself unprofessionally

Pre-lab Assignments. The student groups are expected to submit a pre-lab report describing in detail the experimental plan and procedure which needs to be approved either by one of the instructors for the lab or by the TA. The student groups will NOT be allowed to do the lab experiments without this approval. Pre-lab expectations will be defined during lecture. *Due dates are set in the course calendar.*

Lab Reports. Each student group is expected to submit a lab report. The format for the lab report will be provided in lecture. *Due dates are set in the course calendar.*

Spontaneous Technical Oral Presentation. At any point during the lab, an instructor or TA will ask the group leader for a 2 minute oral summary of what they are working on. Every individual in the class will serve as a group leader at one point during the semester and will be evaluated on their ability to spontaneously and orally communicate a technical project. This exercise in meant to simulate an important situation that occurs frequently in the workplace. The specific expectations and a sample rubric will be provided in class.

Attendance. You should attend all classes. We understand that on *rare* occasions you may have legitimate business that conflicts with class. If you need to miss class, please inform *Professor Rickus* copying your TA *in advance* so you can arrange to submit your work early. Students who are absent are still responsible for knowing course material and getting assignments and announcements regardless of attendance. You are expected to be punctual and to stay for the entire class period. It is simply a matter of courtesy to your fellow students and us.