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

This course proposal form should be completed when introducing a new course or a revision of an existing course. The proposal will be reviewed by the Committee on Curriculum, or, in the case of minor revisions, will be approved administratively by the Associate Provost for Instruction.

This Course Proposal must be completed according to the guidelines provided in Course Proposal Form – Instructions and Guidance. Please see the last page of Course Proposal Form – Instructions and Guidance, for instructions on how this Course Proposal should be submitted to the Committee on Curriculum for review.

Date: December 10, 2020

1. Course Information:

1.1 Course Prefix and Number: BPE 380  
Course Title: Bioprocess Engineering Simulations  
(If a new or renumbered course, please check with the Registrar regarding the use or reuse of the course number)

1.2 ☒ This is a New Course.  
OR  
☐ This is a Major Course Revision  
OR  
☐ This is a Minor Course Revision

If this is a Course Revision, please see Course Proposal Form – Instructions and Guidance to determine if your revision is major or minor. Indicate below the reason(s) for the revision.  

(Please check all that apply)

☐ Course Number/Division ☐ Learning Outcomes ☐ Institutional Resources  
☐ Title ☐ Concepts, Content ☐ Semester Offered  
☐ Credit hours ☐ Catalog Description ☐ Course Inactivation  
☐ Pre- or Co-requisite(s) ☐ Instructional Methods ☐ Course Reactivation  
☐ Format ☐ General Education

1.3 General Education knowledge and skills area (if applicable): If none, check here ☒

☐ American History ☐ Humanities ☐ Other World Civilizations  
☐ The Arts ☐ Mathematics ☐ Social Sciences  
☐ Basic Communication ☐ Natural Sciences ☐ Western Civilization
2. Proposer Need Statement:

2.1 Describe why this course (or course revision) is needed to meet current or proposed goals and outcomes of the program or College, and, if a revision, provide an explanation of and justification for the revision. Bioprocess Simulations course is not offered here at ESF. Students pursuing bioprocess engineering should gain the practical skills and knowledge of process modeling and process flow sheets, equipment sizing, and economic calculations, and use of computer software for a process design, material and energy balance, evaluating commercial scale economic and technical feasibility of a process (Techno-economic analysis), and optimize process conditions.

2.2 List the pre-requisite or co-requisite courses (taught within the home department or taught by another department) and explain their relationship to the proposed course. BPE 300 or a similar course. The proposed Bioprocess Simulation course requires students to understand the bioprocessing unit operations and have the knowledge of unit operations and processes used in biotechnology, biopharmaceutical, biochemical and biofuel industries. Students should also know some basic mass and energy calculations, and this course will allow them to learn how to perform these calculations using computational tools.

2.3 Explain the impact of this course in meeting the goals and outcomes of other Departments/programs (if any).

2.4 If the proposed course is designed to fulfill SUNY General Education Requirements, the Associate Provost for Instruction must review this proposal to ensure that General Education Requirements will be met for the specified knowledge area (See Instructions and Guidance). Please provide an explanation of how this course fulfills SUNY General Education Requirements.

2.5 What are the staffing requirements (instructor, TA, Lab tech, etc.) for this course? If a new course, are there new staffing needs or are there adequate staff members already in place? If a revised course, are there additional staffing needs? Instructor

2.6 What Department (or extra-Department) resources are or will be made available to support the course or course revision? Computers and SuperPro Designer Software (already available)

2.7 Anticipated Enrollment (enter where applicable)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Anticipated Enrollment</th>
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<tbody>
<tr>
<td>Fall Semester</td>
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<td>Summer Semester</td>
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2.8 Anticipated frequency of class meetings. 2 lectures per week (1.5 hour each)
3. DETAILED COURSE DESCRIPTION

3.1 COURSE IDENTIFICATION AND FORMAT:

3.1.1 Course Prefix and Number: BPE 380
3.1.2 Course Name: Bioprocess Engineering Simulations
3.1.3 Credit Hours: 3
3.1.4 Semester (check all that apply): Fall ☐ Spring ☑ Summer ☐
3.1.5 Format (check as appropriate): Lecture ☑ Online ☐ Lab ☐ Field ☐ Other ☐ (explain)
3.1.6 Contact hours per week: 3 hours
3.1.7 Prerequisite(s) – if none, please enter “None” (Be specific, as Upper Division courses and Graduate courses will likely have some pre-requisite knowledge) BPE 300

3.2 SCOPE:

3.2.1 Level of Instruction (check one, or two if a shared resource course):
- Lower Division ☐
- Upper Division ☑
- Beginning Graduate ☐
- Advanced Graduate ☐

3.2.2 Relation to curriculum or to other ESF or Syracuse University courses:
- a. Is this a required course? No ☐ Yes ☑
- If Yes, please list the program(s) for which it is a requirement: Bioprocess Engineering
- b. Is this an elective course within your department? No ☐ Yes ☑
- c. Is enrollment in this course restricted? No ☐ Yes ☑
- If Yes, please explain:
- d. Are other ESF or SU courses similar or identical to this course? No ☐ Yes ☑
- If Yes, please identify the courses:
- e. Is this course a shared resource offering (i.e. is there a graduate or undergraduate concurrent offering)? No ☐ Yes ☑
- If Yes, what is the course number of the concurrent offering?

3.3 STUDENT LEARNING OUTCOMES:

Identify the student learning outcomes associated with this course.

At the completion of this course, students should be able to:

1. Develop flow diagrams illustrating the processes involved and unit operations required
2. Apply design specifications of various unit operations (e.g., bioreactors, fermenters, distillation, etc.) in SuperPro Designer
3. Use kinetics and other experimental data to design and simulate bioreactors in SuperPro Designer
4. Conduct material and energy balance, and throughput analysis using process simulation tools
5. Perform detailed economic analysis and calculate profitability of the process

6. Perform sensitivity analysis and identify optimal process conditions

### 3.4 MAJOR CONCEPTS, PROCESSES or TOOLS:

Identify the course content and themes (e.g. Table of Contents) consistent with the learning domains and outcomes.

1. Basics of process simulations

2. Process visualization (process diagram using process simulation tools)

3. Model process flows

4. Stream properties

5. Chemical properties database

6. Use experimental data (lab scale and pilot scale) to design commercial scale process

7. Equipment Scaling and cost index

8. Material and Energy balance

9. Debottlenecking and cycle time reduction

10. Production Planning and Scheduling

11. Economic analysis

12. Sensitivity analysis and optimal process conditions

### 3.5 INSTRUCTIONAL METHODS:

Identify the methods used to meet the course outcomes, as well as the principal instructional methods. Lectures, lab (computer lab), projects

### 3.6 CATALOG DESCRIPTION

Provide the course description using the precise format to be included in the ESF catalog (i.e. course number and title; format; brief description; semester(s) offered; and pre-/co-requisites). Please do not exceed 1000 characters.

BPE XXX Bioprocess Engineering Simulations (3)

One and a half hours of lecture two times per week. Use of software package (e.g., SuperPro Designer) to design, model and simulate chemical and bioprocess flow sheets. Model complex bioprocess simulations under continuous or batch mode, accessing databases for properties of
chemicals, equipment sizing, material and energy balances of integrated processes, throughput analysis, detailed cost analysis, profitability, overall techno-economic evaluation and sensitivity analysis.

Prerequisite(s): BPE 300

3.7 COURSE HISTORY:

Provide the dates of prior approval of this course, and its revision history. N/A

3.7.1 Relationship to current ESF courses

This course is replacing a current ESF course  ☒ YES  ☒ NO

If NO, then proceed to section 4 below.

If YES, then provide below the number and name of the course to be deactivated and removed from the catalog once this course proposal has been approved:

Course Number (of the course to be replaced)
Course Name (of the course to be replaced)

If the course to be replaced is used by departments other than the department sponsoring this proposal, please indicate below which departments are affected and the date they were notified about the course replacement.

Department:  Date of Notification:
Department:  Date of Notification:
Department:  Date of Notification:
Department:  Date of Notification:
4. Institutional Impacts:

This section pertains to forecasting institutional resource needs to support the course or course revision. Provide clear statements regarding the needs and current availability (or absence) of resources. Note that, if this is a course revision, only the impacts of the revision should be included.

Staffing needs: N/A

Classroom resources (e.g. physical facilities in a laboratory, lecture hall, flexible space, academic computing):

Computer Lab

Technology Resources:

Computers and Software

Computing Resources (software licensing, hardware, access):

SuperPro Designer

Library Resources (subscriptions, services):

N/A

Transportation Requirements (budget, fees, fleet vehicles):

N/A

Forest Properties or Field Practicum Facilities:

N/A
5. Health and Safety Considerations:

Will any of the conditions or situations outlined below be present in association with the course?  

Yes / No

5.1. 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?  

☐ / ☒

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

☐ / ☒

5.3. 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.).  

☐ / ☒

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

☐ / ☒

5.5. 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.).  

☐ / ☒

5.6. 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.).  

☐ / ☒

5.7. Will any students be driving official state or research sponsored land or water vehicles during any class or instructional exercise?  

☐ / ☒

5.8. 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.)  

☐ / ☒

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

For lab and field courses to which all answers are “no”, you should explain that here, also. Normally, we would expect some safety precautions for such courses.
6. Coordination and Consultation

Emails/letters, as noted below and attached to this proposal, or signatures below, indicate that the affected departments, programs or units have been notified of this proposal and have had an opportunity to assess the impact of the proposal on their respective units.

Affected Academic Department(s) or Program(s) – other than the sponsoring department:

Department/Program 1

Chair Signature

Name of Chair/Program Director

Date

[if more than three Departments/Programs, please continue on a separate page]

Other Units:

Associate Provost for Instruction & Dean of the Graduate School (for Gen Ed courses only)

Date

Registrar

Date

Library Director

Date

Computing and Network Services

Date

Physical Plant

Date

Forest Properties

Date

Environmental Health and Safety

Date
7. Proposer Information and Sponsoring Department Chair Affirmation:

Contact Person:

Name: Deepak Kumar  Department: Paper and Bioprocess Engineering
Email: dkumar02@esf.edu  Phone: (315)470-6503

This proposal has been reviewed and approved by the sponsoring Department. Affected departments have been notified and given the opportunity to provide feedback. Department resources are or will be made available to support the course, or a plan is in place to meet the resource needs as identified in the Institutional Impacts section of this proposal (see Section 4, above).

Name: ___________________________________________ Date: ____________
Department Chair (or designated curriculum representative)

Signature: ___________________________________________ Or letter attached □
Department Chair (or designated curriculum representative)

8. Approvals:

_________________________________________  Date
Curriculum Committee

_________________________________________  Date
Faculty Governance

_________________________________________  Date
Provost