

2

ROWAN COLLEGE CURRICULUM COMMITTEE

PROPOSAL TITLE: Bioprocess Engineering 0906-462

UNDERGRADUATE GRADUATE 3.0 CREDIT HOURS

SPONSOR(S): C. Stewart Oiler and School of Engineering Curriculum Committee

DEPARTMENT & TELEPHONE# Chemical Engineering X4631

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION
 ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

STEP #1 (DEPARTMENT)	STEP #2 (RECEIPT)	STEP #3 (SCHOOL)
APPROVED/DATE: NOT APPROVED/DATE: <u>N/A</u> DEPT. CURRICULUM CHR. REVIEWED/DATE: <u>N/A</u> DEPT. CHR.	SCC# <u>0906-125</u> DATE RECEIVED: <u>2/10/96</u> <u>[Signature]</u> SENATE CURRICULUM CHR.	REVIEWED DATE: <u>2/14/96</u> <input checked="" type="checkbox"/> RECOMMEND TO APPROVE <input type="checkbox"/> RECOMMEND NOT TO APPROVE FORWARD FOR OPEN HEARING <input checked="" type="checkbox"/> WITHOUT RESERVATIONS <input type="checkbox"/> WITH RESERVATIONS COMMENTS: <u>[Signature]</u> SCHOOL COMMITTEE CHR.

STEP #4 (ACADEMIC DEAN) COMMENTS:

RECOMMEND
 NOT RECOMMEND
 CONDITIONALLY RECOMMEND (SEE COMMENTS)

DATE & SIGNATURE, DEAN OF SCHOOL: [Signature] 2/16/96

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING: 2/23/96

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE): 2/23/96

RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

STEP #6 (SENATE)

DATE PRESENTED TO SENATE: 2/5/96

APPROVED NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE): 2/20/96

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE: [Signature] 2/20/96

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 9/96

APPROVED: YES NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS _____

FACULTY LOAD HOURS _____

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST [Signature]

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 14 Mar 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 0906-462

DATE/SIGNATURE OF REGISTRAR B. J. Kiley

NOTIFICATION FORWARD:

SENATE CURRICULUM COMMITTEE CHAIRPERSON

DEPARTMENT CHAIRPERSON(S)

ACADEMIC DEAN(S)

REGISTRAR

SPONSOR(S)

Course Proposal**1. Details:**

- a) Course Title:** Bioprocess Engineering
b) Sponsor: School of Engineering Curriculum Committee
 Dr. C. Stewart Slater, Chemical Engineering
c) Credit Hours: 3 credit hours
d) Course Level: Senior (0906.462)
e) Curricular Effect: Technical Elective for Chemical Engineering majors
f) Prerequisites: Reaction Engineering, Separation Processes
**g) Suggested Time/
 Scale of Implementation:** Spring 2000
 1 section
h) Resources: Faculty will be hired and laboratory equipment obtained consistent with Engineering School multi-year budget. Library acquisitions will be required.

2. Rationale:

The proposed course is a new offering consistent with other courses in the Engineering Curriculum Proposal approved by the College Senate in December 1994. The proposed course is consistent with the establishment of the School of Engineering approved by the Board of Trustees in February 1995.

The proposed course is Technical Elective for all Chemical Engineering majors and satisfies the Engineering Topics credit requirements of the Education and Accreditation Committee (EAC) of the American Institute of Chemical Engineers (AIChE) for accreditation of the Chemical Engineering program by the Accreditation Board for Engineering and Technology (ABET).

The course will address the process aspects of biotechnology - one of the most widely recognized emerging multidisciplinary fields for the 21st century. Bioprocess engineering principles are critical in the research and development of new drug production, health care devices, bioremediation of hazardous waste, and specialty chemical/biochemical production. This course will allow chemical engineering students to broaden their career options.

3. Essence of the Course:**a) Objectives:**

Upon completion of the course, students will be able to:

1. Understand the different fields of biotechnology.
2. Combine the essential aspects of biochemistry, microbiology, and genetics with

engineering principles.

3. Understand how to mathematically model bioprocesses.
4. Perform design and scale-up calculations on bioreactors.
5. Select the proper purification and recovery process and design a series of processes.
6. Work in groups to solve open-ended design problems.
7. Collect and analyze laboratory data using experimental systems such as fermentors and microfiltration units.

b) Topical Outline:

The topics to be covered are listed below. The instructor will supply the students with a syllabus during the first week of classes. The instructor will assess any technology advances in the subject matter prior to the course and make topic changes as deemed appropriate to maintain the level and currency of instruction.

Introduction

- Biotechnology and biochemical engineering
- Interface between science and engineering

Overview of biotechnology basics necessary for processing

- Cells and microbial diversity
- Enzyme kinetics
- Cell function
- Metabolic pathways

Cell growth and product formation

- Batch growth and kinetics
- Continuous culture growth
- Stoichiometry of microbial growth and product formation

Process considerations for bioreactors for suspensions and immobilized cultures

- Batch and continuous reactors
- Immobilized cell systems
- Solid-state fermentations

Selection, scale-up, and control of bioreactors

- Scale-up difficulties
- Bioreactor instrumentation and control

Sterilizing process fluids

Separation of insoluble products

Filtration/microfiltration

Centrifugation

Cell disruption

Isolation/purification of soluble products

Extraction

Adsorption

Chromatography

Precipitation

Finishing steps for purification

Crystallization

Drying

Ancillary process operations

Water quality

Solvent recovery

Waste disposal

Laboratory experiments and demonstrations will be integrated throughout the course.

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations, homework and/or projects. A course syllabus with a stated method of arriving the final grade, e.g., number of exams, projects, homework, percentage of grade, will be distributed to students the first week of classes.

d) Course Evaluation:

The proposed course will be evaluated on the basis of student evaluations and curriculum review by appropriate faculty.

4. Results of Consultations:

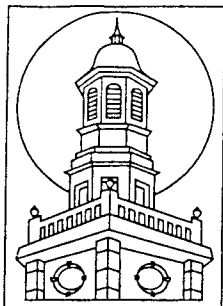
The proposed course is part of the Engineering Curriculum Proposal approved by the Faculty Senate in December 1994. Consultations were submitted with original proposal as specified by the Curriculum Committee. Consultations have been made with Chemistry faculty in the Department of Chemistry and Physics who have provided a letter of support.

Catalog Description

Bioprocess Engineering (0906.462)

(Prerequisite: Reaction Engineering, Separation Processes)

This course reviews the fundamentals and engineering of bioprocess engineering with emphasis on applying biotechnology to industrial processes. Essential aspects of biochemistry, microbiology and kinetics are presented. This course discusses bioreactor engineering, and recovery and purification processes. Processing applications of engineering kinetics and enzyme technology are included. Laboratory experiments and demonstrations will be integrated throughout the course.



Rowan College of New Jersey

Glassboro, NJ 08028-1701 • 609/256-4855

Department of Chemistry and Physics

To: Curriculum Committee
From: Robert Newland, Chairperson
Subject: Chemical Engineering Technical Electives
Date: February 15, 1996

A handwritten signature in black ink, appearing to read 'RN', located to the right of the header information.

I have examined the course proposals listed below and find them in accord with the previously submitted curriculum plan. I also have noted where courses require chemistry and /or physics prerequisites and am convinced there are no additional resources required to meet this demand for our courses. We fully support these proposals.

Electrochemical Engineering
Environmental Regulations in Technology Industries
Environmental Considerations in Process Design
Process Safety
Membrane Process Technology
Advanced Separation Technology
Process Heat Transfer
Fluid Flow in Processing and Manufacturing
Advanced Reactor Design
Bioprocess Engineering
Transport Phenomena