CBEMS112 INTRODUCTION TO BIOCHEMICAL ENGINEERING

Catalog Data: **CBEMS112 Introduction to Biochemical Engineering (Credit Units: 3).** Application of engineering principles to biochemical processes. Topics include: microbial pathways, energetics and control systems, enzyme and microbial kinetics, and the design and analysis of biological reactors. Prerequisites: Chemistry 1C, Mathematics 3D; and CBEMS110 or consent of instructor. (Design units: 1)

Textbook: Bailey, James E. and Ollis, David F., *Biomedical Engineering Fundamentals,* 2nd edition, McGraw Hill, 1986.

References:

Coordinator: Nancy A. Da Silva

Course Objectives: To design biochemical engineering processes, a chemical engineer must understand aspects of microbiology, biochemistry, and molecular biology. An understanding of energetics, regulation, enzyme kinetics, growth kinetics, and transport phenomenon are also required for the design of biochemical systems and for the design and analysis of bioreactors. This course is an introduction to the basic concepts in these areas. The course builds on concepts from biology, chemistry, thermodynamics, mass and energy balances, reaction kinetics and reactor design, and differential equations.

Course Outcomes: Students will be able to:
Understand general concepts in microbiology, biochemistry, and recombinant DNA technology.
Analyze metabolic stoichiometry, energetics, and regulation in the cell.
Analyze enzyme kinetics and the kinetics of growth and product formation.
Design and analyze bioreactors (batch, CSTR, fedbatch).
Understand various operations for the separation and recovery of biological products.

Prerequisites By Topic: Chemical engineering thermodynamics, Mass and energy balances, Reaction kinetics and reactor design, Chemistry, Differential equations.

Lecture Topics:
Microbiology and Biochemistry Topics
Enzyme Kinetics, Immobilized Enzymes
Metabolic Stoichiometry and Energetics
Regulation, rDNA Technology
Kinetics of Growth, Substrate Utilization, and Product Formation
Bioreactor Design
Oxygen Transfer
Product Recovery Operations

Class Schedule: Each class meets 3 hours per week for 10 weeks.

Computer Usage: Not required.

Laboratory Projects:

Professional Component: Contributes toward the Chemical Engineering Topics Courses and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes 5, 8, 9, 10, and 12 as stated at: http://www.eng.uci.edu/dept/objective_chemical

Design Content Description

Approach: Multiple lectures on bioreactor design with relevant homework problems.
Lectures:
Laboratory Portion:

Grading Criteria:

Homework:	20%
Midterm exam:	40%
Final exam:	40%
	100%

Exams and quizzes are closed book and notes. In general, exams and quizzes cannot be made up and no late homework sets will be accepted.

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%
Engineering Science: 2 credit units or 67%
Engineering Design: 1 credit units or 33%

Prepared by: Nancy A. Da Silva **Date:** July 2005

CEP Approved: Fall 2001