Engineering Faculty Document No. 23-01
October 6, 2003

To: Faculty of the Schools of Engineering

From: Faculty of the School of Chemical Engineering

Subject: Conversion of CHE 597T to a permanent course number CHE 525

The Faculty of the School of Chemical Engineering approved the conversion of CHE 597T to CHE 525 on September 25, 2003.

CHE 525 Biochemical Engineering Sem. 1, Class 3, Credit 3
Prerequisite: CHE 348 and BIOL 295E or equivalents or consent of instructor

Enzyme kinetics, mathematical models of microbial growth, bioreactor design and operation, genetic and metabolic engineering, plant and animal cell culture, and purification of biological products.

REASON

The production of chemicals through biological means is becoming more prevalent in industries that employ chemical engineers. Therefore, a course focused on the synthesis and purification of products through biological routes is an important part of the chemical engineering curriculum at both the undergraduate and graduate levels. Applications of fundamental knowledge of microbial, animal and plant cell physiology to the production of chemicals will be introduced in CHE 525. This course utilizes a mathematical modeling framework to describe and analyze enzyme reaction and cellular growth kinetics as well as the separation of biological molecules. Thus, it will prepare students to actively participate in new biologically-based industrial opportunities for Chemical Engineers. This course has been offered numerous times as CHE 597T. The typical enrollment has been 50 chemical engineering students with 10 first year graduate students and the remaining students have been undergraduate seniors.

G.V. Reklaitis, Head,
School of Chemical Engineering
Date:_____

SUPPORTING DOCUMENTATION for **EFD 23-01**, change 597T to permanent course number CHE 525.

1. **Justification**

The production and purification of biomolecules is an area of increasing industrial and academic importance. Chemical engineers continue to play a key role in the development and practice of this field. Biochemical engineering is the field of study concerned with production or remediation of compounds using biological molecules and organisms as catalysts. This course presents a quantitative and mechanistic understanding of biological processes based on the core areas of chemical engineering: thermodynamics, kinetics, and transport. Topics covered are enzyme kinetics, transport of biomolecules, microbial growth, bioreactor design and operation, genetic and metabolic engineering, plant and animal cell culture and purification of biological products.

2. **Level:** This course is intended to be a dual-level course

3. **Prerequisites:** CHE 348, and BIO 295E or equivalents or permission of the instructor.

4. **Course Instructor**: Professor John A. Morgan

5. **Course Outline**:

Topics	# Lectures
a. Macromolecule structure and function	3
b. Enzyme kinetics	3
c. Biocatalysis and immobilized enzymes	3
d. Mathematical modeling of microbial growth	4
e. Mass and energy balances of bioreactors	4
f. Bioreactor operation and design	6
g. Bioseparations	6
f. Plant and animal cell culture	3
h. Recombinant protein production	2
i. Introduction to protein engineering	2
j. Introduction to metabolic engineering	1
k. Genomics, proteomics, metabolomics)	3

6. Text: Bioprocess Engineering Basic Concepts 2nd Edition (2002) M. Shuler and F. Kargi, Prentice Hall.

   Lecture notes based upon selected research articles and selections from Biochemical Engineering Fundamentals 2nd Edition (1986) J. Bailey and D. Ollis, McGraw Hill.