**PROPOSAL NUMBER: 99**

**CURRICULUM PROPOSAL FORM**

*DEADLINES:*

<table>
<thead>
<tr>
<th>PROPOSAL TITLE:</th>
<th>Biomedical Process Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPONSOR/S:</td>
<td>Dr. Stephanie # Farrell &amp; Chem Eng Curriculum Committee</td>
</tr>
<tr>
<td>DEPARTMENT:</td>
<td>Chemical Eng</td>
</tr>
</tbody>
</table>

**CHECK ALL THAT APPLY:**
- [ ] UNDERGRADUATE
- [x] GRADUATE

<table>
<thead>
<tr>
<th>COLLEGE:</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF LAS:</td>
<td>History/Humanities</td>
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<tr>
<td></td>
<td>Math/Sciences</td>
</tr>
<tr>
<td></td>
<td>Social/Behavioral Sciences</td>
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</tbody>
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**TYPE OF PROPOSAL** (Check ALL that Apply)
- [x] New Course (NOT Gen. Ed.)
- [ ] Name Change (Dept., School, Major)
- [ ] Changes in Degree Requirements
- [ ] Changes Involve Gen. Ed. requirements
- [ ] Minor Changes to Existing Courses
- [ ] New Minor/Concentration/Specialization
- [ ] New Major/Degree Program
- [ ] Short Term Course Proposal

**DEPARTMENT**

(SIGNATURE INDICATES APPROVAL)

*Robert P. Holbach 10/22/98*

DEPT. CURRICULUM CHAIR / DATE: 10-22-98

**COLLEGE CURRICULUM COMMITTEE**

DATE OF OPEN HEARING (if necessary)

**APPROVED**

**NOT APPROVED**

COMMENTS:

*Robert P. Holbach 2/1999*  
**SIGNATURE**

**ACADEMIC DEAN (& GRADUATE DEAN, for New Graduate Programs Only)**

**APPROVED**

**NOT APPROVED**

COMMENTS:

*G. Davis 10/22/98*  
**SIGNATURE** (Academic Dean)

**SIGNATURE** (Graduate Dean)
1. Details:

a) Course Title: Biomedical Process Engineering (0906.572)
b) Sponsor: Dr. Stephanie H. Farrell and Chemical Engineering Curriculum Committee
c) Credit Hours: 3 credit hours
d) Course Level: Graduate
e) Curricular Effect: Technical elective for engineering graduate courses
f) Prerequisites: Graduate standing and approval of Graduate Advisor
g) Suggested Time/Scale of Implementation: Fall 1999 1 section
h) Resources: Faculty will be hired consistent with the College of Engineering multi-year budget. No computer software beyond what is currently being acquired for approved course will be necessary. Laboratory equipment will be obtained consistent with the College of Engineering capital budget. Library acquisitions will be required consistent with current acquisition plan.

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 College of Engineering approved by the Board of Trustees in February 1995.

The course will address the areas of biomedical engineering that are important multidisciplinary topics relevant to many areas of engineering and science. The course will describe the basic principles of biomedical processes. This will include an introduction to drug delivery and pharmacokinetics, blood flow an circulatory system, transport across membranes, and human and artificial organs.

3. Essence of the Course:

a) Objectives:

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

1. Understand the fundamentals of thermodynamics, kinetics and mass transfer as related to biomedical processes.
2. Design biomedical devices.
3. Model and simulate biomedical processes.
4. Understand the basic mechanisms of various biomedical processes.
5. Use computer software to analyze biomedical problems.
6. Work in teams to solve open-ended design problems.

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 to biomedical systems
  Interdisciplinary nature of Biomedical systems
  How Chemical Engineering Principles apply to Biomedical Processes
  Mass Transfer
  Heat Transfer
  Fluid Flow
  Chemical Reaction

Drug Delivery
  Objectives
  Traditional methods
  Controlled release
  Mechanisms of controlled release
  Modeling of controlled release systems

Pharmacokinetics
  Dissolution, absorption, metabolism, excretion
  Single and multiple dose
  Injection, ingestion, and controlled delivery
  Pharmacokinetic models

Circulatory system
  Transport processes in physiology
    - Mass transfer
    - Fluid flow
    - Heat transfer

Transport through cell membranes
  Membrane structure, composition, and permeability
  Solvent movement across membranes
Solute movement across membranes

Organs
- Human and artificial kidney
- Human and artificial pancreas
- Human heart and artificial heart

c) Evaluation and Grading Procedure of Students:

Student grades will be based on examinations, homework and a required semester project. A course syllabus with a stated method of arriving to 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. No consultations are relevant.
Catalog Description

Biomedical Process Engineering (0906.572)

Prerequisite: Graduate standing and approval of Graduate Advisor
This course introduces students to applications of chemical engineering fundamentals to biomedical systems. Students analyze and design biomedical processes. The basic biochemistry and physiology required for understanding of biomedical systems is presented. Advanced principles of mass transfer, heat transfer, fluid flow and chemical reaction are used to analyze or design drug delivery systems, pharmacokinetic models, the circulatory system, transport across cell membranes, and human and artificial organs. Laboratory experiments and demonstrations will be integrated throughout the course.