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CURRICULUM PROPOSAL FORM 2000-2001

**NON-GENERAL EDUCATION PROCESS A**

**\*DEADLINES:** Deadline dates for 2000/2001 submissions: Regular proposals: October 20, 2000 to be implemented in Fall 2001; Short-Term proposals: December 8, 2000 to be implemented in Fall, 2001; Regular proposals February 16, 2001 to be implemented in Spring, 2002; March 23, 2000 for short-term courses to be implemented in Spring 2002.

PROPOSAL TITLE: BIOLOGICAL SYSTEMS + APPLICATIONS

SPONSOR(S): G. HECHT / P. MOSTO (BIOLOGY)  
S. FARRELL / S. SLATER (CHEM. ENG.)

DEPARTMENT: BIOLOGICAL SCIENCES

COLLEGE: LAS

0401 210

IF LAS CHECK ONE:  History/Humanities  Math/Sciences  Social/Behavioral Sciences

Check one:  Undergraduate  Graduate

THE ATTACHED **NON-GEN-ED** PROPOSAL IS BEST DESCRIBED BY THE ITEM(S) CHECKED.

New non-gen-ed course

Short-term non-gen-ed course

Minor curricular changes (fewer than three) to:

existing non-gen-ed course

non-gen-ed degree requirements

major

minor, specialization, concentration, track, certificate program

**DEPARTMENT**

(Signature indicates approval)

Dept. Curriculum Chair / Date

Dept. Chairperson / Date

*[Handwritten signatures]*

10-20-00

**ACADEMIC DEAN**

Approved

Not Approved

Comments:

Dean's Signature/Date

*[Handwritten signature]* 11/2/00

**COLLEGE CURRICULUM COMMITTEE**

Date of open hearing (if necessary) \_\_\_\_\_ Approved  Not Approved \_\_\_\_\_

Comments:

Signature of College Chair/Date: *[Signature]* May 17 2001

**UNIVERSITY CURRICULUM COMMITTEE**

Date Received/Processed 7/3/01

Comments:

Curriculum Chair Signature *[Signature]* Date Announced At Senate 7/2/01

**EXECUTIVE VICE PRESIDENT/PROVOST**

Approved  Not Approved \_\_\_\_\_ If no, reasons are as follows:

Student Credit Hours \_\_\_\_\_ Faculty Load Hours \_\_\_\_\_ Equalized Credit Hours \_\_\_\_\_

Official Copy & Approval Sheet Filed (Date): \_\_\_\_\_ Executive VP/Provost Signature/Date *[Signature]* 6/5/01

**REGISTRAR**

Date Approved Course Description Received \_\_\_\_\_ Hegis Taxonomy & Course Number Assigned \_\_\_\_\_

Registrar Signature/Date *[Signature]* 6/5/01

**NOTIFICATION FORWARD**

Senate Curriculum Committee Chairperson

Academic Dean(s)

*memo sent  
8/13/01*

Department Chairpersons

Registrar

\_\_\_\_ Sponsor(s)

## Proposal to Establish a New Course Entitled "Biological Systems & Applications"

### 1. DETAILS:

**a. Course Title:** Biological Systems & Applications

**b. Sponsor(s):** Gregory Hecht (Biological Sciences); Patricia Mosto (Biological Sciences); Stephanie Farrell (Chemical Engineering); Stewart Slater (Chemical Engineering). The Department of Biological Sciences will bear primary responsibility for administering the proposed course.

**c. Credit Hours:** This course will have two lecture sessions (1 hr., 15 min.) and one laboratory session (2 hrs., 45 min. each) sessions per week. As is typical for existing laboratory courses, students will receive 4 credit hours for this course; faculty teaching this course will receive 5 contact hours.

**d. Course Level:** Sophomore (200 level HEGIS number requested).

**e. Prerequisites:** Advanced College Chemistry I (1906.105).

**f. Suggested time and scale of implementation:** Implementation requested for Fall 2001 semester. One section (24 students) will be taught during each Fall semester.

**g. Curricular Effect:** This course will provide Engineering students with a working knowledge of a broad range of biological principles. The focus on application and laboratory work will be particularly valuable to engineering students. The course will provide students with the skills necessary to pursue work in cutting-edge technical fields such as biochemical engineering and biotechnology, biomedical engineering, and environmental engineering.

Engineering students currently take Biology I. The proposed course will replace one of the Biology I sections that is currently offered each Fall semester.

This course will not count towards fulfillment of the B.S. Biology degree, and therefore is not expected to be filled by Biology majors.

**h. Adequacy of the present staff, resources, space needs, and any other additional requirements for implementation.** The Biological Sciences Department will assume primary responsibility for administering this course. Because the Department will offer one less section of Biology I to accommodate the proposed course, the Department believes that it has sufficient resources to implement this course.

**i. Recommended Library Resources:** Library resources are adequate at the present time. In the future, we hope that additional materials (especially journals in the relevant fields) can be purchased for the Rowan Library.

**j. Short-term Evaluations:** Not applicable.

## 2. RATIONALE:

This type of basic science course is consistent with current ABET requirements. Previously 2 semesters of Physics and 16 credits of chemistry were required; however, the new requirements encourage innovative curricula in which basic math and science courses are used to satisfy the direction and mission of the Chemical Engineering program. This course is part of an effort to include innovative methods of teaching and learning and cutting-edge curricula to prepare students better for a rapidly changing and highly competitive marketplace, as recommended by ASEE.

For this course best to serve engineering students, it should provide students with a working knowledge of a broad range of biology principles and techniques that will be used by chemical engineers throughout their curriculum and after graduation. This background should ideally include basic biochemistry, cell biology, genetics, general microbiology, and environmental microbiology, as well as applications of each. The current course offerings from the Biological Sciences Department would require ChemE students to enroll in Biology I, Biology II, Microbiology, and Environmental Microbiology in order to cover all of these areas. Unfortunately, there is insufficient space in the ChemE curriculum to insert a four semester biology sequence. Moreover, the four course sequence would include a great deal of information that would be considered to be superfluous in the context of an ABET review. This proposal seeks to establish a single course that will present the salient topics in a concise and unified fashion coordinated with extensive and rigorous "hands-on" experiences during the laboratory sessions.

## 3. ESSENCE OF THE COURSE:

**a. Objectives of the course in relation to student outcomes.** Students who successfully complete this course will have learned basic concepts in biochemistry, cellular biology (prokaryotic and eukaryotic), genetics (including prokaryotic genetic transfer systems, eukaryotic transmission genetics, and molecular genetics), general microbiological physiology, environmental microbiology, and the applications of all of the above. Students will be exposed to these areas in both lecture and laboratory format. One of the underlying themes present in each lecture will be an emphasis that all biological systems (from the molecular level to the community level) are dynamic, interactive, and generally cannot be treated as static reagents. The laboratory exercises will also provide students with experience in a variety of standard biological techniques including aseptic culturing techniques, light microscopy, micropipetting, and a sampling of techniques from biotechnology and environmental science. The net result is that students will have acquired an integrated "toolkit" of knowledge, physical skills, and a framework for expanding their biological expertise when asked to do so by their future projects.

**b. Topical Outline/Content.** A sample syllabus is presented below. The exact order of some topics may differ slightly than what is presented here, but the lists presented here are representative of the scope of the course.

### *Lecture topics:*

- Course introduction.
- Biologically important molecules.
- Properties of biological membranes.
- Prokaryotic cell biology (including discussion of antibiotic targets).
- Eukaryotic cell biology.
- DNA (structure; replication & prokaryotic cell cycle; transcription & translation)
- Regulation of gene expression.
- Signal transduction cascades.
- Microbial genetics (conjugation; transduction; transformation).
- Human cell cycle (mitosis; meiosis; cancer).

Biotechnology & molecular genetics techniques.  
Microbial metabolism & physiology.  
Microbial growth & nutrition.  
Environmental microbiology (includes nutrient cycling & microbial communities)  
Bioethics.

*Laboratory exercises:*

Basic prokaryotic culturing techniques; aseptic techniques.  
Micropipetting.  
Titer overnight liquid culture of pet microbes.  
Light microscopy & staining techniques.  
Antibiotic sensitivity.  
Growth curve (to be carried out with pet microbes).  
Microbial genetics experiments.  
Mitosis & meiosis.  
Polymerase Chain Reaction (PCR).  
Microbial metabolism/nutrition tests, including tests on their pets.  
Food microbiology experiments, including tests on their pets.  
Quorum sensing.  
Winogradsky column.  
Soil microbiology.  
Water microbiology.

*Please note that the laboratory exercise list above is merely a guide to the types of labs that would be appropriate for this type of course. It would not be reasonable to expect a class to complete all of these exercises in a single semester course. While it is important that this course have as much "hands on" material as possible, the instructor(s) for this course will take care not to overload the syllabus in any given semester.*

*Field trips:*

Water treatment plant.  
Commercial fermentation facility (e.g., brewery or winery).

The sponsors of this proposal are currently evaluating textbooks for use in this course. The vast majority of microbiology textbooks aimed at non-majors would be too simplistic for the proposed course, and the vast majority of "traditional" microbiology textbooks aimed at biology majors have emphases that are somewhat different from what is envisioned for this course. Fortunately, several textbooks with novel approaches have been introduced to the market during the last year. Some examples of these "new generation" texts include:

*Microbiology: Diversity, Disease, & the Environment.* A.A. Salyers & D.D. Whitt (2001).  
ISBN# 1-891786-01-6

*Biology of the Prokaryotes.* J.W. Lengeler, G. Drews, & H.G. Schlegel, eds. (1999). ISBN#  
0-632-05357-7

Both of the texts listed above were written by leading microbiologists and include emphases on metabolic diversity, environmental roles, and industrial applications that often get shortchanged in other books. Regardless of what text is used for this course, it is also assumed that the instructor(s) will assign and make available supplemental reading material from other sources.

**c. Evaluation of students and grading procedure.** Students will earn a semester grade based on the following:

Exams (semester exams as well as a final exam).

Laboratory projects & reports (given the heavy laboratory emphasis in this course, there will undoubtedly be many assignments of this type).

Homework assignments.

Quizzes.

Class participation.

The instructor may also elect to include the types of graded activities during the course. Some examples of these are listed below (not necessarily an exhaustive list):

Semester-long laboratory project.

Class presentations.

Research papers and/or annotated bibliographies (these might be based on searches of the biology research journals and/or engineering journals).

#### **d. Course Evaluation.**

The Biological Science Department routinely reviews the Department's courses and curriculum to assess their success in meeting the goals and objectives of the University, the College and the Program.

The College of Engineering will also assess this course by evaluating their students' ability to apply biological principles and techniques to the solution of Engineering homework problems (and other coursework) and to industrially relevant Engineering Clinic projects in areas of biochemical, biomedical, and environmental engineering.

#### **4. RESULTS OF CONSULTATIONS:**

The Civil and Environmental Engineering program was consulted (please see attached).

#### **5. ADDITIONAL INFORMATION, COMMENTS, ETC.**

None.

#### **6. CATALOG DESCRIPTION:**

Please see following page.

**0401.2XX****Biological Systems & Applications**

*(Prerequisite: 1906.105)*

Fundamental concepts and applications of biochemistry, cellular, microbial physiology, and environmental microbiology will be presented during this course. Emphasis will be placed on the theme that all biological systems (from the molecular level to the community level) are dynamic and interactive. Laboratory sessions will expose students to a variety of standard biological techniques from areas such as biotechnology, microbiology, and environmental biology. No credit toward Biology major.

**To:** Hecht@ROWANDOM.EMP\_PO  
**From:** "Stephanie Farrell" <farrell@rowan.edu>  
**Subject:** FW: engineering course prop.  
**CC:**  
**Date Sent:** Tuesday, October 17, 2000 3:03 PM

Greg,

We have consulted with Civil Engineering on the Biology course proposal. This response is from Kauser Jahan, who is one of the Civil and Environmental Engineering Faculty who does research in the environmental area.

Stephanie

-----Original Message-----

From: Kauser Jahan [mailto:jahan@rowan.edu]  
Sent: Monday, September 25, 2000 4:10 PM  
To: farrell@rowan.edu  
Cc: Jess Everett  
Subject: Re: engineering course prop.

stephanie

The course is more catered to chemical engineering students than environmental engineering students. however there are topics and labs that our students will benefit from. seems like a good course for your program.

kauser

Dr. Kauser Jahan, P.E.  
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