

400<sup>2</sup>

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: *Course Proposal for...*

SPONSOR(S): *Dept. of...*

DEPARTMENT: *...*

COLLEGE: *...*

09dc 483

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

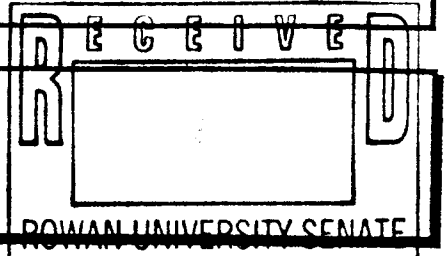
*[Signature]* / 10/26/00

Dept. Chairperson / Date

ACADEMIC DEAN

Approved  Not Approved  Comments:

Dean's Signature/Date *[Signature]* 10/26/00



**COLLEGE CURRICULUM COMMITTEE**

Date of open hearing (if necessary) 2/28/01 Approved  Not Approved \_\_\_\_\_

Comments:

Signature of College Chair/Date: [Signature] 2/28/01

**UNIVERSITY CURRICULUM COMMITTEE**

Date Received/Processed 5/29/01

Comments:

Curriculum Chair Signature [Signature] Date Announced At Senate 5/29/01

**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) 8/13/01 [Signature]  
 Department Chairpersons  Registrar \_\_\_\_\_ Sponsor(s)

## *Course Proposal*

### *1. Details:*

- a) Course Title:** Principles of Engineering Exercise Physiology (0906.483)  
**b) Sponsor:** Co-sponsored by the Departments of Chemical Engineering and Health and Exercise Science; Faculty sponsors Stephanie Farrell (Chemical Engineering) and Edward C. Chaloupka (Health and Exercise Science); Chemical Engineering Curriculum Committee.
- c) Credit Hours:** 4 credit hours  
**d) Course Level:** Senior  
**e) Curricular Effect:** Technical elective for engineering majors  
**f) Prerequisites:** Chemistry I, Math for Engineering Analysis II  
**g) Suggested Time/Scale of Implementation:** Fall 2001  
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 / Health and Exercise Science budgets. Library acquisitions will be required consistent with current acquisition plan.

### *2. Rationale:*

This course is a joint proposal between the College of Engineering and the Department of Health and Exercise Science. The course will be team-taught by faculty of Chemical Engineering and Health and Exercise Science. The course is project-intensive, and involves several laboratory experiments, and a total of 4 credit hours will be assigned for this course.

The proposed course is a Technical Elective for all 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 has a prerequisite of Math for Engineering Analysis II.

The course will address the areas of engineering and exercise physiology that are important multidisciplinary topics relevant to many areas of engineering. The course will describe the basic principles of physiological processes from an engineering perspective. Topics will include metabolism, cardiovascular and respiratory systems, pulmonary mechanics, physical work capacity. Mathematical modeling of the engineering operations will be emphasized. The interrelationships of these systems and their role in the body's response to exercise will be studied.

### *3. Essence of the Course:*

**a) Objectives:**

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

1. Understand the fundamentals of thermodynamics, chemical reactions, mass transfer, and fluid flow as applied to physiologic processes.
2. Model and simulate physiologic processes in normal and stress environments.
3. Analyze the basic physiologic processes from an engineering perspective.
4. Use computer software to analyze physiology-based engineering problems.
5. Work in teams to solve open-ended design problems.

**b) Topical Outline:**

The topics to be covered are listed below. The instructors will supply the students with a syllabus during the first week of classes. The instructors 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 physiology

- Nutrition
- Energy transfer
- Metabolism
- Cardiovascular system

Energy expenditure at rest and during exercise

- Calorimetry
- Respiratory quotient
- Basal metabolic rate
- Energy cost of exercise
- Mechanical work and energy expenditure
- Efficiency of exercise

Respiratory System

- Gas exchange
- Mass balances on the lungs
- Pulmonary mechanics
- Oxygen transport in the blood
- Carbon dioxide transport
- Mass transfer resistance in the respiratory system
- Respiratory demands during exercise

## Cardiovascular System

- Heart function
- Work of the heart
- Blood composition
- Blood flow
- Blood pressure
- Heart rate regulation
- Blood flow regulation
- Heart mechanics

## Thermal System

- Heat loss to the environment
- Heat transfer within the body
- Positive and Negative Work
- Thermal regulation and environmental stress

### **c) Laboratory Experiments**

This course is laboratory-intensive. 3 ½ hours of meeting time per week will be necessary to accommodate the classroom topic and laboratory schedule. The laboratory experiments that will be performed in this course are listed below.

1. Equipment calibration
2. Open circuit spirometry
3. Basal metabolic rate
4. Maximal oxygen consumption
5. Blood lactic acid
6. Aerobic exercise
7. Anaerobic exercise
8. Lung volumes and pulmonary mechanics
9. Respiration during exercise
10. Cardiac output at rest and during exercise
11. Blood pressure at rest and during exercise

### **d) 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 to the final grade, e.g., number of exams, projects, homework, percentage of grade, will be distributed to students the first week of classes.

### **e) 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. The Department of Biological Sciences has been consulted.

## *Catalog Description*

### **Principles of Engineering Exercise Physiology (0906.483)**

*Prerequisite: Chemistry I (1906.100), Math for Engineering Analysis II (0701.236)*

This course introduces students to chemical engineering fundamentals applied to physiologic systems, primarily during exercise. The basic biochemistry and physiology required for understanding these systems is presented. Basic principles of mass transfer, heat transfer, fluid flow, thermodynamics, and chemical reaction are used to analyze the human metabolic system, respiratory system, cardiovascular system, and thermal system. The interrelationships of these systems will be investigated, and their dynamic response to exercise will be studied. Laboratory experiments will be conducted throughout the course. This course is jointly taught with the Department of Health and Exercise Science.



TO: Dr. Stephanie Farrell, Chemical Engineering  
Dr. Edward Chaloupka, Health & Exercise Science

FROM: Dr. Andrew Prieto, Chair, Biological Sciences

DATE: October 26, 2000

RE: New Course Proposal "Principles of Engineering and Exercise Physiology"

At a recent department meeting, the Biological Sciences Department faculty discussed the above cited course proposal which you are sponsoring.

We find the course to be exciting and innovative and strongly support the proposal. However, we also would like to point out that there is already an approved course in Work Physiology within the Biological Sciences curriculum (co-sponsored by Dr. Chaloupka) that is very similar to the new proposal.

Our department has at least two individuals with expertise in this area and would welcome the opportunity to also team teach this course sometime in the future.

