PROCESS A NON-GENERAL EDUCATION ~ **CURRICULUM PROPOSAL** SCC # 4-3

dlines:
gular proposals: October 3, 2003 to be implemented Fall 2004; Short-Term proposals: December 6, 2003 to be implemented Fall 2004
Regular proposals: February 14, 2004 to be implemented Spring 2005; March 21, 2004 short-term courses to be implemented Spring 2005

PROPOSAL TITLE: Advanced Mechatronics

Sponsor(s): Hong Zhang E-Mail: zhang@rowan.edu Ext: 5347
E-Mail: Ext.
E-Mail: Ext.

DEPARTMENT: Mechanical Engineering

COLLEGE: Engineering

If Liberal Arts & Sciences CHECK : ___ **History/Humanities** ___**Math/Sciences** ___**Social/Behavioral Sciences**

_____ **UNDERGRADUATE** __X__ **GRADUATE**

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

__x__ New non-gen-ed course
_____ Short-term non-gen-ed course
___ Minor curricular changes (fewer than three)
____ Existing non-gen-ed course
_____ Non-gen-ed degree requirements
_____ Major
_____ Minor, specialization, concentration, track, certificate program

The following signatures REPRESENT APPROVAL

Department Chair: Date: Feb 7 2005
Department Curriculum Chair: Date:
Academic Dean: Date: 2-7-05
This course is not a resource or workload addition.

UNIVERSITY CURRICULUM COMMITTEE

College Off Date: 4/1/05 College Chair Signature:
Senate Curriculum Chair Signature: Date: Senate Announcement/Vote: 4/6/05
Comments:

EXECUTIVE VICE PRESIDENT/PROVOST Signature: Date: 4/27/05

✓ Approved ~ Not Approved due to the following: ____ Student Cr Hrs ____ Faculty Load Hrs ____ Equalized Cr Hrs

REGISTRAR

Date: 5/3/05 Course Description Received & Approved ~ Hegis Taxonomy & Course 0910.00 542
Registrar Signature:

NOTIFICATION FORWARD

✓ SCC Chair ✓ Academic Dean ✓ Department Chair ✓ Registrar ✓ Sponsor(s)

TM 5/25/05

SCC#_____

NEW COURSE PROPOSAL

Details

a. **Course Title:**

Advanced Mechatronics

b. **Sponsor**

Hong Zhang, Mechanical Engineering

c. **Credit Hours – 3**

d. **Course Level:** Graduate

e. **Prerequisites:** Mechanical System Dynamics and Control (0910.343) or System and Control (0909.321), Network II (0909.202), Computer Science and Programming (0704.103)

f. **Suggested Time and Scale of Implementation:** To be offered every other year starting Spring 2005.

Curricular Effect

The proposed course will be offered as a graduate-level elective for Mechanical Engineering students. Graduate mechanical engineering students are required to take four mechanical engineering electives in their first year. This course will serve as one of these electives. Other engineering students with the required prerequisites may also enroll in this course.

The course was successfully offered in Spring 2002 as a special topics course. Like the special topics course, the proposed course will require no additional staff, space or other resources. The only library resources required for this course, like the special topics course, will be access to the electronic journals already maintained by the Library.

Rationale

Mechanical Engineering has evolved to the stage that few mechanical systems consist only mechanical components. A modern system is more likely to be a combined electrical-mechanical system with the different parts interacting together organically. The proposed course will offer graduate level engineering students the opportunity to study theoretical and practical issues of the state of art technology of mechatronics. The course offers a unique perspective on the integration of mechanical and electrical engineering under one framework.

Essence of the Course

a. **Objectives**

The goal of this course is to present an introduction to (1) the mechanical and electrical component selection, (2) integrated system design and (3) integrated function analysis and control of a mechatronic system. Topics will include the analysis sensor principle, actuator selection, microprocessor and programming, Kinematics of a simple mechatronic system, control of a mechatronic system.

b. Topical Outline/Content

1. Introduction

2. Sensors
   - Encoder
   - Ultrasound sensor
   - Infrared sensor
   - Visual sensor
   - Other sensors

3. Actuators
   - Hydraulic actuator
   - Principle and model of standard DC and AC motors
   - Introduction to step motor and servo motors
   - Other actuating system

4. Kinematics, kinetics and transmission
   - Coordinate system and its transformation
   - Forward kinematics of a multi link system
   - Translation and rotation
   - Gearbox and power transmission

5. Microprocessor and programming
   - Basic Stamp and computer structure
   - Input/Output
   - Analogue/Digital transformation
   - PBASIC programming

6. Projects (conducted by student teams)
   - Mini paper about a typical mechatronic system, e.g., a copy machine, a robopet, a powered wheelchair, etc.
   - Design, build and control a robotic gripper, an autonomous toy car, a remotely operated underwater vehicle, etc.

c. Evaluation of students and grading procedure

Students will be evaluated through in-class examinations, completion of problem sets, in-class presentations, mini paper and hands-on projects.

d. Course evaluation

The success of the course in meeting course goals will be determined through use of in-class examinations, the quality of student presentations and mini papers, outcome of projects and student evaluations.

Letters of Consultation

The proposed course involves topics of primarily a Mechanical Engineering nature. As there is some reference to electrical engineering and computer programming, letters of consultation are attached from the Department of. Electrical and Computer Engineering and Department of Computer Science.

Catalog Description

Advanced Mechatronics (Suggested HEGIS Number 0910.542)

This course presents an introduction to (1) the mechanical and electrical component selection, (2) integrated system design and (3) integrated function analysis and control of a mechatronic system. Topics will include the analysis sensor principle, actuator selection, microprocessor and programming, Kinematics of a simple mechatronic system, control of a mechatronic system.

Prerequisite:
Mechanical System Dynamics and Control (0910.343) or System and Control (0909.321), Network II (0909.202), Computer Science and Programming (0704.103)

SCC#_____

Rowan University

LIBRARY RESOURCES

to

SUPPORT A NEW COURSE* or *NEW PROGRAM PROPOSAL

The purpose of this form is to provide a channel of communication between the library and faculty designing new courses/programs. The information will be used to assess the resources available in the library, and to identify resources the library should acquire to support the course/program. The information will also provide rationale for institutional support for library acquisitions.
This form should be completed in a coordinated effort between the course sponsor(s) and the academic department liaison librarian.

- The sponsor(s) complete parts A & D
  If assistance is required to complete parts A & D, please notify the liaison librarian.

- Forward this form to the librarian who will complete parts B, C, & E

  This form must be completed and attached to the original curriculum proposal before being approved by the Senate Curriculum Committee

A. College Engineering Department Mechanical Engineering

Proposed by: Hong Zhang Date: Sept. 21, 2003

Course Title: Advanced Mechatronics

Anticipated Date for Course/Program Offering: Spring 2006

B. Describe the resources available in the library to support this course/program, including reference, monographic, electronic databases, audio-visual materials, etc. A summary statement is sufficient.

Campbell Library acquires monographs in all aspects of mechanical engineering through an approval plan that automatically supplies new titles from the major publishers in these fields. Conference proceedings are available upon request through the same plan. Numerous reference volumes will support this course to include: Dictionaries, handbooks, standards, and encyclopedias published by IEEE, McGraw Hill, Wiley, and CRC. Electronic databases that will support the course are: *Science Direct* which includes mechanical engineering journal titles published by Elsevier; Engineering Village which includes Compendex.; General Science Full Text, and the Applied Science and Technology Index. Audio-visual materials have not been systematically acquired in this area, but can be purchased as needed.

C. List key periodicals available in the library to support this course/program.

IEEE/ASME Transactions on Mechatronics
Mechatronics

D. List specific resources that should be acquired to support this course.

None

E. Librarian comments and recommendations:

Monographs, reference works, and journals holdings are adequate to support this course. If other materials should be needed, they will be purchased or acquired through document delivery services.

Liaison (Feb. 8, 2005)

Electrical and Computer Engineering

Memorandum

To: Hong Zhang, Mechanical Engineering
From: Robi Polikar, Electrical and Computer Engineering, Curriculum Comm. Chair
Re: Mechatronics

Electrical and Computer Engineering (ECE) fully supports the graduate level course on Mechatronics proposed by the Mechanical Engineering (ME) department. Mechatronics, involved with design of systems that incorporates mechanical and electrical components cannot only serve as a technical elective for ME, but it can also serve as a graduate elective for ECE students.

ECE department looks forward to successful implementation of this course.

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Robi Polikar, Ph.D.
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On the Web: http://engineering.rowan.edu/~polikar

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From: Jennifer Kay [kay@elvis.rowan.edu]
Sent: Wednesday, February 04, 2004 1:16 PM
To: Zhang, Hong
Cc: Nancy Tinkham; Stephen J. Hartley; rusu@rowan.edu; Xu@rowan.edu
Subject: Mechatronics Consultation

MEMO

To: Hong Zhang, Mechanical Engineering
From: Computer Science Curriculum Committee
Re: Mechatronics Proposal

We support the proposal for the graduate "Mechatronics" course.

While there will be some overlap with some of the classes that we offer (notably in programming and robotics), the focus of this course is on the Mechanical Engineering aspects of systems.

Because there is already an undergraduate course titled "Mechatronics," we recommend that you change the name of the proposed course slightly, perhaps to "Advanced Mechatronics."

Jennifer Kay, Associate Professor
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