Proposal for a Graduate Certificate Program in Mechatronics for the Department of Mechanical Engineering

The Department of Mechanical Engineering is proposing to offer a graduate certificate in Mechatronics. Mechatronics is the integration of mechanism design with electronics, sensors, actuators, and computer control. The program will be available to matriculated as well as non-matriculated students. We intend to use the program as an outreach program to working engineers who need to advance their knowledge in this new and developing area.

Need

The Department of Mechanical Engineering has received several requests from graduate students for a certificate program at the graduate level. The students are familiar with our undergraduate certificate and suggested to the department that a graduate certificate be offered.

The new certificate program will be a key part of our plans towards the implementation of the Governor’s initiative for doubling the enrollment in engineering and computer science in five years (tripling in eight years). Mechatronics is one of the major ways of integrating computers with traditional engineering disciplines. The certificate will provide a means for working engineers as well as traditional students to learn this new and developing area. Local industries that have hired our undergraduate certificate students are very pleased with the quality of the students and their skills. These companies have expressed support for a graduate program in addition to the undergraduate program. Several working engineers have expressed interest in the graduate certificate program as well.

Educational Objectives

The educational objectives of the proposed certificate program are:

- Provide continuing education to working engineers in the area of Mechatronics
- Give credit to graduate students in the specialty area of Mechatronics
- Provide graduate students and working engineers with the skills to work in the area of Mechatronics.
Impact on Existing Programs

We expect that there will be a moderate increase in the number of student credit hours (SCH) taught in the college due to this program. This should not adversely impact the departments but, rather, be a benefit to those departments involved in the program. It is also hoped that the certificate program will encourage non-matriculated students to continue their students and eventually earn a master’s or higher degree.

Courses

A total of 15 semester credit hours of approved course work will be required for the certificate. Additionally, the student will complete an approved mechatronics project. The project would be the design of a system that includes sensors, actuators, and microcontroller. It could be an independent project or one related to the student’s professional work or graduate research.

A list of approved course work is listed below. Other courses could be substituted with approval from the certificate coordinators.

1. Required
   - Fall – ME6xxx System Modeling and prototyping – new class 3 hours
   - Spring – ME6xxx microcontrollers for mechatronic systems – new class 3 hours

2. Optional
   - Fall – ME6200 Transfer function controls 3 hours
   - Fall – ME7210 Optimal controls 3 hours
   - Fall – ME7220 Special Topics in controls 3 hours
   - Fall – MExxxx Nonlinear II 3 hours
   - Fall – Phys5610 Electronics I 3 hours
   - Spring – Phys5620 Electronics II 3 hours
   - Spring – ME6210 State space controls 3 hours
   - Spring – ME7200 Nonlinear I 3 hours

Assessment

All of the courses in the program directly relate to mechatronics – sensors, actuators, controls, electronics, and microcontrollers. All of the Department of Mechanical Engineering classes are reviewed as part of our regular class evaluations every year for content and quality.

The Department also surveys graduates of the undergraduate program for accreditation purposes. It is planned to survey recipients of the certificate
program in the same manner. Specifically, we will be asking how the material in the certificate classes have aided them in their work, how much of their work involves mechatronics, and how we could change and improve the program to better prepare them for their work.

**Faculty**

There will be two primary faculty members responsible for teaching the courses, Dr. Sanford Meek and Dr. Mark Minor.

Dr. Meek was one of the prime developers of the undergraduate mechatronics course and the undergraduate certificate program offered by the Mechanical Engineering department. No other departments or faculty from other departments will be directly involved with the certificate program at this time. Faculty in other departments will only be responsible for teaching the courses in those departments which are taken by our students. This is no different from the normal graduate student arrangements.

**Coordinator**

Dr. Meek will be the certificate coordinator. He will be responsible for providing the annual reports to the Graduate School.

**Advisory Committee**

The Department of Mechanical Engineering has an industrial advisory board. This board reviews both the undergraduate as well as the graduate programs in the department. They will also be the advisory board for the certificate program.

**Budget**

There will be no budget impacts on the budget of the department or the college. All of the courses for the certificate are being taught or are being planned. These courses will be taught by existing faculty. No new hires are necessary to implement the certificate program. These courses will be offered with or without a certificate. No additional faculty, space, equipment, or other resources will be needed for the certificate beyond what will be used for the courses.