Proposal to Change the Academic Master Plan

Academic Planning Committee
(Short Form)

Name of Proposed Program: **Minor in Robotics Engineering**

Person Proposing the New Program: **Peter Smith,**
Professor and Interim Chair, Computer Science

Date of Proposal: **4/4/2011**

Approvals:

Academic Planning Committee Approval:

Chair(s): _____ _____

Date: _____ _____

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1. Program Name: Computer Science

Academic Year of Implementation: 2012-2013

Name of the program area or unit that would offer the proposed degree or program: Computer Science

Name, title, and rank, of individual(s) primarily responsible for drafting the proposed degree program: Peter Smith, Professor, Computer Science

2. Description

Description of the degree program. Major subject matter elements of the program, core content areas, and representative courses taught. (250 words)

The Minor in Robotics Engineering is a 25-unit packaging of existing courses providing a hardware and software foundation for design and development of robotics systems.

Required Courses (16 units)

Comp 162 Computer Architecture and Assembly Language (3 units)
Comp 362 Operating Systems (4 units)
Phys 310 Electronics (3 units)
Comp 462 Embedded Systems (3 units)
Comp 499 Capstone (3 units)

Electives (9 units)

Choose three courses from

Math 437 Mathematics for Games, Simulations and Robotics (3 units)
Math 445 Image Analysis and Pattern Recognition (3 units)
Comp 469 Artificial Intelligence and Neural Nets (3 units)
BME 500 Biological Systems, Biomechanics, and Biorobotics (3 units)

We anticipate that majors in Computer Science, and Applied Physics will be the most likely to enroll in this minor. The required coursework in those majors covers much of the lower division preparation for the minor. However, the minor is sufficiently different from each major to warrant a minor designation. Additional applicable majors where we expect enrollment include Mathematics (applied and STEM education), Information Technology, ESRM, and those in Biology interested in the MS in Biotechnology and Bioinformatics.

Student Learning Objectives: Principal content and skills that students will learn in the program. (150 words)

After completing the courses in the minor, students will be able to explain the interaction between hardware and software. They will be able to describe the role of an operating system in managing the resources of a computer. On the hardware side they will be able to build, test and use analog and digital circuits. They will be able to demonstrate the role of electronics in data acquisition, metrology and control of devices. On the software side they will be able to design, implement and test algorithms in both C and a representative assembly language. They will build one or more robotics systems, directly experiencing the challenges and solutions such an implementation requires.

3. Justification

Robotics is a $6 billion industry expected to grow to more than $100 billion by 2030. Applications include manufacturing, farming, national security, health care, aerospace, mining, STEM education, and the military.

In the next 15 years there will be a shortage of American workers with only 40 million workers available to fill the jobs vacates by 70 million retirees. Robotics can help offset this problem.

The need for Robotics Engineering is here and will continue to rapidly increase. We can offer a multidiscipline niche minor reflecting an important industrial STEM emphasis at no additional cost. Additionally 6^{th} through 12^{th} grades are now offering robotics activities for their students. We have support from the agricultural, military, and aerospace community plus interest from the high schools today, and expect support from the medical/health community shortly.

Other Universities and CSU campuses that currently offer the proposed degree:
While other campuses (USC for example) offer courses involving robots, none has a major or minor in this area. It is worth noting that local campuses (CSUN, CLU) have hosted robotics competitions. We see this as a niche area for CSUCI - a program that will make the campus distinct.

Professional uses of the proposed degree program:
The robot engineer is focused on the design, implementation, and support of robots used in such areas as agriculture, armed forces, elderly care, dangerous chemical handling, homes, hospitals, exploration (space, undersea, volcanoes,...), manufacturing, medical operations, mining, search and rescue, security, STEM education, plus much more.

Community/Regional/Statewide need for the proposed program:
Educational robotics activities in local and statewide schools, newly developing agricultural applications to offset expected major labor shortages, aerospace and space exploration activities, police/fire departments/coast guard/border patrol/DEA search, search and rescue, real-time information gathering, and dangerous material handling activities, environmental information gathering, manufacturing automation, medical equipment design and development, and elderly care to name a few areas. The field is growing extremely fast.

4. Enrollment:

The expected number of majors in the year of initiation and three and five years thereafter. Please identify the data source(s) for these projections.

** Note that his is a minor not a major. Estimates are based on informal surveys of current students.

	Number of ~~Majors~~Minors	Number of Graduates
Initiation Year:	6	
Third Year	12	
Fifth Year	20	

5. Resources and Budget

a. Budget. Costs estimated to be associated with the degree in the pre-implementation year, first, third and fifth year of operations. Provide narrative and justification.

The minor uses only existing courses; no additional budget is anticipated. The courses have sufficient space and equipment resources to support greater enrollments. Based on current experience the minor is expected to be a source of resources and funds.

Current faculty can handle the role of advising students in the minor.

	Pre-Implementation Year	**First Year**	**Third Year**	**Fifth Year**
Faculty: (By Rank)				
Staff: (By Job Class)				
Equipment:				
Instructional:				
Program Development: (Consultants, etc)				

b. Facilities. Identify new facilities, building modifications and other physical and space needs associated with the new degree. Provide narrative and justification.

The minor uses only existing courses; no new facilities are required.

Pre-Implementation Year	**First Year**	**Third Year**	**Fifth Year**