NEW COURSE PROPOSAL

DATE   MARCH 15, 2006
PROGRAM AREA   COMPUTER SCIENCE

1. Catalog Description of the Course. *[Follow accepted catalog format.]*

Prefix COMP **Course#** 462 **Title** EMBEDDED SYSTEMS **Units** (3)
3 **hours** Lecture **per week**
☒ **Prerequisites** COMP362
☐ **Corequisites** none
Description This course covers the design of embedded systems. This includes the analysis of small computer systems designed for robotic mechanisms and common appliances such as cell phones and other hand held devices. The course will cover the design, implementation, and testing of software used in such systems with special attention paid to maximizing the use of limited computational resources and the need for event-driven real time system responses.

	Graded	
☐ **Gen Ed**	☐ **CR/NC**	☐ **Repeatable for up to units**
Categories		
☐ **Lab Fee Required**	☒ **A - F**	**Total Completions Allowed**
	☐ **Optional (Student's choice)**	☐ **Multiple Enrollment in same semester**

2. Mode of Instruction.

	Units	Hours per Unit	Benchmark Enrollment	Graded Component	CS # (filled in by Dean)
Lecture	3	1	24	☒	
Seminar				☐	
Laboratory				☐	
Activity				☐	

3. Justification and Learning Objectives for the Course. (Indicate whether required or elective, and whether it meets University Writing, and/or Language requirements) *[Use as much space as necessary]*

Justification: Embedded systems encompass software that resides on small computers that control appliances, cars, telephones as well as robots. Very often, the software has to respond to events that occur in real-time, so it introduces hard deadlines on the timing of responses, so the system has to be written in a way that allows fulfilling such time-critical applications. The controllers constitute very specific programming environments that include gateways to control manipulators and sensors. This course will teach the students how to write effective programs in such environments, how to debug and deploy them, and how to manage their lifecycles.

This course is an elective and does not meet the University Writing and/or Language requirements. .

Learning Objectives:
Upon completion of this course students will be able to:
(Press enter for the next bulleted item)

Sketch the key components of embedded system software
Identify, reference, and analyze embedded systems industry standards
Sketch the key components of embedded system hardware
Select the appropriate software architecture for an embedded system design
Produce software designs that use computer ports effectively
Produce working software used as "drivers" for embedded systems
Identify and sketch the key components of a real time embedded system
Identify and sketch the key components of a robotic controller
Produce working software that adds some elements of intelligence to a robot.

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4. Is this a General Education Course   YES ☐   NO ☒
   If Yes, indicate GE category and attach GE Criteria Form:

   A (English Language, Communication, Critical Thinking)
   A-1 Oral Communication   ☐
   A-2 English Writing   ☐
   A-3 Critical Thinking   ☐
   B (Mathematics, Sciences & Technology)
   B-1 Physical Sciences   ☐
   B-2 Life Sciences – Biology   ☐
   B-3 Mathematics – Mathematics and Applications   ☐
   B-4 Computers and Information Technology   ☐
   C (Fine Arts, Literature, Languages & Cultures)
   C-1 Art   ☐
   C-2 Literature Courses   ☐
   C-3a Language   ☐
   C-3b Multicultural   ☐
   D (Social Perspectives)   ☐
   E (Human Psychological and Physiological Perspectives)   ☐
   UD Interdisciplinary   ☐

5. **Course Content in Outline Form.** *[Be as brief as possible, but use as much space as necessary]*
   (Press enter for the next bulleted item)

   - Principles of real-time systems
   - Fundamental hardware concepts
   - Microprocessors
   - Device drivers
   - Embedded operating systems
   - Fundamentals of robotics
   - Handling touch sensors
   - Handling vision
   - Controlling manipulators
   - Math for robots
   - Self-orientation
   - Multi-robot environment

Does this course overlap a course offered in your academic program? YES ☐ NO ☒
If YES, what course(s) and provide a justification of the overlap?

Does this course overlap a course offered in another academic area? YES ☐ NO ☒
If YES, what course(s) and provide a justification of the overlap?
Signature of Academic Chair of the other academic area is required on the consultation sheet below.

6. **Cross-listed Courses (Please fill out separate form for each PREFIX)**
   List Cross-listed Courses

   Signature of Academic Chair(s) of the other academic area(s) is required on the consultation sheet below

   Department responsible for staffing:

7. **References.** *[Provide 3 - 5 references on which this course is based and/or support it.]*
   (Press enter for the next number)

1. Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers, Tammy Noergaard, Springer, 2001
2. An Embedded Software Primer by David E. Simon, Addison-Wesley Professional, 1999
3. Building Robots With Lego Mindstorms : The Ultimate Tool for Mindstorms Maniacs by Mario Ferrari, Giulio Ferrari, Ralph Hempel, Syngress, 2001
4. Creative Projects with LEGO Mindstorms by Benjamin Erwin, Addison-Wesley Professional, 2001

8. List Faculty Qualified to Teach This Course.

Computer Science Faculty

9. Frequency.
a. Projected semesters to be offered: Fall ☒   Spring ☒   Summer ☐

10. New Resources Required. YES ☐ NO ☒
  If YES, list the resources needed and obtain signatures from the appropriate programs/units on the consultation sheet below.

a. Computer (data processing), audio visual, broadcasting needs, other equipment)

b. Library needs

c. Facility/space needs

11. Will this new course alter any degree, credential, certificate, or minor in your program? YES ☐ NO ☒
  If, YES attach a program modification form for all programs affected.

AJ Bieszczad   11/20/2005
Proposer of Course   Date

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Approvals

_____
Program Chair   Date

_____
General Education Committee Chair   Date

_____
Curriculum Committee Chair   Date

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Dean   Date