Minnesota State University, Mankato

Curriculum Proposal

Please type or select the requested information. Print completed forms, add appropriate paper attachments, and route through MSU's curricular process for recommendations and decisions.

College: Science, Engineering and Technology
Department: Electrical and Computer Engineering and Technology
Program: Embedded Systems

Type of Change: COURSE PROPOSALS
Proposal #: 385
Effective Date of Change: Academic Year 2007-08

Proposed Course

Title Current: New Course
Title Proposed: Embedded Systems
24-Char. Abbrev: EET 441

Number of Credits: 4

Include a course or program description for the Bulletin (30-40 words maximum for courses, 100 for programs):

Design and prototyping of embedded systems including both hardware and software components. A variety of hardware, software, sensors and displays will be used depending on the embedded system requirements. Issues related to these systems will be studied as well as appropriate documentation standards.

Pre: EET 254

Rationale or Justification for change:

This course develops engineering skills needed in order to effectively combine microprocessor/microcontroller/DSP technology hardware and software technology and perhaps additional mechanical parts, in a system designed to perform a dedicated function. In some cases, embedded systems are part of a larger system or product, as in the case of an antilock braking system in a car. The proposed course was strongly endorsed by the ECET Industry Advisory Board at the Fall 2006 meeting.

***For General Education or Cultural Diversity Courses Only***

General Education Course:

GE Category #: N/A
GE Category Name (Maximum of 3 Categories)

N/A
N/A
N/A

Cultural Diversity Course:

(Please check one.)

- Core (At least 75% devoted to topics of race, gender, sexual orientation, age, class, and disabilities as they occur in United States Society.)

- Related (At least 25% devoted to the above topics or to a global perspective on topics related to African American, Asian, Hispanic, and Native American inhabitants of the United States.)

For Writing Intensive Courses, attach a description of the kind and quantity of writing.

For Upper Division Courses, include a description of the respects in which it is broad and general rather than narrow and specific, and so suitable as GE.

Attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes associated with each GE competency or CD designation.

c. List of strategies to be used to assess students' achievement of each GE competency or CD designation.

***For New Courses***

Instructional Type: Lecture/Lab
Grading Format: Grade

Other courses are being changed or eliminated. (Explain.)

Please see attached form showing changes in the program.

Course will be offered:

- Fall Semester
- Spring Semester
- Summer Session

Course content or title is similar to courses in other departments. (Attach copy of letter of agreement with other program(s) contacted. Indicate the nature of the discussions and/or resolution of differences or potential conflicts.)

Attach paper copies of the following:

a. Syllabus or course outline.

b. Course's student learning outcomes.

c. A list of resources required to offer and support this course.

d. A description of how teaching this course will affect department staffing.

e. If 400/500 level course, an explanation of added expectations of graduate students.

Revised September 2002

Received Jan 5, 2007
<table>
<thead>
<tr>
<th>Position</th>
<th>Signature</th>
<th>Date</th>
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<tbody>
<tr>
<td>Department Chair</td>
<td>Will B. Hughes</td>
<td>10/30/06</td>
</tr>
<tr>
<td>College Curriculum Committee Chair</td>
<td>Karen C. Chon</td>
<td>11/3/06</td>
</tr>
<tr>
<td>College Dean</td>
<td></td>
<td>1/6/06</td>
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<td>General Education Subcommittee Chair</td>
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<td>Undergraduate Curriculum and Academic Policy Committee Chair</td>
<td>A.C.</td>
<td>4/16/07</td>
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<td>Faculty Association Graduate Committee Chair</td>
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<td>Graduate Dean</td>
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<td>Academic Affairs Council Assistant Vice President</td>
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<td>Senior Vice President and Vice President for Academic Affairs</td>
<td>S.I.S.</td>
<td>4/20/07</td>
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<td>Comments:</td>
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EET 441 Embedded Systems (4 credits)
Course Proposal
Draft Syllabus

Semester: Spring 2007
Course Number: EET 441/498
Course Title: Embedded Systems

Course Description: Design and prototyping of embedded systems including both hardware and software components. A variety of hardware, software, sensors and displays will be used depending on the embedded system requirements. Issues related to hardware and software specifications will be studied as well as appropriate documentation standards.

What is an embedded system? A combination of computer hardware and software, and perhaps additional mechanical or other parts, designed to perform a dedicated function. In some cases, embedded systems are part of a larger system or product, as in the case of an antilock braking system in a car.

Prerequisite: EET 454 or permission of instructor
Class Time: MWF 8:00 – 8:50AM
Class Location:
Lab Time: Wednesday 1:00 – 2:50

Team Meetings: Regular team meetings will be required outside of class lecture times. Students must initiate and complete designs in a small group format.

Instructor:
Office:
Phone:
Email:
Office Hours:

Course Outcomes
• Use of microprocessors or microcontroller to create embedded systems
• Interfacing of a microcontroller or microprocessor to a standard bus structure with appropriate software and hardware to resolve timing issues
• Appropriate documentation skills to clearly describe and explain the project
• Necessary research skills to find information to complete embedded designs
• Appropriate prototyping and testing skills to complete embedded designs

Course Outline

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<tr>
<th>Topics</th>
<th>Lectures</th>
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<td>USB bus structure, performance, characteristics</td>
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<tr>
<td>PCI bus structure, performance, characteristics</td>
<td>3</td>
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<tr>
<td>ISA bus structure, performance, characteristics</td>
<td>3</td>
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</tbody>
</table>
RS 232 bus structure, performance, characteristics 3
Centronics Parallel port structure, performance, characteristics 2
I2C interface structure, performance, characteristics 2
SMB interface fabrication, operation, interface, characteristics 3
LCD displays fabrication, operation, interface, characteristics 5
Temperature sensors fabrication, operation, interface, characteristics 5
PWM Control design, implementation, operation 5
Pressure sensors fabrication, operation, interface, characteristics 3
GPS design, interface, operation 3
Strain gauges fabrication, operation, interface, characteristics 2

Course Laboratory Outline

<table>
<thead>
<tr>
<th>Topics</th>
<th>Lab Number</th>
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<tbody>
<tr>
<td>USB bus interfacing</td>
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<tr>
<td>PCI bus interfacing</td>
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<tr>
<td>ISA bus interfacing</td>
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<td>RS 232 bus interfacing</td>
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<tr>
<td>Centronics Parallel port</td>
<td>5</td>
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<tr>
<td>I2C interface interfacing</td>
<td>6</td>
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<td>SMB interface operation</td>
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<tr>
<td>LCD display interfacing</td>
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<tr>
<td>Temperature sensors operation</td>
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<tr>
<td>PWM Control interfacing</td>
<td>10</td>
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<tr>
<td>Pressure sensors interfacing</td>
<td>11</td>
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<tr>
<td>GPS interfacing</td>
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<tr>
<td>Strain gauges interfacing</td>
<td>13</td>
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<tr>
<td>Projects implementation &amp; test</td>
<td>14</td>
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</tbody>
</table>

Project Completion Format - Teamwork

All projects will be completed as part of a design team. Team members and the course instructor will assess each team member’s contribution to the effort.
EET 441 Embedded Systems
Course Proposal
Outcomes

After completing Embedded Systems (EET 441) the student will be able to:

1. Use of microprocessors or microcontroller to create embedded systems

2. Interfacing of a microcontroller or microprocessor to a standard bus structure with appropriate software and hardware to resolve timing issues

3. Appropriate documentation skills to clearly describe and explain the project

4. Necessary research skills to find information to complete embedded designs

5. Appropriate prototyping and testing skills to complete embedded designs
Resources to support this course will result from allocation of existing department resources.
EET 441 Embedded Systems
Course Proposal
Staff Impact & Needs

Staff Impact – Staffing resources to support this course will result from allocation of existing department resources.