**PURDUE UNIVERSITY**

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE

(18000-40000 LEVEL)

**DEPARTMENT:** Engineering  
**EFFECTIVE SESSION:** 001  
**Spring 2010**

**INSTRUCTIONS:** Please check the items below which describe the purpose of this request.

- 1. New course with supporting documents
- 2. Add existing course offered at another campus
- 3. Expiration of a course
- 4. Change in course number
- 5. Change in course title
- 6. Change in course credit/type
- 7. Change in course attributes (department head signature only)
- 8. Change in instructional hours
- 9. Change in course description
- 10. Change in course requisites
- 11. Change in semester offered (department head signature only)
- 12. Transfer from one department to another

**PROPOSED:**

- Subject Abbreviation: ECE
- Course Number: 485
- Long Title: Embedded Real-Time Operating Systems
- Short Title: Embedded RTOS

**EXISTING:**

- Subject Abbreviation
- Course Number

**TERMS OFFERED:**

- Check All That Apply:
  - Summer
  - Fall  
  - Spring

**CAMPUS(ES) INVOLVED:**

- Calumet
- Cont Ed
- Tech Statewide
- Ft. Wayne
- Indianapolis
- W. Lafayette

**COURSE ATTRIBUTES:** Check All That Apply

- 6. Registration Approval Type
  - Department
  - Instructor
- 7. Variable Title
- 8. Honors
- 9. Full Time Privilege
- 10. Off Campus Experience

<table>
<thead>
<tr>
<th>Schedule Type</th>
<th>Minutes Per Week</th>
<th>Meetings Per Week</th>
<th>Weeks Offered</th>
<th>% of Credit Allocated</th>
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<td>Laboratory</td>
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**COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):**

An introduction to embedded real-time operating systems, with an emphasis on embedded system software development, tasks, inter-task communications and synchronization as well as network software.

Pre-requisites: ECE 362, ECE 368

**Signature and Date**

- Calumet Department Head
- Date
- Calumet School Dean
- Date
- Fort Wayne Department Head
- Date
- Fort Wayne School Dean
- Date
- Indianapolis Department Head
- Date
- Indianapolis School Dean
- Date
- North Central Department Head
- Date
- North Central Chancellor
- Date
- West Lafayette Department Head
- Date
- West Lafayette College/School Dean
- Date
- West Lafayette Registrar
- Date

**OFFICE OF THE REGISTRAR**
Required Course | ECE 485 - Embedded Real-Time Operating Systems
| Offered in the Fall or Spring semester

| An introduction to embedded real-time operating systems, with an emphasis on embedded system software development, tasks, inter-task communications and synchronization as well as network software.

Prerequisite | ECE 362 - Microprocessor Systems and Interfacing
| ECE 368 - Data Structures

Prerequisite by Topic | Experience programming in C, experience programming microcontrollers, understanding of circuits and electrical components.

Required Textbook | MicroC/OS-II The Real-Time Kernel, 2nd edition, by Jean J. Labrosse,

References | None

Coordinator | Guoping Wang, Assistant Professor of Computer Engineering

Course Objectives | The course provides an introduction to embedded real-time operating systems. Topics covered include general embedded systems concepts, general embedded software development, real-time operating systems concepts, an examination of the uC/OS-II Real-Time Operating System (RTOS) including an examination of source code, an introduction to network programming including the TCP/IP protocol suite. The course also covers an introduction to the FreeRTOS, an introduction to the VxWorks RTOS as well as VxWorks development tools.

The course also includes a lab that utilizes the Microchip PIC24 microcontroller as a platform to develop an embedded application running under uC/OS-II as well as FreeRTOS. The lab also uses the Netburner development kit to allow exploration of embedded networking software development.

Schedule | Class: Two 75-minute lectures per week
| Laboratory: One 165-minute session per week

Lecture Topics

1. Embedded Systems Overview  
2. Embedded C Programming  
3. Development/Debugging Tools  
4. Real-Time System Concepts  
5. uC/OS-II Configuration/Initialization  
6. uC/OS-II Tasks  
7. uC/OS-II Synchronization/Message Passing  
8. uC/OS-II Other Functionality/Additional Components  
9. Netburner Introduction  
10. Networking Basics

2 classes
2 classes
1 class
3 classes
1 class
2 classes
2 classes
1 class
1 class
11. Ethernet/IP/TCP/UDP
12. Sockets/Client Server
13. FTP/HTTP/HTML
14. Network Software Development
15. FreeRTOS
16. VxWorks
17. Exam

2 classes
2 classes
3 classes
2 classes
1 class
1 class
1 class

Course Outcomes
A student who successfully fulfills the course requirements will have demonstrated:

1. Familiarity with many of the issues involved with embedded systems [k, 6]
2. Familiarity with key Real-Time Operating System terms and concepts. [k, 6]
3. Ability to program using system calls in a uC/OS-II environment. [a, b, c, k, 1, 3, 4, 6]
4. Ability to program an embedded system with tasks and executive. [a, b, c, k, 1, 3, 4, 6]
5. Understanding and ability to use tools to build an embedded real-time system [b, k, 3, 6]
6. Ability to specify, design and implement a small embedded system. [a, b, c, k, 1, 3, 4, 6]
7. Ability to present design information effectively in the forms of technical reports and oral presentations [g, 8]

Laboratory Outline

<table>
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<tr>
<th>Lab #</th>
<th>Lab Experiment</th>
<th>1 session</th>
<th>2 sessions</th>
<th>1 session</th>
<th>5 sessions</th>
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ABET category: Engineering science: 3 credits or 75%
Engineering design: 1 credits or 25%

Prepared by: Paul Simunek Date: April 1, 2009