Office of the Registrar
FORM 40 REV. 5/11

PURDUE UNIVERSITY
REQUEST FOR ADDITION, EXPIRATION, OR REVISION OF AN UNDERGRADUATE COURSE (10000-40000 LEVEL)

DEPARTMENT: School of Electrical and Computer Engineering

EFFECTIVE SESSION: 201710

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 semesters offered (department head signature only)
□ 12. Transfer from one department to another

PROPOSED:

Subject Abbreviation: ECE
Course Number: 40862
Long Title: Software for Embedded Systems
Short Title: Software for Embedded Systems
Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

EXISTING:

Subject Abbreviation:
Course Number:

TERMS OFFERED
Check All That Apply:
□ Summer ☑ Fall ☑ Spring

CAMPUS(ES) INVOLVED
□ Calumet
□ Cont Ed
□ Ft. Wayne
□ Indianapolis
□ N. Central
□ Tech Statewide
☑ W. Lafayette

CREDIT TYPE

1. Fixed Credit: Cr. Hrs.
2. Variable Credit Range:
Minimum Cr. Hrs
(Check One) To □ Or □
Maximum Cr. Hrs
3. Equivalent Credit: Yes □ No □

COURSE ATTRIBUTES: Check All That Apply

1. Pass/Not Pass Only □
2. Satisfactory/Unsatisfactory Only □
3. Repeatable □
Maximum Repeatable Credit:
4. Credit by Examination □
5. Fees □Coop □Lab □Rate Request
Include comment to explain fee
6 Registration Approval Type
Department □ Instructor □
7 Variable Title □
8 Honors □
9 Full Time Privilege □
10 Off Campus Experience □

Schedule Type	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture	50	3	15	100
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio				
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

This course provides an introduction to software design for embedded computing systems. Major topics covered include the importance of time and timing in embedded systems, embedded software organization (FSM-based program design, polled loop systems, foreground- background systems, event driven architectures, multi-tasking, etc.), real-time scheduling and real-time operating systems, wired/wireless networked embedded systems, debugging techniques for embedded software, and advanced topics such as memory-safe programming, implementing reentrant functions, and minimizing code space, memory usage, and power consumption. The course features a series of integrated assignments using state-of-the-art embedded hardware platforms, embedded software design tools, and real-time operating systems that reinforce the concepts taught in the lectures.

*COURSE LEARNING OUTCOMES

i. an understanding of the embedded software design process and tools used. [k]
ii. an understanding of various software architectures for embedded systems. [a,c]
iii. an ability to apply advanced debugging techniques to embedded software. [b,e]
iv. an ability to analyze and implement real-time embedded applications . [a,c]
v. an ability to design and implement distributed applications for networked embedded systems. [b,c]

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 Faculty Senate Chair — Date
Vice Chancellor for Academic Affairs — Date

* 3/7/16
West Lafayette Department Head — Date

3/1/16
West Lafayette College/School Dean — Date

West Lafayette Registrar — Date

OFFICE OF THE REGISTRAR

Engineering Faculty Document No. 50-16
November 20, 2015
Page 1 of 1

TO: The Faculty of the College of Engineering
FROM: The Faculty of the School of Electrical and Computer Engineering
SUBJECT: New Course numbered ECE 40862.

The faculty of the School of Electrical and Computer Engineering has approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

ECE 40862 Software for Embedded Systems
Sem. 1, 2. Lecture 3, Credit 3.
Prerequisite: ECE 36200, CS 15900

Course Description:
This course provides an introduction to software design for embedded computing systems. Major topics covered include the importance of time and timing in embedded systems, embedded software organization (FSM-based program design, polled loop systems, foreground- background systems, event driven architectures, multi-tasking, etc.), real-time scheduling and real-time operating systems, wired/wireless networked embedded systems, debugging techniques for embedded software, and advanced topics such as memory-safe programming, implementing reentrant functions, and minimizing code space, memory usage, and power consumption. The course features a series of integrated assignments using state-of-the-art embedded hardware platforms, embedded software design tools, and real-time operating systems that reinforce the concepts taught in the lectures.

REASON:
The School of Electrical and Computer Engineering seeks to give students hands-on experience in addition to a theoretical background in software for embedded systems. By completing hands-on assignments, students will gain experience with a number of essential tools and techniques used in the creation and maintenance of such systems. The proposed course gives students the opportunity to learn, with platforms and simple exercises, concepts such as cross compilation, polling & interrupts, control loop design, TinyOS, Linux, Real-time scheduling, MSP430F5438 & Beagleboard platforms, and writing simple distributed embedded applications. ECE has a number of qualified faculty capable of teaching this course. This course has been offered experimentally in various previous semesters: Spring 2011, Fall 2012, Fall 2013 and most recently in Fall 2015.

for V. Ragu Balakrishnan, Head
School of Electrical and Computer Engineering

Approved for the faculty of the Schools
of Engineering by the Engineering
Curriculum Committee

ECC Minutes 14 Date 3-1-16
Chairman ECC

ECE 40862 Software for Embedded Systems

Sem. 1, 2 Lecture 3, Credit 3.
Prerequisite: ECE 36200, CS 15900

Course Description:

This course provides an introduction to software design for embedded computing systems. Major topics covered include the importance of time and timing in embedded systems, embedded software organization (FSM-based program design, polled loop systems, foreground- background systems, event driven architectures, multi-tasking, etc.), real-time scheduling and real-time operating systems, wired/wireless networked embedded systems, debugging techniques for embedded software, and advanced topics such as memory-safe programming, implementing reentrant functions, and minimizing code space, memory usage, and power consumption. The course features a series of integrated assignments using state-of-the-art embedded hardware platforms, embedded software design tools, and real-time operating systems that reinforce the concepts taught in the lectures.

Learning Objectives:

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

i. an understanding of the embedded software design process and tools used. [k]
ii. an understanding of various software architectures for embedded systems. [a,c]
iii. an ability to apply advanced debugging techniques to embedded software. [b,e]
iv. an ability to analyze and implement real-time embedded applications . [a,c]
v. an ability to design and implement distributed applications for networked embedded systems. [b,c]

Assessment Method for Learning Objectives: The students will have several opportunities to satisfy the course outcomes including design assignments and a midterm/final exam. A student will satisfy each course outcome when his/her score for the corresponding exam/assignment question(s) equals or exceeds 40%, which represents minimal competency. If the student fails to meet this level of minimal competency on a specific course outcome, the student will have a second chance to do so by appearing for a retest (either written or through an interview, to be chosen by the instructor). While the retest will not affect the student's score on the original test, it will provide him/her a second opportunity to demonstrate competency on the course material, and satisfy the course outcome.

Lecture Outline:

Week(s)	Major Topics
1	Introduction to embedded systems and associated tool flow
2	Review of embedded hardware
1	Time and clocks in embedded systems
3	Software architectures for embedded systems
3	Real-time operating systems
2	Software for networked and distributed embedded systems
2	Debugging techniques for embedded software
1	Advanced topics

Total 15 class sessions

Required Text:
An Embedded Software Primer, David E. Simon, Addison-Wesley Professional, 1999, ISBN No. 13: 978-0201615692.
Recommended Text:
Introduction to Embedded Systems, A Cyber-Physical Systems Approach, E.A. Lee and S.A. Seshia, 2011, ISBN No. 978-0-557-70857-4.