ECE 5466: Embedded Computer Systems

Course Description

This course introduces the design principles, analysis methods and case studies of microprocessor-based and time-critical embedded systems, such as sensor and actuator networks, multimedia devices, mobile phones, and avionics. Topics include real-time operating systems, processor scheduling,
performance control, resource management, power-aware design, energy optimization, etc.

Prior Course Number: 8194.03
Transcript Abbreviation: Embedded Comp Sys
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad, Graduate
Student Ranks: Junior, Senior, Masters, Doctoral
Course Offerings: Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 5362, or Grad standing in Engineering
Exclusions:
Cross-Listings:

Course Rationale: The design of embedded systems is a major area in computer engineering. Such a course is offered by the CpE programs at most universities.

The course is required for this unit's degrees, majors, and/or minors: No
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Doctoral Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Be familiar with embedded program optimization.
Be competent with power management for embedded systems.

Be competent with process/thread scheduling in the OS.
Master real-time scheduling algorithms, such as RMS and EDF.
Be familiar with feedback control designs for embedded systems.
Be exposed to the designs of embedded, networked, and mobile systems.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction of embedded systems	1.0							
Microprocessor, I/O, interrupts	2.0							
Program optimization	3.0							
Power management	8.0							
Real-time OS and process scheduling	3.0							
Real-time scheduling	5.0							
Feedback control design	2.0							
CPU utilization control	4.0							
Student project presentations	6.0							
Case studies	3.0							
Project programming environment	3.0							

Grades

Aspect	Percent
Homework/lab	20%
Semester-long group project	50%
Midterm exam	10%
Final exam	20%

Representative Textbooks and Other Course Materials

Title	Author
Computers as Components: Principles of Embedded Computing System Design	Marilyn Wolf

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
*	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
**	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
*	e	An ability to identify, formulate, and solve engineering problems.
	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
	j	A knowledge of contemporary issues.

Course Contribution		College Outcome
	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
*	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
*	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
*	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
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	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Prepared by: Xiaorui Wang