CSE 474 Introduction to Embedded Systems

Credits
4 (4 hours lecture, 1 hour recitation)

Lead Instructor
Shwetak Patel

Textbook
*Embedded Systems - A Contemporary Design Tool* - James K. Peckol

Course Description
Introduces the specification, design, development, and test of real time embedded system software. Use of a modern embedded microcomputer or microcontroller as a target environment for a series of laboratory projects and a comprehensive final project.

Prerequisites
CSE 143

CE Major Status
Selected Elective

Course Objectives
- Understand the embedded systems development cycle and use the tools supporting such development.
- Understand the importance of and methods for designing and developing safe, reliable, and fault tolerant embedded systems.
- Develop high quality, well annotated, multifile software packages.
- Understand and design systems subject to real-time constraints.
- Develop drivers for basic analog and digital peripheral devices.
- Use debugging tools to verify proper program execution on a dedicated target system.
- Test a program executing on a dedicated target system.

ABET Student Outcome Coverage: This course addresses the following outcomes:
H = high relevance, M = medium relevance, L = low relevance to course.
(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 (M)
(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 (H)
(6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (M)

Topics:

Software design and abstraction
Software development life cycle
C programming for embedded systems
Control and control flow
Tasks, control, and scheduling
Inter-task communications
Operating systems basics
Memory management
Basic digital signal processing techniques: digital filters, FFTs
System performance and optimization
Safety, reliability, fault tolerance, and test
System testing
Advanced topics in embedded systems

Note: recitation will be used for a TA-led introduction and support on writing C programs. Recitation is optional, but strongly recommended for students without prior C programming experience.