

## 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, multfile 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.