ESE 381 Embedded Microprocessor System Design II

Spring 11, K. Short *January 26, 2011 3:01 pm*

Lecture: Tue. and Thu. 8:20 - 9:40 am, Light Engineering 152
Office Hours: Tue. and Thu. 9:50 - 10:50 am and 3:50 - 4:50 pm, Light Engineering 229

Course Objectives

This course is a continuation of ESE 380 Embedded Microprocessor System Design I. The three primary course objectives are for you to learn:

1. additional general embedded system design concepts
2. detailed design techniques for implementing embedded systems using AVR microcontrollers
3. embedded C programming and mixed C and assembly language programming

These objectives are covered through lectures, discussions, demonstrations, and laboratory work that emphasize basic concepts and specific applications. The laboratory work culminates in the design of a complete embedded system prototype.

Tentative List of Course Topics

The following is a tentative list of topics to be covered. Some variation from this list will occur based on the design project selected for this semester.

1. Introduction
2. Bit Manipulation in C
3. Digital Input and Switch Debouncing
4. Keypad Scanning Hardware and ASM Software
5. Keypad Scanning C Software
6. LCD Display Hardware
7. LCD Display Software
8. Sensors and Analog Information
9. ATmega128 Analog-to-Digital Converter
10. Common Operational Amplifier Signal Conditioning Circuits
11. Serial Peripheral Interface (SPI)
12. Digital-to-Analog Conversion
13. Analog-to-Digital Conversion
14. Pointers and Pointers to Functions
15. Table Driven Finite State Machines in C
16. ATmega128 Interrupts and Interrupt Driven Systems
17. Real Time and Calendar Clocks
18, Power on Self Test (POST)
19. Driving High Power Loads
20. Wireless Data Transfer
21. Storage Classes in Single and Multifile Programs

22. Parameter Passing and the Stack
23. Mixed C and Assembler Programs
24. Data Storage and Memory Models
25. AVR External Memory Interface
26. Low Power Operation and Battery Powered Systems

Prerequisites

The prerequisite for this course is ESE 380 Embedded Microprocessor System Design I. In addition, a basic understanding of the C programming language (for example, from a course such as ESE 124) is assumed.

Course Structure

This course has a lecture, discussion, and laboratory format. Lectures and discussions assume that students have completed prerequisite reading assignments.

Laboratory sessions start the week of January 30th. They are held in the Embedded Systems Design Laboratory, room 230 in the Light Engineering Building. The first two laboratory modules are each one week in duration. The remaining modules are each two weeks in duration. The modules culminate in a complete design that you must document in the form of a design document and a user's manual.

Source Material

There is no textbook for the course. Numerous manufacturers' application notes, data sheets, and user manuals are used. These are made available on BlackBoard either directly or via links.

We use the AVR IAR Embedded Workbench IDE for software development. This is an embedded C/C++ and assembler development environment from IAR Systems that targets code to AVR microcontrollers.

We use the full version of this IDE in the Embedded Systems Design Laboratory (ESDL). There is a free version called the KickStart Version of IAR Embedded Workbench. You can download this version to your own PC from:

http://supp.iar.com/Download/SW/?item=EWAVR-KS4

Grades

There will be three exams. The schedule for the exams is:

First Exam	Thursday, March 3rd
Second Exam	Thursday, March 31st
Third Exam	Thursday, May 5th

Course grade computation:

Exams	40%
Laboratory	40%
Design Documentation and User's Manual	15%
Class participation	05%

NO LABORATORY WORK IS ACCEPTED LATE. ALL PRELAB SUBMISSIONS MUST BE RECEIVED BY 10AM ON TUESDAY, OR THEY WILL BE CONSIDERED LATE AND WILL NOT BE ACCEPTED.

ANY QUESTIONS RELATED TO LABORATORY OR EXAM GRADES MUST BE RESOLVED WITHIN 7 CALENDAR DAYS FROM THE DAY THE GRADED MATERIAL IS MADE AVAILABLE FOR PICK UP.

Academic Dishonesty

Academic dishonesty is taken very seriously in this course. If you are caught cheating on an exam you will get a grade of F for the course and your case will be submitted to the Committee on Academic Standing and Appeals (CASA) of the College of Engineering for further action.

Tentative Lecture Schedule

The lectures are presented based on the assumption that you have completed the assigned reading prior to the lecture. This same assumption applies to exams as well. A tentative schedule of the lecture topics is provided on Blackboard. A lecture handout will be available on Blackboard at least one week prior to each lecture. It is recommended that you print this handout and bring it to lecture. The intention is to cover approximately one chapter of the text each week. A more detailed schedule will be provided on Blackboard.

Computers in Lecture

The use of any type of computing device by students during lecture is not permitted.

The following statement is included at the request of the Provost.

If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, you are urged to contact the staff in the Disabled Student Services office (DSS), Room 133 Humanities, 632-6748/TDD. DSS will review your concerns and determine, with you, what accommodations are necessary and appropriate.