Tentative Syllabus: ESE 381 Embedded Microprocessor System Design II

Spring 19, K. Short *January 26, 2019 8:19 pm*

Lecture: Tue. and Thu. 10:00 - 11:20 am, Light Engineering 152
Office Hours: Tue. and Thu. 4:00 - 6:00 pm, Light Engineering room 229.

Course Objectives

This course builds on concepts introduced in ESE 380 Embedded Microprocessor System Design I to further develop a student's expertise in embedded system design. The focus is on designing systems using microcontrollers and embedded C. Three primary course objectives are for you to learn:

1. Additional and more advanced embedded system design concepts
2. Detailed design techniques for implementing embedded systems using ARM microcontrollers
3. Embedded C programming and mixed C and assembly language programming

These objectives are achieved 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 typical list of topics to be covered. Variation from this list will likely 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. 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. 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. Low Power Operation and Battery Powered Systems

Prerequisites

The prerequisites for this course are ESE 380 Embedded Microprocessor System Design I and ESE 271 Electrical Circuit Analysis 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 you have completed the prerequisite reading assignments.

Laboratory sessions start the week of January 27th with an orientation. Laboratory sessions are held in the Embedded Systems Design Laboratory, room 230 in the Light Engineering Building.

Source Material

The following textbooks are required for this course:

1. *The Definitive Guide to ARM Cortex -M0 and Cortex-M0+ Processors,* 2nd Edition, Joseph Yiu, Newnes 2015, (ISBN 978-0128032770).

2. *Atmel ARM Programming for Embedded Systems*, Mazidi, Chen, and Ghaemi, MicroDigitalEd 2017, (ISBN 978-0997925975).

3. *C in a Nutshell*, 2nd edition, Peter Prinz and Tony Crawford, O'Reilly 2015, (ISBN 978-1-4919-0475-6). This text will be used as the C reference for this course.

We will use Atmel's Studio 7 IDE for software development.

Manufacturers' application notes, data sheets, and technical papers are also used in this course. These are made available on BlackBoard either directly or via links.

Grades

Course grade computation:

Exams 45%

Exam 1 Thursday Feb. 28th

Exam 2 Thursday April 4th	
Exam 3 Thursday May 2nd	
Laboratory	45%
Class participation	10%

Class participation includes attendance at lectures. There will be a sign-in attendance sheet at each class. Your first three absences are without penalty. Each absence after the third cost 1 point on your course grade total.

NO LABORATORY WORK IS ACCEPTED LATE. ALL PRELAB SUBMISSIONS MUST BE RECEIVED BY 9:00 PM 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 RETURN.

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

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. Each lecture handout will be available on Blackboard at least one week prior to the lecture. It is recommended that you print each lecture handout and bring it to class.

Computers and Other Electronic Devices in Lecture

The use of any type of computing device or other electronic devices by students during lecture is not permitted.

The following statements are included at the request of the Provost Office.

Disability Support Services (DSS)
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. All information and documentation is confidential.

Academic Integrity Statement
Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/.

Critical Incident Management
Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.