ECE/CS 5780/6780: Embedded System Design

Scott R. Little
Lecture 0: Course Overview

Course Description

- Introduction to issues in embedded system design using microcontrollers.
- Topics include:
  - Microcontroller architecture,
  - Embedded software design,
  - Interrupt synchronization,
  - Timing generation and measurement,
  - Serial and parallel I/O interfacing, and
  - Analog interfacing.

Prerequisites

- You are expected to have knowledge of the following subjects:
  - Programming in C (i.e., CS 1000, CS 2000, or CS 4400)
  - Data structures in C (queues, stacks, and linked lists)
  - Microcomputer programming (i.e., assembly language programming)
  - Digital logic (binary arithmetic, multiplexers, tri-state logic, finite state machines, etc.)
  - Test equipment like multi-meters and oscilloscopes
  - Discrete analog electrical circuits (resistors, capacitors, inductors, and transistors)

Course Information

- Course website: http://www.cs.utah.edu/classes/cs5780/
- Send questions to: teach-cs5780@cs.utah.edu
- Course mailing list: cs5780@cs.utah.edu
- Lectures: T, H 12:25-1:45pm in WEB 1250.
- Scott's office hours: T 11:00 a.m.-12:00 p.m. and H 2:00 p.m.-3:00 p.m. or by appointment.
- Scott's office: MEB 4120 / 801.581.8378
- TAs: Anthony Thatcher and Steve Tomer
- TA office/lab: MEB 2265
Textbook & documentation

- **Title:** *Embedded Microcomputer Systems: Real Time Interfacing, 2nd Edition*
- **Author:** Jonathan W. Valvano
- **ISBN-10:** 0-534-55162-9
- Should be available in the bookstore.
- Microcontroller, project board, and code development environment documentation are available via the course website.

Grading Policy

- **ECE/CS 5780:**
  - Lab reports - 40 percent
  - Midterms - 30 percent
  - Final - 30 percent
- **ECE/CS 6780:**
  - Lab reports - 20 percent
  - Midterms - 30 percent
  - Final - 30 percent
  - Project - 20 percent
- More information regarding the 6780 student projects will be given later.

Lab Times

<table>
<thead>
<tr>
<th>Section #</th>
<th>Day</th>
<th>Time</th>
<th>TA</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1</td>
<td>T</td>
<td>2:00 p.m.-5:00 p.m.</td>
<td>Steve</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Section 2</td>
<td>W</td>
<td>11:50 p.m.-2:50 p.m.</td>
<td>Anthony</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Section 3</td>
<td>H</td>
<td>3:05 p.m.-6:05 p.m.</td>
<td>Anthony</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Section 4</td>
<td>F</td>
<td>7:30 a.m.-10:30 a.m.</td>
<td>Anthony</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Office Hours</td>
<td>M</td>
<td>9:30 a.m.-10:30 a.m.</td>
<td>Steve</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Office Hours</td>
<td>W</td>
<td>9:30 a.m.-10:30 a.m.</td>
<td>Steve</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Office Hours</td>
<td>W</td>
<td>2:50 p.m.-4:50 p.m.</td>
<td>Anthony</td>
<td>MEB 2265</td>
</tr>
<tr>
<td>Office Hours</td>
<td>F</td>
<td>1:00 p.m.-3:00 p.m.</td>
<td>Anthony</td>
<td>MEB 2265</td>
</tr>
</tbody>
</table>

- The lab is staffed from 7:30 a.m. to 6:00 p.m.
- 24/7 card key access is also available.

Lab Partners

- Labs can be completed in teams of two.
- 6780 students must work with other 6780 students.
- **2 ITEMS DUE WED 01/09:**
  - Email: teach-cs5780@cs.utah.edu with:
    - A ranked list of lab sections you can attend.
    - Name of a partner (we can assign if you desire).
  - Sign up for the course mailing list:
    http://mailman.cs.utah.edu/mailman/listinfo/cs5780
PBMCUSLK: Microcontroller Project Board

- Breadboard
- 60-pin MCU connector
- USB BDM pod
- LCD Module
- COM Port
- 8 DIP Switches
- 5kΩ potentiometer
- 8 green LEDs
- 8 push buttons
- Buzzer

Microcontroller Kit Checkout Policy

- Each partnership receives one Microcontroller Project Board and HCS12C32 module.
- Both parties must be present to checkout the kit and sign the loan agreement form.
- These kits also include software, cables, wires, docs, etc.
- The entire contents of the kit must be returned CLEAN, COMPLETE, AND IN WORKING CONDITION before the last day of class.
- You are responsible for up to $250 for loss or damage.

16-Bit HCS12C32 Student Learning Kit

- MC9S12C32 MCU
  - 32K Byte Flash EEPROM
  - 2K Bytes RAM
  - 31 I/O lines
  - 8-Ch 16-bit Timers
  - SCI/SPI Ports
  - Key Wake-up port
  - CAN 2.0 Module
  - 8-Ch 10-bit ADCs
  - 8MHz Internal Bus
  - 25MHz Operation
- 40 pin connector
- RS-232 Serial Port
- 3 push buttons (2 user/reset)
- 3 LEDs (2 user/VDD)

Labs and Lab Reports

- Labs begin next week (1/15).
- Prelab checked at the beginning of your lab section.
- Working lab should be checked off during your lab section.
- Lab reports due to TA at beginning of your next lab section.
- Only one prelab and report per team is required.
- Put your lab section number on all lab reports.
- There is no provision for turning in late lab reports.
- Lab reports will be returned in your next lab section.
- If you have a question regarding your grade, please contact the grader for that assignment to address the issue.
- All labs reports and exams are assumed to be correctly graded one week after they are returned.
- After the one week has lapsed, no changes will be considered.
Cheating Policy

- Cheating will not be tolerated in this course.
- First offense results in a zero on the lab/exam.
- Second offense results in a failure of the course.
- Cheating includes but is not limited to:
  - Examining or using solutions for labs from previous years or other students in the class.
  - Copying a solution from another student during an exam.
  - Making one's solution to a lab or exam question available to another student.
  - etc.
- Use your common sense. Anything that gives you an unfair advantage over other students is likely considered cheating.