SYLLABUS

The best way to understand what you will learn in this class is to list the labs you will complete and the example projects we will build. You will complete each lab first in simulation and then on the real board. For each module we will design a system and you will build and test a similar system.

Module 1: Welcome and introduction to course and staff

Module 2: Fundamental concepts: numbers, computers, and the ARM Cortex M processor
Example. Develop a system that toggles an LED on the LaunchPad
Lab 2. Run existing project on LaunchPad with switch input and LED output

Module 3: Electronics: resistors, voltage, current and Ohm's Law

Module 4: Digital Logic: transistors, flip flops and logic functions
Lab 4. Debug a system with two inputs and two outputs

Module 5: Introduction to C programming
Example. Develop a system that inputs and outputs on the serial port
Lab 5. Write a C function and perform input/output on the serial port

Module 6: Microcontroller Input/Output
Example. Develop a system that inputs from a switch and toggles an LED output
Lab 6. Write C software that inputs from a switch and toggles an LED output

Module 7: Design and Development Process
Example. Develop a system that outputs a pattern on an LED
Lab 7. Write C functions that inputs from a switch and outputs to two LEDs, which is a simulated pacemaker

Module 8: Interfacing Switches and LEDs
Example. Develop a system with an external switch and LED
Lab 8. Interface an external switch and LED and write input/output software.

Module 9: Arrays and Functional Debugging
Example. Develop a system that debugs by dumping data into an array
Lab 9. Write C functions using array data structures that collect/debug your system.

Module 10: Finite State Machines
Example. Develop a simple finite state machine
Example. Develop a vending machine using a finite state machine
Example. Develop a line-tracking robot using a finite state machine
Example. Develop a stepper motor robot using a finite state machine
Lab 10. Interface 3 switches and 6 LEDs and create a traffic light finite state machine

Module 11: UART - The Serial Interface, I/O Synchronization
Example 11. Develop a communication network using the serial port
Lab 11. Write C functions that output decimal and fixed-point numbers to serial port

Module 12: Interrupts
Example 12. Develop a system that outputs a square wave using interrupts
Example 12. Develop a system that inputs from a switch using interrupts
Example 12. Develop a system that outputs to a DC motor that uses pulse width modulation
Lab 12. Design and test a guitar tuner, producing a 440 Hz tone

Module 13: DAC and Sound
Example 13. Develop a system that outputs analog signal with a R-2R digital to analog converter
Lab 13. Design and test a digital piano, with 4 inputs, digital to analog conversion, and sound

Module 14: ADC and Data Acquisition
Example 14. Develop a system that inputs an analog signal with an analog to digital converter
Example 14. Develop an autonomous robot that uses two DC motors and two distance sensors
Lab 14. Design and test a position measurement, with analog to digital conversion and calibrated output

Module 15: Systems Approach to Game Design
Lab 15. Design and test a hand-held video game, which integrates all components from previous labs.

Module 16: Wireless Communication and the Internet of Things
Lab 16. Connect a CC3100 booster pack to the LaunchPad and communicate with an access point. Lab 16 will not be graded, but we will provide a way for you communicate with a class server