Term Project

1 INTRODUCTION

You will synthesize what you have learned in ELC 343 and ELC 411 into a useful project

2 PROCEDURE

1) Write a proposal and get approval for your project. Some acceptable projects at:
    a. Neural network based system for classifying an input signal as either sinusoidal or square wave, based on the results of a Fast Fourier Transform.
    b. Multi-user opto-electronic lock system based on notches in cards and opto-interrupters.
    c. DC motor speed control based on feedback controller. Use a disc with notches and opto-interruptor. Use LED blinking at RPM * N Hz, where N is the number of notches, to visualize the adaptation of speed.
    d. Shave-and-a-haircut detector, use piezo into ADC to detect each knock, and open lock after secret code.
    e. Waveform classifier – either sine, triangle or square wave, from 20 Hz to 20 KHz. Display wave shape, and frequency. You decide on the algorithm. Display results on the LCD with real-time update.
    f. Audio FX generator.
    g. Musical instrument tuner.
    h. Keyboard based polyphonic music synthesizer.
    i. Read I2C based temperature/humidity sensor and display results on LCD.
    j. Drive a color LCD display via SPI interface
    k. Capture signals and transfer to PC via serial interface or USB

2) Acceptable projects will combine one or more of the following challenges, maximum grade depends on overall degree of difficulty (limited to 100 points). Do not over-reach! The vast majority of your grade on this project is based on getting it working fully!
    a. 50 pts
        i. USB
        ii. Direct Memory Access (DMA)
        iii. I2C
        iv. Serial Peripheral Interface (SPI)
        v. Multi-time-scale real time processing
        vi. Use of 32L476GDISCOVERY board
    b. 40 pts
        i. Analog to Digital Converter
    c. 30 pts
        i. Digital to Analog Converter
        ii. Pulse-width-modulation
        iii. Timer block
        iv. Stepper motor
        v. Seven-segment display
        vi. Fast Fourier Transform
        vii. Neural Network
        viii. Digital Filter (FIR or IIR)
        ix. Significant coding in assembly language
    d. 20 pts
        i. Opto-interruptors or other opto-sensors
        ii. Three or more push-buttons
        iii. Analog pressure sensor

3 GRADING

Design/Construction (maximum 60%)

60% for fully working

40% for partially working

Code (maximum 20%)

20% for well commented, well structured, adhere to all guidelines

10% for working code

Report (maximum 20%)

10% for completeness – all sections and measurements

10% for professionalism

4 WRITE A REPORT

The report is to include, but not limited to the following:

a) **Cover Sheet** with Title, Class, Names, etc.
b) **Introduction**.
c) Brief recap of **Procedure**.
d) **Design** information – explain your choices and give full documentation: schematics (both PSoC schematics, and your own circuit schematics), equations, etc. You can paste in code snippets, but use mono-spaced font and ensure that code is well formatted. Include any equations or other relevant information that helps you to explain what, why and how you did what you did.
e) **Results**, presented in tables, figures, or other organized means, and a discussion of the results that you obtained. You should include your debug experiences under **Results**.
f) The report must be understandable to another engineer not working on this project.
g) A conclusion of your results and discussion of anything you found especially interesting or not expected from your work on this project.

REPORT NOTES:

- One report per team
- You may use the IEEE paper format, if you like: (template is 2014_04_msw_usltr_format.doc). In this case the cover sheet info is embedded at the top.
- Microsoft Word, .docx file.
- Upload via GitHub (**one upload per team**).
- Also upload all code files that you wrote, or hand edited (and **only** those files!), via GitHub (**one upload per team**).