CpE 3150 Project 1

Demo due Tuesday, Apr. 19 at 4:30 pm
Report and Peer Reviews due Tuesday, Apr. 19 at the time of your team's demo

For your first project, you will design a simple, self-contained 8051-based device that will, *at a minimum*, monitor two keys – one is a positive key that increments the counter, and the other is a negative key that decrements the counter; display the current count in binary on a set of 4 LEDs; and sound an alarm when the count "turns over" (cycles from a binary 15 to 0 or 0 to 15). The counter should be 0 initially. Each team member is expected to design one or more additional features related to the counter incrementing/decrementing operation and displaying the count. Hardware will be provided for you. Software must be written in ASM. The alarm frequency (speaker frequency) should be in the range of 500-1500 Hz.

TEAMS: Projects will be done in teams of 4 of your own choosing. Each team is highly recommended to have a member that is currently taking CpE 3151, as they will be most familiar with hardware, though it is not required to complete this project. If you would like me to help you find a member from CpE 3151, please let me know. Team member contribution will be evaluated in the final report and through a confidential evaluation after the project has been turned in. Please do not share your team's solution with other teams.

PARTS: Your project will be implemented on the "Simon" board. It uses a Philips P89LPC932A1, which can be programmed "in place" using a serial port connection and the FlashMagic programming software. A number of Simon boards are available in the EECH room 210 laboratory (See me, Roger Younger, in room 209 to check out a Simon board). The Simon board already has battery power, 9 LEDs and 9 push-button switches that you can use to implement your project. One button should be used as an positive key and another one should be used as a negative key. You can find the FlashMagic software on computers in the room 210 lab or in the ECE CLCs (rm EECH 105 and 106). The room 210 lab is open every day from 9:00-5:00, M-F. I am available to answer questions about the project during my office hours or if my office door is open.

The Simon board that you check out will be used for both project 1 and 2 and may be used until the end of the semester. Unless you have made other arrangements, Simon Boards must be returned to me (Mr. Younger) at the time of your Project 2 demo. ***If you do not return the Simon board when submitting Project 2, your team will receive a 0 for your Project 1 and 2 grades***.

Directions for using FlashMagic can be found at https://sites.google.com/a/mst.edu/introtocpe/ and the "Creating Projects in Keil uVision" document on blackboard.

SOUND: You can generate a sound on the Simon board's speaker by sending it a square wave at a frequency from a few hundred to a few thousand Hz (1000 Hz is decent). The 8051 has on-board timers that can be used for this task or you can use internal delay loops. When calculating the frequency of sound you are generating, please double check the number of clock cycles per machine cycle used by the P89LPC932 – it *might* not be the same as the standard 8051 (hint). Check the clock frequency used on the Simon board.

DELIVERABLES AND DEADLINES: Points are given for the following deliverables (60points total). A grade of 80% is possible for the basic counter increment/decrement and display given in the project description. The remaining 20% of the project grade is based on the additional features incorporated into your project design and implementation. The demo for your project must be completed by 4:30 pm on Tuesday, Apr. 19. The commented project code, report, and peer evaluation forms are due by 4:30 on Tuesday, Apr. 19. No project demos or other deliverables will be accepted after 4:30 pm on Tuesday, Apr. 19.

- **Team assignment** (due Thursday, Mar. 24, by 4:00). Select teams of 3 or 4 of your own choosing. It is recommended, but not required, to have at least one team member who is taking CpE 3151. If you need assistance finding a team, please let me know, and I will help place you on a team.
- **Project demonstration** (10 points). An appointment sheet will be posted in room 210 EECH close to the due date to allow you to reserve a slot, including during the class period of Apr. 19. Projects beyond this date will not be accepted. Note: start debugging your project ahead of time or you seriously risk missing your deadline.
- **Individual feature development** (10 Points)**.** Each team member must develop one or more features to complement the standard operation of the counter (given in the first paragraph in this project assignment). Features will be graded based on using the hardware components of the Simon Board and using the instruction set capabilities for this 8051 variant.
- **Project code** (due with project). During your project demonstration, I will ask you to: show me your code, assemble your code, email me a copy of your code, download the code to your device, and show me your working device. Your code does not have to be commented at this point.
- **Short report** (15 points). Your report should include:
    - **Title and team members**
    - **Summary.** Give a summary of what you did in your project, what problems you encountered, and how you got around them. State the desired output frequency from the buzzer and show, mathematically, how you achieved it.
    - **Explanation.** If your code did not work, explain what you might do to fix it.
    - **Future work.** Explain what you might do to improve your project or the way you went about completing your project (timeline, etc).
    - **Project code.** Well documented code is worth more, as is code that makes appropriate use of segments, variables, labels, etc.
    - **Work effort distribution.** List each person in your group. Tell what their job was and the total percentage effort they contributed to the completion of the project.
- **Peer rating of team members (**5 points). Each student is required to complete the peer review form (it can be downloaded from Blackboard), sign and submit it by the deadline.