ECE 243 Computer Organization Course Project - 2023

The final project (which is worth the equivalent of 2 labs) will be done together with your lab partner. You will have two broad choices of what to do for the project:

Choice 1: Lab 8 Processor Extension. Detail in **Processor Extension Project.**
- Short description: In Lab 8 you made enhancements to your processor by including a program counter, memory interface, and new instructions (ld, st, and, b{cond}). This project involves further extensions to the processor design, where you will augment the processor architecture so that it supports subroutines and stacks, and also provides shift and rotate operations. You will change register $r5$ into an up/down counter, to implement a stack pointer register, sp. You will add the following instructions: push, pop, bl (which will use register $r6$ as a link register, lr), cmp, lsl, lsr, asr, and ror. Finally, you will write some assembly-language code to demonstrate the capabilities of your processor (running on the processor).

Choice 2: Open Software/Hardware Project. Detail in **Open Software/Hardware Project.**
- Short description: Here you do a project of your own choosing, based on software running on the DE1-SoC, either in C or in assembly language, perhaps using graphics such as that done in Lab 5. You may also attach your own hardware to the system if you wish. Each project in the class must be unique, which is done by being the first one to claim the project on a Piazza thread that will be set up.

The project is due in your lab period the week of April 10 and submitted to the Quercus Assignment 'Final Project'. The project will be demonstrated to your TA during the final lab. See the individual documents mentioned above for details.

Here are the specific steps you must follow.

1. Decide which of the two choices (above) you're going to do for the project – the *Processor Extension* **or** the *Open Software/Hardware Project*.

2. For groups that choose the Open Software/Hardware Project (*), you must also do the following:
   a. Each project must be different than the others in the course. To claim your *unique* project, go to the Piazza Thread @335 for this Course, and give a one or two-line statement of what your project would be. The *first* group to claim a project (that is approved) is the only one allowed to do that project, so review the previous posts before you post to this link. Your post should be a short sentence or two that has enough information to understand the goal and roughly the work to be done.
      - **Good Example**: *Platformer game. Jump on platforms to get to a goal at the top of the screen.*

- **Bad Example**: *Speed typing game.* [Not enough information to know what this means]. **Improved version**: *Speed typing game: the player has to type words shown on the VGA display, using a PS2 keyboard, within the time limit to succeed in the game*.

Good Example: *Attached sensor array of light sensors, used to build a primitive camera that can display on the VGA display.*

If the instructor or TA responds with 'approved' you have uniqueness approval. If they respond with 'project taken' you must try another. You may only suggest one project at a time. Approval will be granted if the description is sufficient, and the topic has not already been taken by a group that posted previously. Your project must have uniqueness approval to proceed.

b. Once you've thought through more details for your project, you must send an email to your TA describing, in a few paragraphs or 5-6 bullet points, what you plan to do for the project. Your TA will provide feedback on these points – to give you guidance. You should send this email as soon as possible, but no later than Friday March 31st at 6pm.

3. All projects (for both Choice 1 and 2) will be done over a two-week period. That period starts at the end of Lab 8.   This means you have two lab sessions in that period, which will be used as follows:
    a. In the lab session in the week of April 3, your TA will be available for consultation during the 3-hour lab period.
    b. The lab in the week of April 10. You'll be able to consult with your TA in the first hour of the lab period but will be graded in the final 2 hours.