Introduction

Due to a wide array of interests and backgrounds in this class, I am planning to provide options so that the class project will be meaningful for everyone. These options include:

- Solo option (individual).
- Team option (2 or 3 individuals):
    - Hardware design and implementation.
    - Software design and implementation.
    - Mixed design and implementation.

Objective

- Solo option - Be able to apply what you have been studying this quarter to an in-depth topic or project in the computer architecture area.
- Team options – Be able to utilize the strengths of your team to implement a processor architecture that includes a customized instruction set.

Specifics

- Solo option

    Your task is to take your chosen topic and do some research. You can track down information on the web, from manufacturers, from books and journals, and perhaps technical papers from conferences. I'd like to leave what you present and write about quite open-ended, ensuring that an overview of your topic is important, as well as an in-depth analysis sufficient to take up 6 minutes of oral presentation time and 8-10 pages of writing.

    - Potential Topics
        - Processors
            - Intel's Atom, Core I3/I5/I7, Willamette, Xeon, etc.
            - Snap Dragon, Cell, Apple's A12, latest AMD offerings
        - Architectures
            - Intel's Sandy Bridge, IBM Watson
            - GPU Architectures, NVIDIA APU or Tesla GPU
            - RAID Arrays, Solid State Drives
            - Cloud computing, Compiler architecture and design, SIRI
            - Internet of Things (IoT)
        - Other
            - Floating Point division or multiplication algorithms
            - Multi- and Hyper-threading
            - Branch prediction algorithms
            - Future computing technologies
            - Asynchronous processors

- Team options
    - Hardware

        Implement a custom-designed instruction set that is geared specifically towards Booth's Radix-4 multiplication algorithm. Your target implementation language will be VHDL or Verilog and your target hardware will be the FPGA boards used in Digital Design class and based on the Xilinx Spartan chips.
    - Software

        Your task is to choose one or more of the following and implement using an appropriate language or tool:

        - A visual data path simulator. Examples include the Javascript Pathsim application from the course textbook web page, or the following link that shows machine code execution on a 6502 microprocessor: (http://visual6502.org/JSSim/index.html)

- A full-featured assembler for your customized instruction set to implement Booth's Radix-4 multiplication algorithm.
- Another software application that you explain to the instructor by the due date.
  - Mixed
    - The task of a mixed team would be to combine the talents of several individuals to implement the combined hardware and assembler described above.

Deliverables
- Presentation;
- Paper;
- Test questions;
- Attendance.

Presentation
All options require an in-class presentation:
- Solo option – Expect your presentation to be about 6 minutes in length followed by a three-minute question and answer session.
- Team option – Expect your presentation to be about 8 minutes in length followed by a five-minute question and answer session.

Paper
- A high-quality 8-10 page/person paper on your chosen topic.

Test Questions
- One page of test questions relating to your topic, **with answers**, in Word format that includes:
  - 1 multiple choice problem;
  - 2 true / false problems;
  - 1 short answer question.

Attendance
- Attendance is required for all students for all presentations.

Grading
This project will constitute 40% of your final class grade. Note that ***each person*** must submit all materials to the required drop boxes. Your project grade will be composed of the following parts:
- Project committal form (10 points).
- Project update forms placed in the appropriate drop boxes (10 points each).
- A written paper/report with length guidelines of (10 pages - solo option) (20 pages – other options), not including appendices:
  - Rough draft (25 points) placed in the *project rough draft* drop box (5 pts).
  - Final paper (55 points) placed in the *project final paper* drop box (5 pts).
- PowerPoint presentation (25 points) placed in the *project presentation* drop box (5 pts).
- Test questions with answers (in Word format) placed in the *project test questions* dropbox (15 points).
- Quality of work factor, as judged by the instructor (30 points).
- Attendance at all 5 class periods (25 points).

Rough Due Dates
- Project selection – February 12.
- Oral presentation – as scheduled.
- Submit PowerPoint slides – at the conclusion of your presentation.
- Rough draft – noon, Friday, March 6.
- Test questions – noon, Thursday, March 12.
- Final paper/report – Final test time Tuesday, March 17, 4pm.