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 8 minutes of oral presentation time and 10 pages of writing.
  - Potential Topics
    - Processors
      - Intel’s Atom, Core I3/I5/I7, Willamette, Xeon, etc.
      - Snap Dragon, Cell, Apple’s A10, 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 option
    Implement s custom-designed instruction set that is geared specifically to 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 option
    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](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.
  o Mixed team
    • The task of a mixed team would be to combine the talents of several individuals to implement the combined hardware and assembler described above.

**Presentations**
All options will require an in-class presentation near the end of the quarter.
  • Solo option - Expect your presentation to be about 8 minutes in length followed by a four-minute question and answer session.
  • Team presentations – Expect your presentation to be about 4 minutes per team member followed by a six-minute question and answer session.

**Grade**
This project will constitute 40% of your final class grade. Your project grade will be composed of the following:
  • Project committal form (10 points).
  • Progress updates and instructor meetings as necessary (20 points).
  • A written paper/report not to exceed (10 pages - solo option) (20 pages – other options), not including appendices. Rough (30 points) and final drafts (60 points) are required for all options.
  • Your oral presentation (20 points).
  • Your power point presentation placed in the correct D2L dropbox (10 points).
  • Quality of work factor, as judged by the instructor (50 points).

**Rough Due Dates**
  • Project selection – early February.
  • Oral presentation – as scheduled.
  • PowerPoint slides – at the conclusion of your presentation.
  • Rough draft – class time, Thursday, March 8.
  • Final paper/report – Final test time Wednesday, March 21, 8am.