EEL4930/5930 EμPSD **Fall Semester, 2013**
Term Research Project **Weight: 30% of course grade**
Final Report Due: Dec. 9 Noon

The following is a description of the capstone research projects for our course this semester. You are to form a team of one or two persons and conduct an experimental research project, in an area of FPGA-based NIOS II system designs of your choice – subject to approval by the instructor.
These capstone projects are intended to run for the remainder of the semester, and its purpose is to provide the opportunity to more deeply explore fundamental issues in the embedded microprocessor designs in terms of a particular DE2 board target issue, which will be this semester the following larger projects:

Project Title	**Task Idea**
LCD	Program to implement custom characters like different smiley faces
AUDIO-IN	Use an amplitude tracking to determine sags or swells in a power signal
AUDIO-OUT	Generate a power signal disturbance with sags and swells, and frequency shifts
USB	Check the device for R/W errors and measure maximum transfer rate
InDA	Allow an optical device to transmit data
RS232	Communication with other device via serial port
PS2	Input data from key board and display on LCD or LED
VGA Display	Display a class ID and your name on the VGA
SD Card	Check memory R/W and measure maximum transfer rate
Custom Instruction:	
Floating point	Compare speed of vector product with/without FP special instructions
S-box	Implement S-Boxes used in the DES algorithm

For details on the project see the SOPC builder documentation from the Altera University IP blocks.
The culmination of your project will consist of a clear and concise technical report suitable for publication discussing your project, experiments, results, and analysis as well as an appendix (electronic to be posted on the class webpage) with a clear representation of all your models or programs including a final presentation at the end of the semester. Your documentation should be prepared and presented in a structured, polished, and professional manner. The project grade will be determined based on the ratio of the quality of the work *not* necessary the challenge. You are reminded that with any research endeavor, the objects (i.e. models, simulation experiments, test benches, etc.) that you develop for your project are a necessary but not sufficient condition for success. The most important outcome of the research will be the results achieved, analysis rendered, insight gained, and conclusions drawn as demonstrated in your technical report.

You have to follow the following general rules for the tasks:

1. Each student has been assigned one project from the above list selected by the instructor. Notify the instructor of any problem with the project or presentation time via email ASAP.
2. You should have regular meeting in your group and report your design progress on a weekly basis. If you have problems with the design or the project and cannot hold deadlines (e.g. illness) talk well in advance with the instructor. 50% point penalties apply for the first 24 hours late; 10% point penalty applies for each additional day late.
3. You can either use the Altera predefined Media μP or your own custom μP. As development software use the 9.1 Altera Monitor Program installed on the XP PCs in the logic lab.
4. At the end of the semester all results (with permission of participating students) will be posted on the class webpage at `campus.fsu.edu`. To have a similar file format, it is very important to follow very close the style guide given below regarding the content of your presentation and report. This will also be very important to earn full credit for your design.
5. Your project report and presentation must at least cover the following:
    - Overview on the μP used, hardware specification and software needed for the task
    - Software tools, books, datasheets etc. used
    - All written C/C++ programs and VHDL/Verilog code

Deliverables (total of 100 points):

(B) Status Reports

Due each Wednesday at the beginning of class: Due days are:11-6;11-13;11-20;11-27 collectively worth 20 points.

The contents of each status report will include a summary of the tasks from the Gantt chart that have been completed, those that are currently underway, and those yet to begin. In addition, an indication of status for the project as a whole should be included, selected from one of three categories: *on schedule*, *behind schedule*, or *ahead of schedule*. If behind schedule, an estimate of how far behind should be provided in units of days.

(C) Final Report

Due Monday December 9 at noon (get a time stamp if you put the report in the instructor E&C mailbox!) and worth 50 points.

As previously described, the final report is the primary means by which the quality of your work will be measured. Related publications in the literature may serve as useful samples or models to help you in deciding upon the structure and format of your report, but of course your report must be entirely your own work written in your own words unless otherwise noted by reference citations and quotations. In lieu of a demonstration to the instructor you may take a short video of your working final project design. **The final report should have between 5 and 10 pages and should reflect you insight and not be copies of data sheets!**

(D) Presentation of Results

Has to be delivered during class period (12-2 or 12-4) and is worth 30 points.

The presentation should give an overview of the accomplished work including the tasks from the Gantt chart. Group of two have 20 minutes for the presentation, and single presenter 15 minutes including time for questions. If possible, prepare MS PowerPoint slides that can be posted on the class web page. If you use another text system, generate a PDF or postscript file. You can also scan pages (e.g., simulation printout) and convert it to a PDF file with the HP or IKON copy machines in the ECE office.