

# **ECE 4170: Introduction to HDL with Applications to Digital System Design**

**Spring 2007 Semester**  
**Instructor: Prof. Sudhakar Yalamanchili**

## Project Proposals

**Due date: February 7<sup>th</sup>, 2007**

**Submission Format: PDF document or URL (see below).**

### Overview

The purpose of the project is to provide a significant design experience rooted in VHDL. The experience is intended to illustrate the use of HDLs in the design of digital systems.

Projects may be carried out in groups of 1-2 people. The complexity of the project should be commensurate with the team size. A common starting point for the project is the Soft SoC that is briefly described in class although this is not necessary. This design has a RISC processor, system bus, memory and some peripherals. Documentation and source for the Soft SoC will be provided. You can use this design as a baseline to design a customized SoC for a target embedded system, or you can develop a standalone customized hardware implementation. You may pick examples from set top boxes, cell phones, network switches, RFID based applications, etc. From such applications, pick a set of compute intensive kernels that typically will be implemented as custom hardware. Note that there is a C compiler available for the Soft SoC RISC processor – a major advantage. You may need to provide some custom C code segments for I/O, configuration and the like. This determination will be part of your functional design step that will follow proposal submission. Note that the use of the Soft SoC does require a learning curve, for example understanding the processor bus protocol and memory maps are necessary prelude to a working design. We will help you with documentation and advice but expect to spend a fair amount of time (well spent in our opinion) learning about the internal operation.

### **Project Proposal Format**

The project proposal must include the following information and is expected to be no more than 2 pages. However, this does require thought and some exploration. I expect you will spend more time in thought and discussion rather than reading so start early, and do not be afraid to be creative!

1. Project Title
2. Project Members (in alphabetical order)
3. Project Description
  - a. Functionality
  - b. Block diagram of the envisioned customized hardware with key functional components and their interfaces, e.g., to the Wishbone bus.
  - c. System inputs and outputs: for example, the input may be a MPEG encoded video stream the output is a decoded video stream
  - d. Some measure of the complexity of the functions you are implementing. This may be in terms of arithmetic operations, amount of data to be processed, the number of distinct functions, etc. This item is intended to have you think a bit more deeply about what you will be doing.
4. What do you anticipate are the challenges? What is expected to be the most time consuming component of the development?

Every project will have a webpage. If you wish, the project proposal may be placed on the project webpage and a URL provided to the TA rather the submission of a PDF document. You can expect the project webpage to be continuously updated throughout the semester. You will be given feedback on your proposal and eventually (with possibly some iteration with the instructor and TA) a final proposal will be accepted.