# CS 401 NAME(s): Due May 15

## FINAL GROUP PROJECT FINAL PROJECT PART IV: I/O IMPLEMENTATION

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| **CATEGORY** | **Beginning**  **70% – 79%** | **Satisfactory**  **80% – 89%** | **Excellent**  **90% – 100%** |
| **IO Implementation**  **50 Pts** | One simple I/O device and one direction (either input or output) | Two simple I/O devices one for input and one for output. | Two excellent I/O devices one for input, one for output, include SDRAM for 95% and above. |
| **Final CPU / IO Integration**  **50 Pts** | CPU can either output or input from IO device. | CPU can output and input from both I/O devices. | CPU can output and input from both I/O devices and the implementation is excellent. For 95% and above include SDRAM. |
| **Final Presentation**  **50 Pts** | Adequate presentation communicated information | All final presentation requirements met. Demo worked successfully | Excellent final presentation, met all requirements, communicated well verbally and visually. |
| **Individual Summary**  **50 Pts** | Half page summary not very reflective. | Adequate summary. | Reflective summary that discusses contributions and lessons learned. |

4.1 Final Project Implementation and Demostration

The goal of this project is to implement your CPU on the Xilinx FPGA and interface in some way with the external world.

Proposal

As a group decide on a target application for your CPU that includes I/O of some sort. Make sure that your proposal lists features in order of increasing difficulty. For example:

Proposal Title: CPU with VGA Output and Keyboard Input:

Feature List In Order of Complexity:

1. CPU runs correctly and can output/compute colors on the VGA screen
2. CPU reads from keyboard and modify a color on the VGA screen.
3. CPU can read a number form the keyboard and display the number on screen.
4. CPU can read both numbers and operators from the keyboard and display calculations on the VGA.

Project Ideas

* Create an SDRAM interface that allows your CPU to read/write from the SDRAM.
* Create a program that uses the XSTEND board
* Create a keyboard interface that allows your CPU to read text/numbers from a keyboard buffer(kind of like cin)
* Create a pong program that uses the VGA interface
* Create a serial interface that allows your CPU to talk to an external device.
* Create a digital filter program that uses audio codec on the XSTEND board.
* Create a character generator, present your final with your system.

### What to Hand In:

Completed CPU and I/O Interface Design

* Completed hardware design diagram including CPU and I/O
* Documented VHDL code, working program
* Final electronic presentation requirements (PowerPoint, Prezi, etc.)
  + Make sure your group uses good presentation skills (look at audience, speak clearly so all can hear, etc.)
  + What does your system do?
  + How much time did you spend on the project?
  + Where were the road-blocks? How did you solve the problems?
* One Page Individual Summary of Group Project
  + What you contributed, how your group worked together, what you learned.
  + What you would do differently next time.