# ECE 484 – Final Project

Last Updated: 28 Feb 2013

## Final Project Overview

For the final project, you must propose your own project, develop a sign-off schedule, design/build/test your design, and provide a final report/presentation. Your final project must fall under one of the following categories:

1. Design/Implement a digital system that uses both a microprocessor and hardware.
   1. Both the microprocessor and hardware portions of the project should be non-trivial. Just using the hardware for UART, GPIO, or collision detection would be considered trivial.
   2. The design must have at least one input and one output source.
   3. You can easily fit multiple Picoblaze cores on our FPGA.
   4. Consider using a MicroBlaze core if you need a more powerful microprocessor. You can then code in C and compile the code without having to reimplement the entire FPGA design.
2. Microprocessor Implementation – design/ implement a non-trivial microprocessor.
   1. You may use a previously defined ISA (e.g., MSP430, ARM, MIPS, SPARC, PowerPC, AVR, etc.).
   2. Write a non-trivial program to test all the instructions available.
   3. Interface the microprocessor with external hardware to demonstrate input/output capabilities.

# Grading Criteria

Your grade will be based on the following criteria:

1. Complexity of your hardware and software design.
2. Quality of your documentation in the final report and presentation.
3. Amount of effort demonstrated in class.
4. Functionality of project based on the deadlines and requirements you set.

## Final Project Hints

* A wide variety of example final projects can be found on Cornell’s ECE 5760 [course webpage](http://people.ece.cornell.edu/land/courses/ece5760/FinalProjects/). Here are a few examples:
  + Implement a simple sprite-based video game.
  + Use double frame-buffering to implement the ability to draw primitive shapes to a VGA screen.
  + Add real-time filtering and effects to an audio or video stream.
  + Implement a subsystem from your capstone project.
  + Use an Ethernet cable to communicate useful information between your FPGA and a computer.
* Other courses with good example projects:
  + <http://web.mit.edu/6.111/www/>
  + <http://ece545.com/F12/index.html>
* Talk to your instructor if you need a more powerful FPGA.

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| Final Project Sign-Off Sheet | **Name:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

### Final Project Proposal - Draft

Due BOC Final Project Lesson 1

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| --- | --- | --- | --- | --- |
| **#** | **Task Description** | **Date** | **Time** | **Sign-Off** |
| 0.1 | Schedule (similar to the sign-off sheet we used for each of our labs) describing deadlines for you to demonstrate project functionality for various subsystems and the final overall design. |  |  |  |
| 0.2 | A brief paragraph (or a few sentences) describing the big picture of what your final project will do. |  |  |  |
| 0.3 | Bullet list of the requirements your final project will meet for “minimum functionality” and “full functionality.” |  |  |  |

### Final Project Proposal - Finalized

Due BOC Final Project Lesson 2

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| --- | --- | --- | --- | --- |
| **#** | **Task Description** | **Date** | **Time** | **Sign-Off** |
| 1.1 | All items above must be finalized and signed off by your instructor. |  |  |  |

### Final Project Presentation

Due BOC Lesson 40

Your final presentation should last between 5 to 10 minutes (including demo and Q&A) and must include the following:

* **Introduction** – Provide a brief overview of the problem. Include the minimum and full functionality requirements.
* **Implementation** – Provide high-level block-diagram of your solution and briefly describe *in words* how you implemented each the modules.
* **Test/Debug** – Briefly describe the methods used to verify system functionality. List the major problems you encountered and how you fixed them.
* **Demonstration** – If you had any success with your final project, include a demonstration of your current functionality. If
* **Conclusion** – Explain what your learned from this final project and what changes you would recommend in future years to this final project or the lectures leading up to this final project.

### Final Project Documentation

Due COB Lesson 40

Your final project report must include the following:

* **Introduction** – Provide a brief overview of the problem.
* **Implementation** – Provide high-level block-diagram of your solution and briefly describe *in words* how you implemented each the modules. Commented VHDL code and simulation screenshots should be included in an appendix.
* **Test/Debug** – Briefly describe the methods used to verify system functionality. List the major problems you encountered and how you fixed them. If your final project did not meet all the requirements, you need to include a “hand-off” report that describes to another engineer: (1) current status of the final project (what works and what does not); (2) known problems preventing the project from working; (3) what you think led to the problems (schedule, faulty equipment, weak design, etc.); and (4) what you would do as the next step.
* **Conclusion** – Explain what your learned from this final project and what changes you would recommend in future years to this final project or the lectures leading up to this final project.

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| Final Presentation Grade Sheet | **Presenter:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Evaluator:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| --- | --- | --- | --- | --- |
| **Category** | **Unsat (D/F)** | **Subpar (C)** | **Average (B)** | **Outstanding (A)** |
| Description of the “big picture” behind the project |  |  |  |  |
| Purpose of the project (requirements) |  |  |  |  |
| Presenting the appropriate level of details |  |  |  |  |
| Smooth transition between subjects |  |  |  |  |
| Logical presentation (clarity) |  |  |  |  |
| Conclusion |  |  |  |  |
| Eye Contact |  |  |  |  |
| Gestures |  |  |  |  |
| Visual Aid |  |  |  |  |
| Handling of Questions |  |  |  |  |
| Difficulty of Project |  |  |  |  |
| Recommended Overall Project Grade |  |  |  |  |

### Comments: