

# Microprocessor-Based Systems (E155)

David Money Harris and Matthew Spencer

Fall 2015

## Syllabus

### Contact Information

Instructor: Matthew Spencer Parsons 2358 x78537 [Matthew\\_Spencer@hmc.edu](mailto:Matthew_Spencer@hmc.edu)  
David Money Harris Parsons 2373A x73263 [David\\_Harris@hmc.edu](mailto:David_Harris@hmc.edu)  
Lab Assistant: Amy Ngai [mngai@g.hmc.edu](mailto:mngai@g.hmc.edu)  
Ben Chasnov [bchasnov@g.hmc.edu](mailto:bchasnov@g.hmc.edu)  
Alex Alves [aalves@g.hmc.edu](mailto:aalves@g.hmc.edu)  
Class web page: [pages.hmc.edu/harris/class/e155](http://pages.hmc.edu/harris/class/e155)  
Class email list: [eng-155@hmc.edu](mailto:eng-155@hmc.edu)

Be sure to check that you are on the class email list. You should have received email before the beginning of classes. If you did not receive mail, add yourself to the list or risk missing important late-breaking announcements.

### Schedule

Lecture: MW 1:15-2:30  
Lab: M 2:45 – 5:30 / Tu 1:15-4:00  
Office Hours: Fri 1-3 in MicroP's Lab, or by appointment  
Lab Hours: Sat 1-3, Sun 12-4

You will be working on labs on your own time and it is not required that you attend the entire scheduled lab period. However, you should plan to show up for the first few minutes of each lab to see demonstrations. You also must get your projects checked off at some point during the lab period.

You are encouraged to come to office hours to ask questions, get help with your labs, talk about careers and graduate school, or just raid the candy jar. We are available more often than not, so try dropping in if you are having a problem with your lab. You may also contact the lab assistants for questions when we are not available.

### Recommended Texts

I assume you have a strong mastery of digital design at the level of E85; review *Digital Design and Computer Architecture*, *ARMed* if you feel rusty on a topic.

### Grading

Labs: 50%  
Final Project: 45%  
Activities: 5%

Your grade in the class is based on seven labs and a final project. Late labs are not accepted, but your lowest lab score will be dropped before the average is calculated so if you are sick or have an emergency one week you can drop that lab. Labs are done individually. You are welcome to discuss them with other

students or the instructor after you have made an effort by yourself. Please list the names of other students you have worked with. However, you should turn in your own work, not work identical to that of another person. **It is an honor code violation to simply copy someone else's work.** Solutions to past years labs have been handed out. Obviously, it is also an honor code violation to refer to these solutions while doing your lab. The final project will be done in groups of two.

The deliverables for each lab will consist of the following:

- A brief written report, which must not exceed one page, that provides a summary of the work, context for the other materials, an explanation of major design decisions, and a succinct explanation of whether the lab met requirements or how it deviates.
- Schematics of the circuits constructed for the lab.
- Code written for the lab.
- Figures that illustrate the output of the circuits or other results of the lab.

The purpose of these deliverables is to train you in professional, technical communication, so there are high standards to which they will be held. All schematics must feature neat wiring, up to date values for every component, and ports labeled with both the pin and the signal associated with them. Figures must be readable and must include labeled axes and legends. Code should be commented; omit library code that is provided elsewhere. The report should be grammatically correct, succinct, tightly focused and thorough. Properly referencing figures will help keep the report brief.

Labs are graded on a 10-point scale. 3 points are given for the system meeting its specified requirements. Another 3 points are given for answering a “fault tolerance question,” with 3 points for a correct answer to the first question, 2 for a second try, and so forth. 4 points are given for the report, schematics, and code.

Wednesday lectures will consist of in-class activities and design projects. Your work will count toward a small portion of your grade. You may miss two days without penalty.

## Schedule

Week	Monday Lecture	Wednesday Activity	Due
8/31		Analog Behavior of Digital System	
9/7	Comb & Seq Logic	Logic Design	(Lab Demos)
9/14	Verilog Coding	FPGA Datasheet	Lab 1 – FPGA Board
9/21	Synchronous Design	Verilog FSMs	Lab 2 – Muxed Display
9/28	ARM Assembly	ARM Programming	Lab 3 – Keypad
10/5	ARM Hardware	C Programming	Lab 4 – Assembly
10/12	ARM Interfacing	C Examples	Lab 5 – Audio
10/19	Fall Break No Class		
10/26	Interrupts	Motors, Speakers	Lab 6 – Wireless or IoT
11/2	Project Kickoff	Wireless Links	Lab 7 – AES / ImgProc Project Proposal 11/4
11/9	VGA Graphics	Data Converters	Proposal Debriefs
11/16	Patents	Signal Processing	
11/23	Presentations	Presentations	Project Status Report
11/30	Presentations	Presentations	
12/7	Interview Questions	Project Demos	Report Due 12/11

## Honor Code Violations

It goes without saying that students in this class are expected to follow the honor code. An honor code policy appears below and prescribes behavior that is considered honorable, so read those maxims and follow them closely. Any honor code violations will be handled through JB.

## Honor Code Policy

1. All students enrolled in this course are bound by the HMC Honor Code. More information on the HMC Honor Code can be found in the HMC Student Handbook.
2. It is your responsibility to determine whether your actions adhere to the HMC Honor Code. If this document does not clarify the legitimacy of a particular action, you should contact the course instructor and request clarification.
3. Work you submit for individual assignments should be your own, and you should complete all assignments based on your own understanding of the underlying material. If you work with, or receive help from, another individual on an assignment, provide a written acknowledgement in complete sentences that includes the person's name and the nature of the help.
4. This document is not meant to be an exhaustive list of every possible Honor Code violation. Infractions not explicitly mentioned here may still violate the Honor Code.
5. **Boundaries of Collaboration**  
Verbal collaboration with other students on individual assignments is encouraged AFTER you have given serious thought to each component yourself. However, all submitted written work should be written by yourself individually, and not a collaborative effort or copied from a common source (e.g., a chalkboard). It is NOT acceptable to work on labs in lockstep with another classmate.
6. **Use of Computer Software**  
The use of graphing calculators and computer software to aid in course work is acceptable, as long as it does not substitute for an understanding of the course material.
7. **Use of Web Resources**  
The use of Internet resources to aid in course work is acceptable, as long it does not substitute for an understanding of the course material. Plagiarism and direct copying from online (or any other) sources is strictly prohibited.
8. **Use of Your Own Work from Previous Semesters**  
If you have previously attempted this course, you may resubmit your work from previous semesters as this semester's coursework, as long as you understand the underlying material.
9. **Use of Other Course Resources from Previous Semesters**  
You may not reference assignments (labs, problem sets, activities) of this course from previous semesters.
10. **Retention of Course Resources**  
Assignments and exams from this course may not be committed to dorm repositories or otherwise used to help future students.

## Inclusiveness and Harassment

We do difficult work in this class and everyone should feel comfortable engaging with the material. We explicitly want students to feel safe doing this work, so it is worth stating that the instructors are committed to making the class a safe space for everyone regardless of race, gender, ethnicity, sexual orientation, religion and especially academic history. If you feel that you are experiencing a hostile environment, speak to an instructor immediately.