

University of Maine — ECE471: Embedded Systems

Instructor:

Vincent Weaver

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Office: Barrows 203

Office Hours: 10:45am-noon Tuesday and Thursday, or e-mail to arrange an appointment

TA:

Xiang Guo

Course Website:

http://web.eece.maine.edu/~vweaver/classes/ece471_2016f/

Lectures: Tuesday/Thursday 9:30am-10:45am, Dunn 115

Final Exam: Thursday 15 December 2016, 2:45pm-4:45pm, Dunn 115

Course Listing:

Application of micro-processors to the solution of design problems, including hardware characteristics, peripheral control techniques and system development. Lec 3. (Fall.)

Content this Semester:

We will investigate modern embedded systems, with a focus on ARM processors.

Pre-requisites:

ECE271 or permission

This course involves limited ARM assembly language and extensive C coding.

Textbook:

None

Hardware:

You will be required to have a Raspberry Pi device for homework assignments. Any model will do but I'd recommend getting a Model B+ or Model 2B if possible. If you are having trouble getting a Raspberry Pi by the start of class, please see me.

In addition certain devices will be loaned out for use in the homeworks and projects (such as LED displays and temperature sensors). It is expected that these will be returned at the end of classes, and this will factor into your class participation grade.

By the end of the course you will:

- Learn the definition of “Embedded System”
- Program embedded C and Assembly Language
- Write C programs that are well commented, check for errors, and have no compiler warnings
- Understand Code density concerns, specifically with ARM/THUMB/THUMB2
- Understand Raspberry Pi Hardware
- Program Embedded Linux systems
- Understand Firmware and booting
- Program embedded interfaces: GPIOs, i2c, SPI, and 1-wire

- Understand the various tradeoffs of embedded busses
- Understand Embedded system computer security
- Understand Embedded system programming best practices
- Understand Real-life and ethical impact of poorly designed embedded systems
- Know the difference between hard and soft real time
- Understand Embedded power and energy considerations

Homework Assignments:

Assignments will be announced in class and posted to the website. Homework submissions will be done via e-mail.

Final Project:

A final project will be assigned that involves creating an embedded device using an embedded platform of your choice that does some manner of input and output. There will be a final presentation of your project in front of the class, as well as a final writeup. The project can be done in groups of two. More details on the project will be given out about halfway through the semester.

Grading:

Class Participation (5%)

11 homework assignments (lowest one dropped) (50% total)

1 project (20%)

1 midterm exam (10%)

1 final exam (15%)

Late Work: Late work is penalized at 20% a day.

Regrade requests: If you disagree with the grading of an assignment, please submit via e-mail your request.

Resubmission of code: If on initial submission your code part of a homework does not work, you may improve it based on feedback and resubmit it for consideration. This can be useful especially for code that is re-used in later homeworks. Please include some text describing what you fixed. At most only one or two points might be added back to your previous homework grade.

University of Maine required Statements

Academic Honesty Statement

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Students with disabilities statement

If you have a disability for which you may be requesting an accommodation, please contact Disabilities Services, 121 East Annex, 581-2319, as early as possible in the term.

Course Schedule Disclaimer (Disruption Clause)

In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Sexual Violence Policy and Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

- For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000.
- For confidential resources off campus: Rape Response Services: 1-800-310-0000 or Spruce Run: 1-800-863-9909.
- Other resources: The resources listed below can offer support but may have to report the incident to others who can help: For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911.

Or see the OSAVP website for a complete list of services at <http://www.umaine.edu/osavp/>