University of Maine — ECE471: Embedded Systems — Fall 2019

Instructor:

Vincent Weaver
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Office: Barrows 203
Office Hours: 1pm-2pm Tuesday and Thursday, or e-mail to arrange an appointment

Course Website:

`http://web.eece.maine.edu/~vweaver/classes/ece471_2019f/`

Lectures: Monday/Wednesday/Friday 1:00pm-1:50pm, Barrows 123

Final Exam: Monday 16 December 2019, 9:30am-11:30am, Barrows 123

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 3B or 3B+ 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%)
2 midterm exams (15% combined)
1 final exam (10%)

Late Work: Late work is penalized at 10% a day.

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

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

https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/#Accessibility

Course Schedule Disclaimer (Disruption Clause)

https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/#Schedule

Observance of Religious Holidays/Events

https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/#Observance

Sexual Violence Policy and Sexual Discrimination Reporting

https://umaine.edu/citl/teaching-resources-2/required-syllabus-information/#Reporting_Long