University of Maine — ECE471: Embedded Systems — Fall 2026

Instructor:

Vincent Weaver
e-mail: vincent.weaver@maine.edu
Office: Barrows 203
Office Hours: Tues/Thurs 1:30pm-2:30pm or e-mail for time

TA:

None

Course Website:

https://web.eece.maine.edu/~vweaver/classes/ece471_2026f/

Lectures:

Monday/Wednesday/Friday 9:00am-9:50am, Barrows 119

Final Exam:

Wednesday 16 December 2026, 12:15pm-2:15pm, Barrows 119

Course Listing:

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

Pre-requisites:

ECE271
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. Most models will do but a 3B+ is recommended. More details on this will be discussed in class. If you are having trouble getting a Raspberry Pi by the second week of classes, 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.

Student Learning Outcomes:

Upon completing this course, you will be able to:

1. Know the definition of "Embedded System"
2. Program embedded C and Assembly Language
3. Write C programs that are well commented, check for errors, and have no compiler warnings
4. Understand Code density concerns, specifically with ARM/THUMB/THUMB2
5. Understand Raspberry Pi Hardware
6. Program Embedded Linux systems
7. Understand Firmware and booting
8. Program embedded interfaces: GPIOs, i2c, SPI, and 1-wire
9. Understand the various tradeoffs of embedded busses
10. Understand Embedded system computer security
11. Understand Embedded system programming best practices
12. Understand Real-life and ethical impact of poorly designed embedded systems
13. Know the difference between hard and soft real time
14. Understand Embedded power and energy considerations

Topics Covered:

1. Definition of / Recognizing Embedded Systems
2. Familiarity with Embedded Hardware
    - Raspberry Pi Boards
    - ARM Embedded Processors
3. Embedded System Programming
    - ARM Assembly Language
    - C programming
    - Writing reliable C code
    - Computer Security in embedded systems
    - Ethics in embedded systems
4. Embedded Operating System Programming
    - Real Time Concerns
    - Real Time Operating Systems
5. Embedded I/O
    - GPIO (General Purpose I/O)
    - i2c bus
    - SPI bus
    - 1-wire bus

AI Statement:

AI usage is not allowed for any assignments in this class (including, but not limited to, homeworks, tests, or projects).

Homework Assignments:

Assignments will be announced in class and posted to the website. Announcements will be sent to your UMaine e-mail address. 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)
2 midterm exams (15% combined)
1 final exam (10%)
1 final project (20%)

Late Work:

Late work will be considered but is penalized up to 10% a day.

Regrade requests:

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

Requesting Help on Coding Assignments:

If you have trouble with your code not working, the easiest way for me to help is if you send me your code. The full code is much easier to debug than screenshots. I'll do my best to respond in a timely manner, but for best results try to give me at least 24 hours to respond.

Pandemic/Mask Policy:

We will generally follow UMaine policy. If you have a major serious contagious illness, please don't come to class, let me know we'll work something out. If you're feeling sick for any reason you are encouraged to wear a mask.

Academic Honesty:

- Please do not submit other people's work as your own
- Do not copy, cut-and-paste or re-type code that you didn't write yourself (this includes code from classmates, the internet, or AI).
- Do not use AI when completing assignments

- Do not share copies of code, yours or otherwise. If you share your code with another student and they turn it in as their own, *both* you and the other student are cheating. Do not share code even if it is past the due date, as I do accept late work. It's distressingly common for cheating to happen this way, where someone "accidentally" submits code they talked a friend into sending to them.
- What can you do?
    + You may always discuss assignments and share code with the Professor
    + You may always discuss assignments and share code with with the TA
    + You may discuss assignments at a high level with classmates
    + You may have classmates look at your code to look for obvious problems (ideally over your shoulder and not by sending them the full code)
    + When actually writing the code the submitted code must be yours and yours alone
- Those committing academic dishonesty will obtain a zero for all assignments involved in the incident with possibly more consequences depending on the seriousness of the incident. Note: a zero for academic dishonesty will not be dropped as part of the "lowest homework grade dropped" policy.

University of Maine Campus Policies

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, or generated by software or systems without the explicit approval of the instructor, 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.

Please see the University of Maine System's Academic Integrity Policy listed in the Board Policy Manual as Policy 314: https://www.maine.edu/board-of-trustees/policy-manual/section-314/

Students with disabilities statement

If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, um.sas@maine.edu, 581.2319, as early as possible in the term. Students may begin the accommodation process by submitting an accommodation request form online and uploading documentation at https://umaine-accommodate.symplicity.com/public_accommodation/. Once students meet with SAS and eligibility has been determined, students submit an online request with SAS each semester to activate their approved accommodations. SAS creates an accessibility letter each semester which informs faculty of potential course access and approved reasonable accommodations; the letter is sent directly to the course instructor. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.

Course Schedule Disclaimer (Disruption Clause)

In the event of an extended disruption of normal classroom activities (due to COVID-19 or other long-term disruptions), 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.

Observance of Religious Holidays/Events

The University of Maine recognizes that when students are observing significant religious holidays, some may be unable to attend classes or labs, study, take tests, or work on other assignments. If they provide adequate notice (at least one week and longer if at all possible), these students are allowed to make up course requirements as long as this effort does not create an unreasonable burden upon the instructor, department or University. At the discretion of

the instructor, such coursework could be due before or after the examination or assignment. No adverse or prejudicial effects shall result to a student's grade for the examination, study, or course requirement on the day of religious observance. The student shall not be marked absent from the class due to observing a significant religious holiday. In the case of an internship or clinical, students should refer to the applicable policy in place by the employer or site.

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 faculty or staff member who is deemed a "responsible employee" 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, they are required to report this information to Title IX Student Services 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 Northern Light Primary Care, University of Maine: at 207-581-4000.

For *confidential resources off campus*: Rape Response Services: 1-800-871-7741 or Partners for Peace: 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*: Title IX Student Services: 207-581-1406, Office of Community Standards: 207-581-1406, University of Maine Police: 207-581-4040 or 911.

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*: Title IX Student Services: 207-581-1406, Office of Community Standards: 207-581-1406, University of Maine Police: 207-581-4040 or 911.

For *confidential resources on campus*: Counseling Center: 207-581-1392, Northern Light Primary Care, University of Maine: at 207-581-4000, Confidential Resource Advisor: 207-571-5372 (call or text). Or see the Confidential Resource Advisor website for a complete list of services and resources https://www.maine.edu/confidential-resource-advisor/

Visit the Title IX Student Services website at umaine.edu/titleix/ for more information.