

Instructor:

Vincent Weaver
e-mail: vincent.weaver@maine.edu
Office: Barrows 203
Office Hours: Tues/Thurs 11am-12pm



Course Website:

https://web.eece.maine.edu/~vweaver/classes/ece571_2024f/

Course Schedule:

Lectures: Monday/Wednesday/Friday 12:00pm-12:50pm, Barrows 130

Final Exam: None

Course Listing:

Includes techniques for developing software and hardware for microprocessor-based systems, computer aided design using a multistation logic development system, use of components commonly found in microprocessor-based systems.

Content this Semester

We will investigate the design of modern advanced microprocessors, with a focus on ARM and x86 architectures. We will look at supporting hardware, such as GPUs, hard-disk, and RAM. We will investigate various metrics for evaluating such systems, including performance, power, energy, and code density.

Pre-requisites:

ECE471 or permission
Ideally you have some C programming skills and basic Linux knowledge.

After this class you will be able to:

- Know the features and limitations when measuring performance using Hardware Performance Counters
- Understand the various Energy and Power metrics used when analyzing modern computer systems
- Be able to conduct power and performance analysis using the Linux operating system.
- Know the power and performance implications of various architectural features, including Superscalar, Out-of-order, Hardware Multi-threading, Caches, and Branch Predictors.
- Know the power and performance implications of various pieces of hardware, including CPU, GPU, Memory, and Disks.
- Know the power and performance implications of the x86 and ARM architectures.

AI Statement:

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

Grading:

Class Participation (5%)

11 homework assignments (5% each), Lowest is dropped

1 midterm exam, tentatively scheduled 29 October (20% total)

1 final project (25%)

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

Assignments:

Assignments and class notes will be posted to the course website.

Announcements, including homework assignments, will be sent to your UMaine e-mail address.

Homework assignments will be submitted via e-mail.

Optional Textbook:

Computer Organization and Design: The Hardware / Software Interface by Patterson and Hennessy.

Note, the 2007 edition of this book can be read free online via the UMaine library.

Covid/Mask Policy:

We will generally follow UMaine policy. If you have COVID (or any other 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 other people's code, from this or previous years. It's distressingly common for people to somehow "accidentally" submit code they receive this way
- 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.symplixity.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 inci-

dent 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.