CMPE 110: Computer Architecture
Winter 2018

Basic Information

Lectures: MWF 1:20–2:25 PM (J Baskin Auditorium)
Instructor: Professor Ethan L. Miller (elm+cmpe110(at)ucsc.edu)
Office: 337A Engineering 2, Mon 2:30–4:00 PM and Wed 9:30–10:30 AM
Prerequisites: CMPE 12 and either CMPE 13 or CMPS 12A/L
(Hennessy & Patterson)
Home page: https://canvas.ucsc.edu/courses/9147

Course Overview

The goal for students in this course is to learn the fundamental principles of computer architecture. To help students accomplish this goal we’ll cover the various important aspects of computer architecture in general, examine specific examples from current CPUs and systems, and consider the RISC-V instruction set architecture and its possible impact on system design. Topics include:

- Computer system performance
- Instruction set architectures
- Pipelining & forwarding
- Multi-execution units
- Caches
- Memory hierarchy
- Virtual memory
- Branching & branch prediction
- Multicore CPUs
- GPUs and SIMD instructions

Prerequisites

The formal prerequisites for this class are CMPE 12 and either CMPE 13 or CMPS 12A. We’re going to assume you gained the knowledge and skills from these classes as taught at UCSC; if you took the equivalent classes at another university or community college, you may want to look over the syllabi and materials for the offerings on this campus.

Resources

The required text, Computer Organization and Design RISC-V Edition: The Hardware Software Interface, is available at the UCSC bookstore as well as online booksellers such as Amazon. Homework problems may be taken from the book (the RISC-V version), and lectures will complement the material as presented there. You should read the material in the textbook before it is covered in lecture. Other than the textbook, all of the material in this class, including assignments and grades, will be available on Canvas (https://canvas.ucsc.edu/courses/9147), and will require that you log in to access it. We’ll be conducting all class-related discussion, including announcements, on Piazza, at http://piazza.com/ucsc/winter2018/cmpe110.
Evaluation & Grading

Exams

There will be an in-class midterm on Wednesday, February 14th and a final exam during the scheduled slot in exam week (Wednesday, March 21st from 8:00–11:00 AM).

You must take each exam at the scheduled time unless you have an unexpected illness or family emergency. You must let the professor know by email or text message before the exam’s scheduled start, unless you’re incapacitated by illness. In addition, you must provide a doctor’s note or letter from the funeral home before you can make up the exam. There are no exceptions to this policy.

Homework Assignments

There will be 5–6 graded homework assignments over the course of the quarter. You’ll typically have about a week to do each assignment. You may not work with anyone on the homework assignments—the goal is to see how well you understand the material.

Homework will typically be submitted on Canvas: each assignment must be submitted as a single PDF file. You may type up your homework, or scan in handwritten material (or both), as long as it’s in a single file. There are scanner programs available for Android and iOS cell phones that you may wish to use. Please scan your homework in black and white if possible, and no higher than 200dpi resolution, so that the files don’t get too big. If there are any programming problems as part of a homework assignment, they will be managed and submitted via git. We assume that you’re familiar with git from CMPE 12 or other prerequisites; please see the Canvas site for links to help with git if you need them.

Timeliness

Rather than approve extensions on a case-by-case basis, each student may turn in one assignment (of her/his choice) up to two days late. Think of this like “sick days” that you may use if you’re feeling ill. We won’t try to verify your illness, but neither will you get a second extension should you actually be sick later in the quarter. Other than this single exception, late homework will not be accepted.

Quizzes

There will be 6–8 unscheduled quizzes over the course of the quarter. They will take about 15 minutes, and be 4–5 multiple choice questions on recently-covered material. Quizzes will be given by iClicker, so you’ll need to either purchase an iClicker or install the appropriate software on your phone. We’ll drop the lowest two quiz grades when computing your quiz average so, while you’ll get a zero if you miss a class in which a quiz is given, you can miss two quizzes without it affecting your grade.

Notes & Class Participation

You may optionally turn in (on Canvas) notes that you take in class or on other materials such as the textbook. Notes can only raise your overall grade, but can’t lower it—we’re giving you an extra opportunity to demonstrate mastery of the material. These notes may be handwritten or typed by you—you may not turn in material copied verbatim from other sources, including class slides, textbooks, other students, or the Internet). Each week’s notes must be turned into Canvas by Sunday at 9 PM following the week in which the material was covered in class in order to receive credit for them. We’ll use the higher of your notes grade and your exam average for 8% of the overall class grade.

You may receive extra credit on your overall course grade for actively participating in class, including things such as actually participating (asking questions) in lecture, visiting office hours, and participating in Piazza discussions.
Grading

Grades in the class will be distributed as follows:

- Homework assignments: 20%
- Quizzes: 10%
- Midterm: 20%
- Final: 50%

In order to pass the class, you’ll need to demonstrate basic mastery of the subject material as demonstrated by your homework, quizzes, and exams. You may not pass if your (weighted) average in any of these three areas is below 55%. Note that merely meeting this requirement isn’t sufficient to pass the class: a 56% exam average, 57% homework average, and 59% quiz average will result in a failing grade.

We expect to use the following approximate ranges for overall scores. Individual assignments may be curved, but there is no guarantee of this.

- A: 89–100%
- B: 79–89%
- C: 69–79%
- D: 60–69%
- F: below 60%

Getting Help

There are several ways to get help with concepts covered in class, textbook, and homework assignments, listed in approximately the order you should try them for help.

- Attend classes and lab sections.
- Read Canvas for information on assignments.
- Read and post to the class discussion forum, hosted at piazza.com.
- Meet with the course staff during office hours.
- Email the course staff (cmpe110-staff(at)ucsc.edu).

You’re encouraged to post general questions to the Piazza forum, and to answer questions others have posted there. Asking things like “how does this concept work?” or “can we work through this problem not on the homework?” are fine. Questions such as “what did you get for Problem 2 on this week’s assignment” or “what did I do wrong on this pipeline diagram?” are not acceptable, and should be asked during office hours (preferable), or via email. Course staff will read Piazza and reply to posted questions.

Office hours are your chance to ask the course staff in-depth questions about the material being covered, homework assignments, or anything else about computer architecture (or other general computer engineering and computer science issues) you want to discuss. Many students find that discussions in office hours are highly informative and interesting, and it usually helps faculty members write you better recommendations for jobs and graduate school. Please don’t just drop by outside of office hours, since I’m likely to be busy. If you can’t attend office hours, arrange a meeting in advance by emailing the course staff member with whom you want to meet. Appointments with me are managed by my admin, Cynthia McCarley; please email cynmccar(at)ucsc.edu to set up an appointment if you have an academic conflict (lecture or section) that prevents you from attending my office hours.

Email to the course staff (cmpe110-staff(at)ucsc.edu) will be answered if possible, especially if it only requires a short answer. More complex questions like “please explain this concept to me” can’t be answered via email, so you’ll get a brief “come to office hours” response. It may take up to 24 hours for an email response during the week and longer on the weekends, depending on when the course staff read and respond to email. Email to the professor must be sent to elm+cmpe110(at)ucsc.edu. Email regarding CMPE 110 sent to to any other address of mine may be deleted by my email filter.
Accommodations for Students with Disabilities

UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to Prof. Miller privately during office hours. If you cannot attend any office hours due to an academic conflict (another course or section only), you may make an appointment. Accommodations must be made two weeks before the assignment / exam for which you want accommodations, or we cannot guarantee that we can accommodate you. All students who may benefit from learning more about DRC services are encouraged to contact the DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.

Academic Integrity

Academic integrity is a requirement for this course (and, indeed, for your entire academic career). All material submitted for a grade must be your own independent work; this includes homework, quizzes, notes, and exams. If you get help from anyone other than course staff, you must acknowledge their contribution on your submitted work. This includes help from tutors from MSI and similar programs as well as private tutors. Obviously, any form of collaboration during a quiz or exam is strictly forbidden, but you may study in groups if you like.

You may discuss class material with others, and you may discuss general approaches to homework assignments. You may look at someone else’s notes, but you may not look at or discuss their homework solutions. Regardless of anything else, you may not record your own notes in any form—written or electronic—until fifteen minutes after you’ve discussed material with anyone. This does not apply to course staff or to university-provided tutors (e.g., MSI tutors), but applies to all other people, whether they’re in the class or not, at all times, even when course staff are present. For example, you may not copy someone else’s notes in lab section (or any other time, for that matter).

By taking this class, you agree to abide by the Personal Responsibility Document that’s available on the course Canvas page. You must turn in a signed copy of this document by Sunday, January 14th, as your submission for homework assignment 0. Students enrolled as of Friday, January 12th who do not turn in this form by January 14th will receive a failing grade (F/NP) for the class. If you add the class after January 12th, you have 72 hours to submit a signed copy of the Personal Responsibility Document, and must do so before turning in any other assignment.

We take academic integrity very seriously, and report all violations of academic integrity to the School of Engineering and to your college Provost. If you violate academic integrity, you will fail the class. Period. Depending on the severity of the violation, the university may impose additional penalties, including suspension and even expulsion in rare cases.

The bottom line: don’t cheat!