CS 3810: Computer Organization

Course Details and Objectives
Fall 2023

Course Information

Description of CS 3810

An in-depth study of computer architecture and design, including topics such as RISC and CISC instruction set architectures, number representations, digital logic and circuits, CPU organizations, pipelining, memory hierarchies, and parallel machines. Emphasis is placed on performance measures and compilation issues.

Instructor

Daniel Kopta, *Email:* `dkopta@cs.utah.edu` *Office:* MEB 3190A

Lectures

Lectures are Mondays and Wednesdays from 11:50am to 1:10pm in room GC 1900.

Class Website

The class website is on Canvas at `https://utah.instructure.com`. It will contain all pertinent course info and materials such as lectures, announcements, updates, corrections, and grades. Students are required to check their email and Canvas regularly until final grades are posted.

Textbook

Computer Organization and Design MIPS Edition, 6th edition by David Patterson and John Hennessy, 2021 Copyright ISBN: 978-0-12-820109-1

Coursework

Grading

Your grade for this course will be determined by the following:

Assignments	35%
Exams	45%
Quizzes	10%
In-class Participation	10%

If X is your overall course score, letter grades will be assigned using the below scale. Scores will *not* be rounded.

	$90 > X \geq 87$ B+	$80 > X \geq 77$ C+	$70 > X \geq 67$ D+	
$100 \geq X \geq 93$ A	$87 > X \geq 83$ B	$77 > X \geq 73$ C	$67 > X \geq 63$ D	$60 > X \geq 0$ E
$93 > X \geq 90$ A-	$83 > X \geq 80$ B-	$73 > X \geq 70$ C-	$63 > X \geq 60$ D-	

Assignments

There will be an assignment due most weeks, consisting of a mix of written and programing exercises to solidify students' understanding of the material. Programming assignments will mostly make use of the MIPS assembly language. Written assignments must be submitted digitally in pdf format.

Exams

Midterm exams will be given during the regular class time in the regular class room on Wednesday, September 27 and Wednesday, November 1. The final exam will be held on Thursday, December 14 at 10:30am in the regular class room. All exams are written exams.

Quizzes

There is a short quiz on Canvas every week to give students a low-risk assessment and a chance to practice the related material. Quizzes will generally be due Mondays at 11:00am before the first class for the new week. Quizzes will not be accepted late.

Participation

The class participation grade will be based on attendance and completion of in-class responses using polling software during most class sessions. Half of the credit will be awarded for answering questions at all, and half will be awarded for answering correctly. Bring an internet-connected device to class.

Dropped Scores

The one lowest quiz, and three lowest participation scores will be dropped. The purpose of these dropped scores is to account for illness or other extraordinary circumstances preventing you from completing or attending them. Do not use your dropped scores simply to avoid doing the work. No exam or assignment scores will be dropped.

Getting Help

See the "Getting Help" page on Canvas for information about my office hours, TA help hours, discussion boards, etc.

Course Guidelines

Piazza

Piazza is used for questions and discussions related to the course. Students must use their first and last names (as they appear in Canvas) in their Piazza profile, such that the correct name is visible to the instructor and TAs on posts. Note that students may select to post anonymously, such that their name is not visible to classmates.

For questions that other students can not answer, such as questions about your grade or requests for an extension, make your post private, not public.

Late Work

Late assignment submissions will incur a penalty of 10% of the assignment's max value if submitted within the 24-hour period following the due date. This penalty increases by 10% per 24-hour period, up to three days. Work submitted more than three days late will not receive credit. An assignment is considered late if submitted any amount of time past the deadline, as measured by the submission system. Any delay caused by the submission system or corrupt/lost files is not an excuse for lateness. **Do not risk submitting at the last minute**. Late days apply to assignments only; other work, such quizzes, will not be accepted late.

College of Engineering Guidelines

For information on withdrawing from courses, appealing grades, and more, see:
`https://www.coe.utah.edu/semester-guidelines`

Students with Disabilities

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Safety

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus

safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

Violence and harassment based on race, national origin, color, religion, age, disability, sex or gender (which includes sexual orientation and gender identity/expression) is a civil rights offense and will not be tolerated. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776.

Learning Outcomes

By completing this course, students will be able to:

- compose simple computing circuits (such as an adder)
- explain the basic building blocks of a computer: arithmetic-logic unit, registers, central processing unit, and memory
- describe the internal representation of numbers (including two's complement and floating-point representation) and non-numeric data (such as characters, strings, records, and arrays)
- write simple programs at the assembly level and explain how constructs in higher-level languages (such as conditionals and procedure calls) can be mapped to assembly language
- describe the memory hierarchy (including the role of virtual memory and caching) and its effect on program performance
- reason about superscalar processor capabilities (such as out-of-order and speculative execution) and its effect on program performance
- describe hardware support for parallelism (including multicore processors and GPUs) and its potential effect on program performance