Course Syllabus
ECE 554: Computer Architecture

Instructor: Dr. Sudeep Pasricha (sudeep@colostate.edu), ENGR B119

Lectures: Tu/Thu 4:00pm – 5:15pm, CLARK A202

Office Hours: 9am – 10:30am, Fridays via Zoom

Course TA: Liping Wang (liping.wang@colostate.edu)

TA Hours: Monday, Wednesday, 1pm-3pm via Zoom or ENGR C1

Course Description: The objective of the course is to provide students with a solid foundation in modern computer architecture. The computing world today is in the middle of a revolution: mobile clients and cloud computing have emerged as the dominant paradigms driving programming and hardware innovation today. This course focuses on this dramatic shift, exploring the ways in which software and technology in the "cloud" are accessed by smartphones, tablets, laptops, and other mobile computing devices. The major focus is on advanced topics in modern computer architecture, including advanced parallel processor design, neuromorphic and AI computing, photonic computing, processing-in-memory, chip-scale networks, parallel programming, advanced data and thread level parallelism, and warehouse-scale computing.

Prerequisites: ECE452 or equivalent computer organization course; familiarity with C/C++ and Python programming; Linux

Textbook: John L. Hennessy, David A. Patterson. Computer Architecture, Sixth Edition: A Quantitative Approach, 2018

Syllabus: Here is a tentative outline and syllabus for this course:

Module	Week	Lecture Content
1	1	Fundamentals of Advanced Computer Architecture
2	2-5	Advanced Cache and Main Memory Design
3	5-7	Advanced Interconnection Networks
4	8	Processing-in-Memory
	9	Spring Break
5	10	Advanced Instruction Level Parallelism
6	11-12	Thread Level Parallelism, OpenMP, Coherence
7	13	Data Level Parallelism, GPUs
8	14	AI and Neuromorphic Computing
9	15	Photonic Computing
10	15	Warehouse-scale Computing
	16	Finals Week

Grading: Grading is based on the following components:

- Homework Assignments (5): 20%
- Reading Assignments (8): 20%
- Class participation: 10%
- Examinations (closed book): 50%

- Midterm: 15%
- Comprehensive Final: 35%

Grading Scale:

>95%	90-94%	85-89%	80-84%	75-79%	70-74%	65-69%	55-64%	40-55%	<40%
A+	A	A-	B+	B	B-	C+	C	D	F

Learning Objectives: Upon completion of the course, successful students will be able to analyze the building blocks for advanced computing systems used in smartphones, tablets, laptops, servers, datacenters, and supercomputers. They will be able to examine the trade-offs between performance, energy, reliability, cost, and security in diverse computing platforms and across a wide range of applications. Students will learn to design and evaluate software algorithms for achieving desired trade-offs across a wide range of state-of-the-art computing platforms. They will also be able to design and evaluate hardware systems for achieving desired trade-offs across a wide range of state-of-the-art computing platforms. Furthermore, students will learn to analyze state-of-the-art research and design challenges for emerging and future computing platforms

Assignments: Homework assignments will involve solving problems related to computer architecture, as well as tools for computing platform design and exploration. Reading assignments will involve reading technical research papers and summarizing their key contributions and a critique in around 500 words.

Submission Policy: Homework and reading assignments will be assigned throughout the semester. You are allowed late submission up to 3 days on one homework and one reading assignment. You can also skip one reading assignment of your choice, without impacting your grade. Otherwise all homework and reading assignments should be submitted before the deadline via Canvas, and ***late submissions will not be graded!***

Re-grading Policy: Re-grading requests should be made within a week from the date of the graded item (homework, exam, or project) becoming available.

Academic Integrity: All submitted work should be your own. Copying of language, structure, images, ideas, or thoughts of another, and representing them as one's own without proper acknowledgement (from github code repos, other web sites, books, papers, other students, etc) and failure to cite sources properly is not acceptable. Sources must always be appropriately referenced, whether the source is printed, electronic, or spoken. Minor first infraction in HWs and presentations will lead to a zero score + one letter level (e.g. A to B) reduction in course grade. Project or Major or repeated infractions in HWs and presentations will result in "F" grade for the course + report to Dean's Office. For more information see CSU's Academic Integrity Policy: https://tilt.colostate.edu/AcademicHI (Links to an external site.) and Student Conduct Code: https://resolutioncenter.colostate.edu/student-conduct-code/ (Links to an external site.)

Attendance: I encourage everyone to attend all the lectures and actively participate in class discussions.

Appointment: I encourage you to make at least one appointment with me during the semester for advice or to discuss research opportunities, independent study, research ideas, course suggestions, concerns, or any other topic you feel is appropriate.