

Course Syllabus

ECE 554: Computer Architecture

Instructor: Dr. Sudeep Pasricha, Engr B119, 970-491-0254

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 cell phones, tablets, laptops, and other mobile computing devices. The major focus is on advanced topics in modern computer architecture, including advanced parallel processor design optimizations, neuromorphic/brain computing, processing-in-memory, emerging memory architectures, silicon photonic chip-scale networks, and parallel programming.

Prerequisites: ECE452 or equivalent computer organization course;

Grading: Grades will be based on homework assignments (30%), participation (10%), paper reports (10%), and examinations (50%). The paper reports will be based on selected readings in computer architecture, as chosen from a list of papers from recent conferences provided to the students.

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

Topics

Week	Topic
1	Introduction to Computer Architecture
2	Advanced Cache Design
3, 4	Contemporary Main Memory Architectures
5	Emerging Memory Technologies
6	Interconnection Networks
6, 7	Silicon Photonic Networks
7	Processing in Memory
8	Advanced ILP
9	Spring Break
10	Advanced ILP and TLP
11	Midterm
11, 12	Coherence
12	OpenMP
13	DLP
14	Heterogeneous Computing
14, 15	Neuromorphic Computing
16	Warehouse Scale Computing
17	Finals

Grading Methodology and Scale

A+ ≥ 95%; 90 ≤ A < 95%; 85 ≤ A- < 90%; 80 ≤ B+ < 85%; 75 ≤ B < 80%; 70 ≤ B- < 75%; 65 ≤ C+ < 70%; 55 ≤ C < 65%; 40 ≤ D < 55%; F < 40%;

Student Learning Objectives

Upon completion of the course, successful students will have developed an understanding of the building blocks of advanced computing systems used across the digital spectrum, in smartphones, personal computers, servers, and large datacenters. They will have an appreciation of the state-of-the-art design techniques and challenges encountered in methodologies for computer architecture design. Through literature reviews, they will have learnt about specific topics relevant to computer architecture design in greater depth and will have gained experience in reading and summarizing recent research papers from journals and conferences.