Course Introduction and Overview

Dr. Soner Onder
CS 4431
Michigan Technological University
the attributes of a [computing] system as seen by the programmer, i.e., the conceptual structure and functional behavior, as distinct from the organization of the data flows and controls the logic design, and the physical implementation.

Amdahl, Blaaw, and Brooks, 1964
What is Computer Architecture?

Old definition: Instruction Set Architecture (ISA)
Today’s definition is much broader: hardware organization of computers (how to build computer)--includes ISA.

Layered view of computer systems:

Role of the computer architect:
To make design trade-offs across the hw/sw interface to meet functional, performance and cost requirements.
CS 4431 Course Focus

Understanding the design techniques, machine structures, technology factors, evaluation methods that will determine the form of computers in 21st Century
Related Courses

CS 3421 → CS 4431 → CS 5431

- How to build it
- Implementation details
- Why, Analysis, Evaluation
- Parallel Architectures, Languages, Systems

Strong Prerequisite
Grading

- 30 % Project
  - To be done individually
  - Consists of multiple phases
- 10 % Homework assignments
- 30 % 2 Midterm Exams
- 30 % Final Exam

For success in this course you must turn in the project and/or homework assignments on time.

Attendance is required.
Topic Coverage


- Instruction Set Principles and Examples (Appendix A)
- Architecture Description Languages – FAST/ADL simulation system
- Pipelining: Basic and intermediate concepts (review, Appendix C)
- Fundamentals of Quantitative Design and Analysis (Chapter 1)
- Memory Hierarchy Design (Chapter 2)
- Instruction Level Parallelism and its Exploitation (Chapter 3)
- Data Level Parallelism in Vector, SIMD, and GPU architectures (Chapter 4)
- Thread Level Parallelism (Chapter 5)