

# INTRODUCTION AND LOGISTICS

Mahdi Nazm Bojnordi

Assistant Professor

School of Computing

University of Utah

# Instructor

- Mahdi Nazm Bojnordi
  - ▣ Assistant Professor of School of Computing
  - ▣ PhD degree in Electrical Engineering
- Research in Computer Architecture
  - ▣ Novel Memory Technologies
  - ▣ Energy-Efficient Computing
- Office Hours
  - ▣ Please email me for appointment
  - ▣ MEB 3418
- Class webpage: <http://cs.utah.edu/~bojnordi/teaching.html>

# Teaching Assistants

- Anirban Nag

- ▣ Email: [anirban@cs.utah.edu](mailto:anirban@cs.utah.edu)

- ▣ Office Hours: Monday 3:00-4:30 PM

- ▣ MEB 2180



- Manikanth Miryala

- ▣ Email: [manikanth.miryala@utah.edu](mailto:manikanth.miryala@utah.edu)

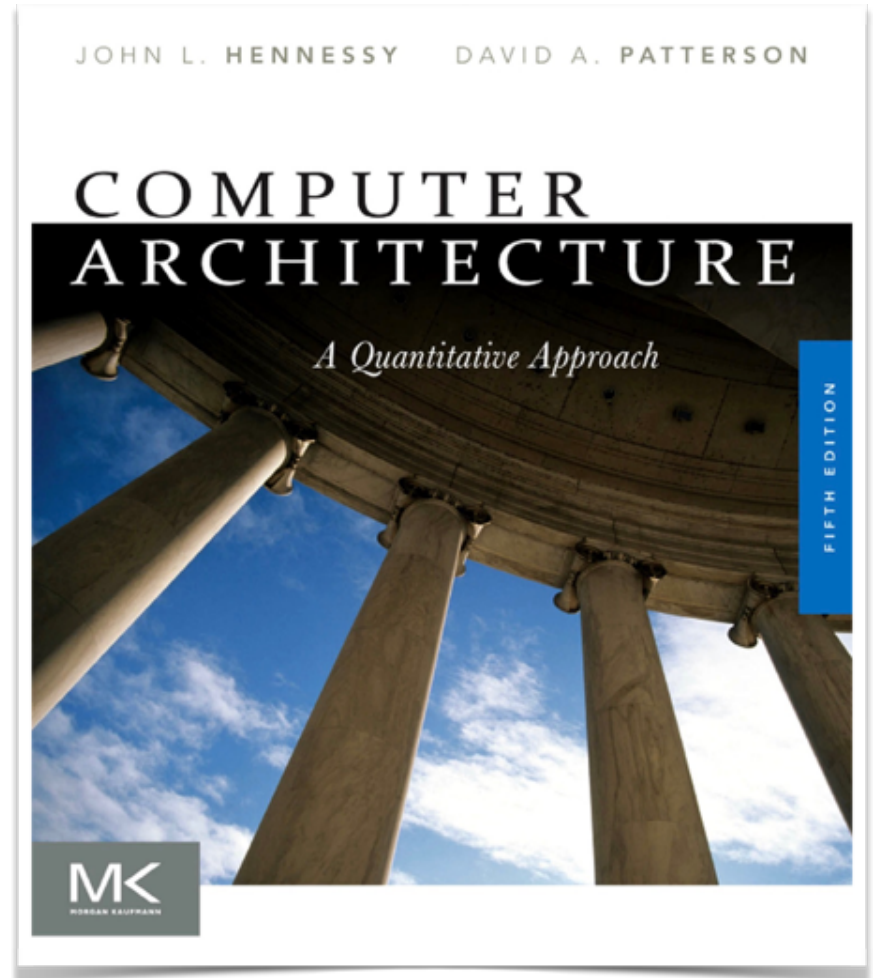
- ▣ Office Hours: Wednesday 10:00-11:30 AM

- ▣ CADE Lab.



# Resources and Requirements

- Textbook: Computer Architecture A Quantitative Approach - 5th Edition, John Hennessy and David Patterson
- Pre-requisite: CS/ECE 3810 or equivalent



# Course Expectation

- We use Canvas for homework submissions, grades, and homework announcements.
- Grading

	Fraction	Notes
Assingments	50%	Weekly homework assignments
Midterm Exam	20%	In-class, October 18th
Final Exam	30%	Wednesday, December 14th
Class Participation	0-10%	Questions and answers in class

- Good news: we will drop your lowest assignment score.

# Academic Integrity

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- Do NOT cheat!!
  - Please read the Policy Statement on Academic Misconduct, carefully.
  - We have no tolerance for cheating
- Also, read to the College of Engineering Guidelines for disabilities, add, drop, appeals, etc.
- For more information, please refer to the important policies on the class webpage.

# Why CS/ECE 6810?

- ☐ Need another qualifier/graduation requirement?
- ☐ You plan to become a Computer Architect?
- ☐ Understand what is inside a modern processor?
- ☐ Want to use the knowledge from this course in your own field of study?
- ☐ Understand the technology trends and recent developments for future computing?
- ☐ ...

# Estimated Class Schedule

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- Introduction and Performance Metrics
- Instruction Set Architecture and Pipelining
- Instruction-Level Parallelism
- Compiler Optimization
- Dynamic Instruction Scheduling
- Memory System Design
- Data Parallel Processors (VLIW and GPU)
- Interconnection Networks
- Embedded Systems



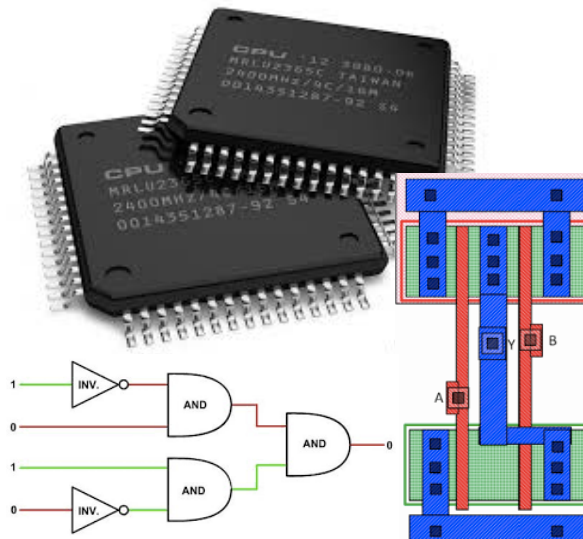
# What is Computer Architecture?

- Computer systems are everywhere ...

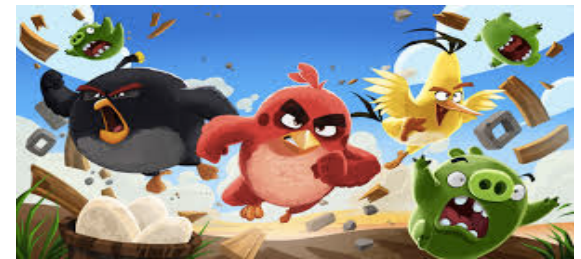


# What is Computer Architecture?

- What is inside modern processors ...



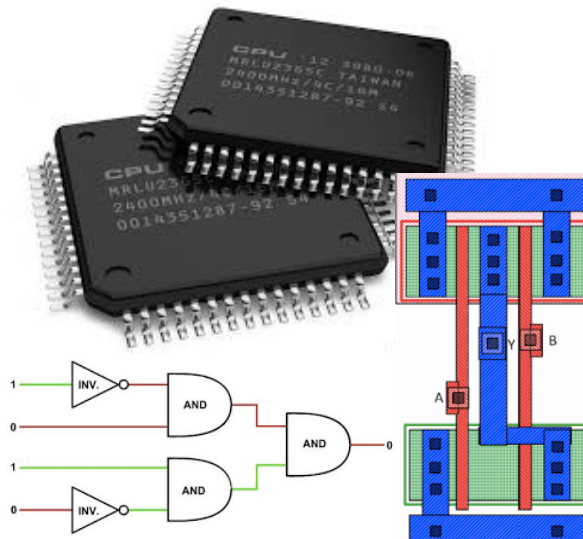
**VLSI Circuits**  
**Hardware Implementation**



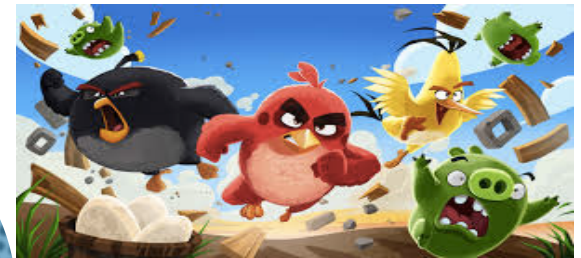
**Software Applications**  
**OS and Compiler**

# What is Computer Architecture?

- Computer architecture is the glue between software and VLSI implementation

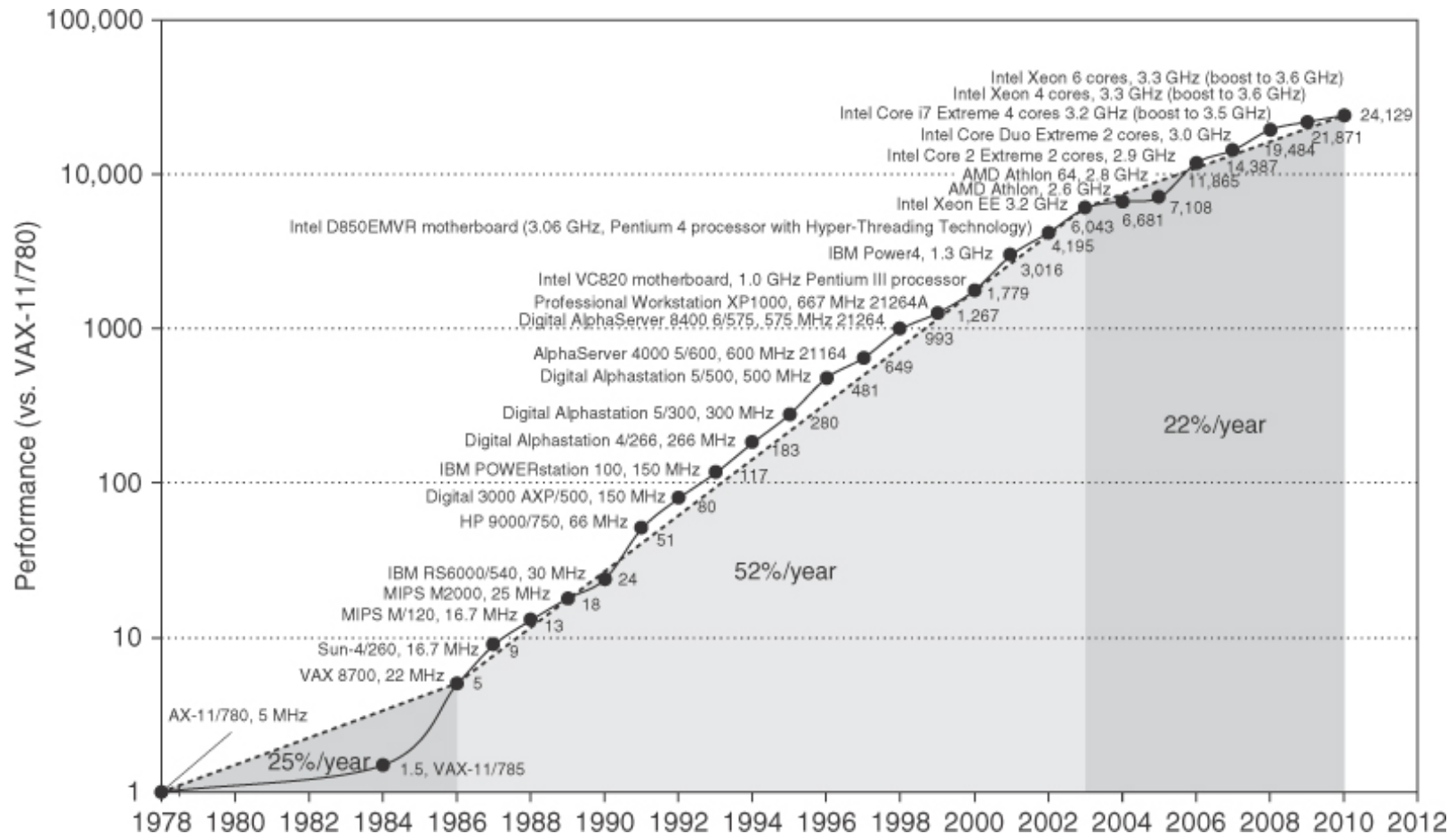


**VLSI Circuits**  
**Hardware Implementation**



**Software Applications**  
**OS and Compiler**

# Growth in Processor Performance



Source: Hennesy & Patterson Textbook

# Growth in Processor Performance

- Main sources of the performance improvement
  - ▣ Enhanced underlying technology (semiconductor)
    - Faster and smaller transistors (Moore's Law)
  - ▣ Improvements in computer architecture
    - How to better utilize the additional resources to gain more power savings, functionalities, and processing speed.

# What are New Challenges?

- Resources (transistors) on a processor chip?
  - ▣ Not really, billions of transistors on a single chip.
- Can we use all of the transistors?
  - ▣ Due to energy-efficiency limitations, only a fraction of the transistor can be turned on at the same time!
- Who is affected?
  - ▣ Server computers by the peak power
  - ▣ Mobile and wearables due to energy-efficiency