Chapter 1: Fundamentals of Quantitative Design & Analysis (Part 1)

What is computer architecture?
Why study computer architecture?
Common principles
What is Computer Architecture?
Instruction set architectures

Most ISAs today are general-purpose register based
Operands may be registers or memory locations
Register-memory vs. load-store

Addressing modes
Register, immediate, displacement, …

Operand sizes
8 bits, 16 bits, 32 bits, 64 bits, SP and DP FP

Operations: Arithmetic, memory, control flow, floating point

Encoding: fixed vs. variable length

Action no longer in ISA
But not always the case: CISC vs. RISC – what happened?

Our main focus: organization
Goals of the Computer Architect
Why Study Computer Architecture? - Historical Trends

- Historical Trends

- Moore’s law ends

- Dennard scaling ends, ILP slows

- Amdahl’s law limits
Why Study Computer Architecture?
Why Study Computer Architecture Today?

Golden Age of Computer Architecture!


Full video here: https://www.acm.org/hennessy-patterson-turing-lecture

QnA: Why software community needs to hardware now?
https://youtu.be/3LVeEjsn8Ts?t=4268
Relationship to Prerequisites

Prerequisite
How to design a computer?

This course
How to design a computer WELL?
   Emphasis on Quantitative vs. Qualitative

Be sure to check the handout for details on the prerequisites