CSC180: Lecture 1

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Administrivia

Course info sheet…

Who should be taking this course…

- What is your level of computer science experience?
  - Much experience
  - Some experience
  - Little experience
  - No experience

- What computer science classes have you taken before, if any?
  - Grade 12 computer science
  - Grade 11 computer science
  - Grade 10 computer science
  - Some computer science course(s) outside of high school
  - A little computer science as part of another course
  - No computer science background at all

Who should be taking this course…

- How many different, non-trivial, working computer programs have you written?

  - none

  - 1 to 10

  - 11 to 25

  - more than 25

- In first year, engineering science students either take CSC180 and CSC190, or they take CSC192 and an elective of their choice, if they have prior computer science experience. If CSC180 was not for credit, would you still take it?

  - Yes

  - No

Introduction to Computers and Programming

History Note
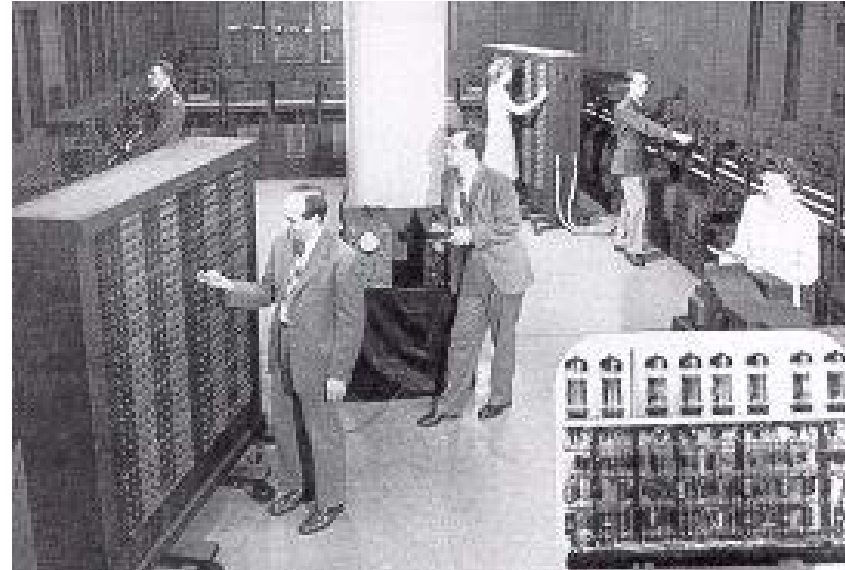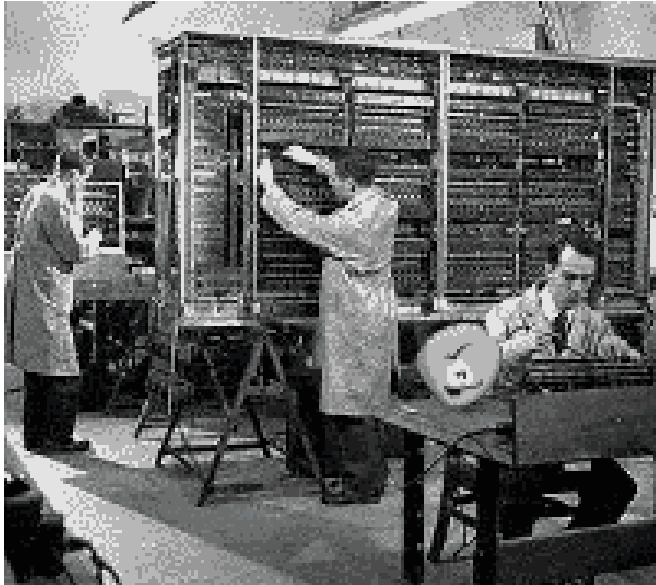
Analog vs Digital

- Analog
  - Continuous
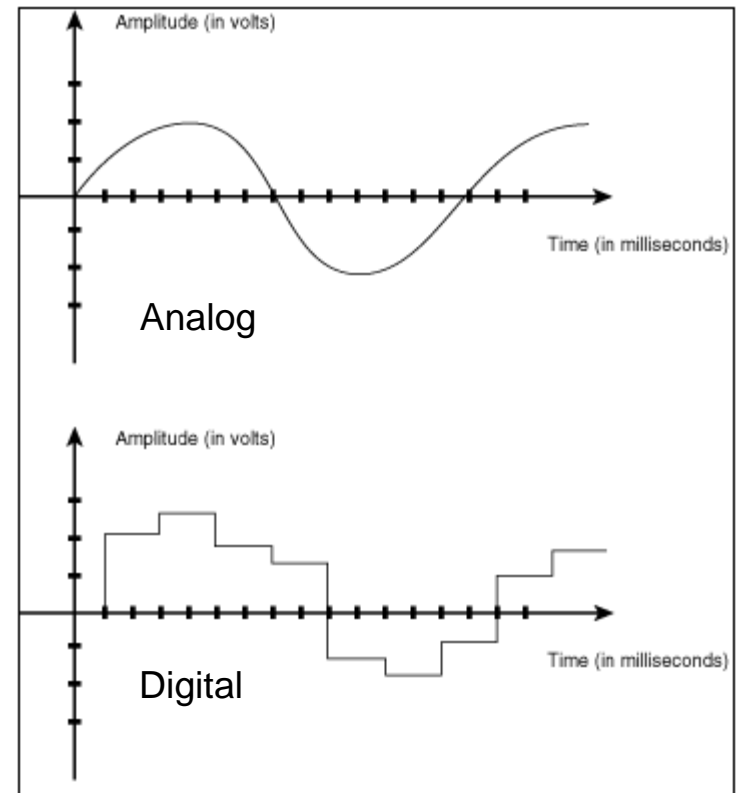   - Time
      - Every time has a value associated with it, not just some times
    - Magnitude
      - A variable can take on any value within a range
    - e.g.
      - temperature, voltage, current, weight, length, brightness, color

Amplitude (in volts)

Time (in milliseconds)

Analog

Amplitude (in volts)

Time (in milliseconds)

Digital

Analog vs Digital

Analog

Digital

- Digital
  - Discontinuous
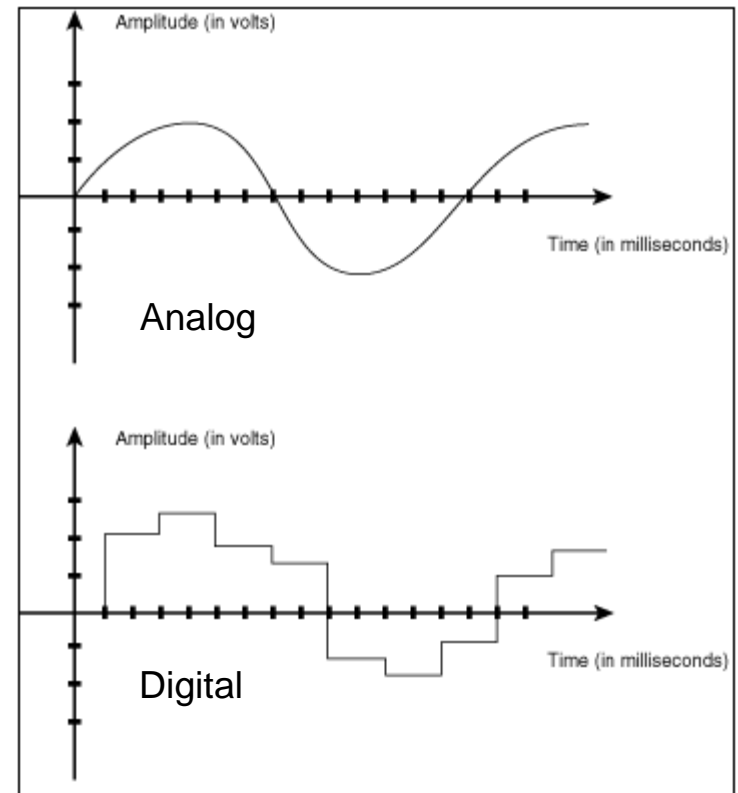   - Time (discretized)
      - The variable is only defined at certain times
    - Magnitude (quantized)
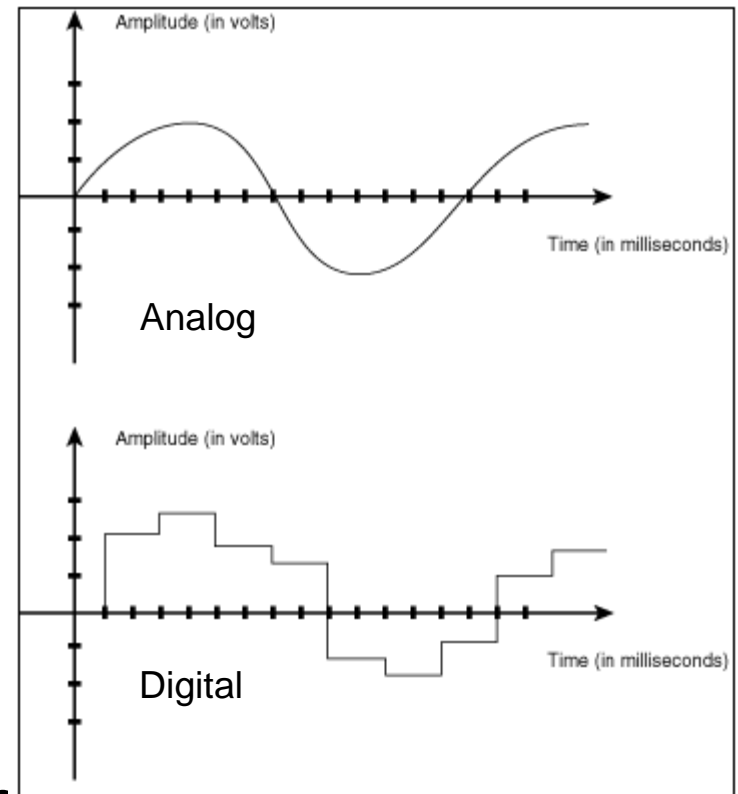   - The variable can only take on values from a finite set
    - e.g.
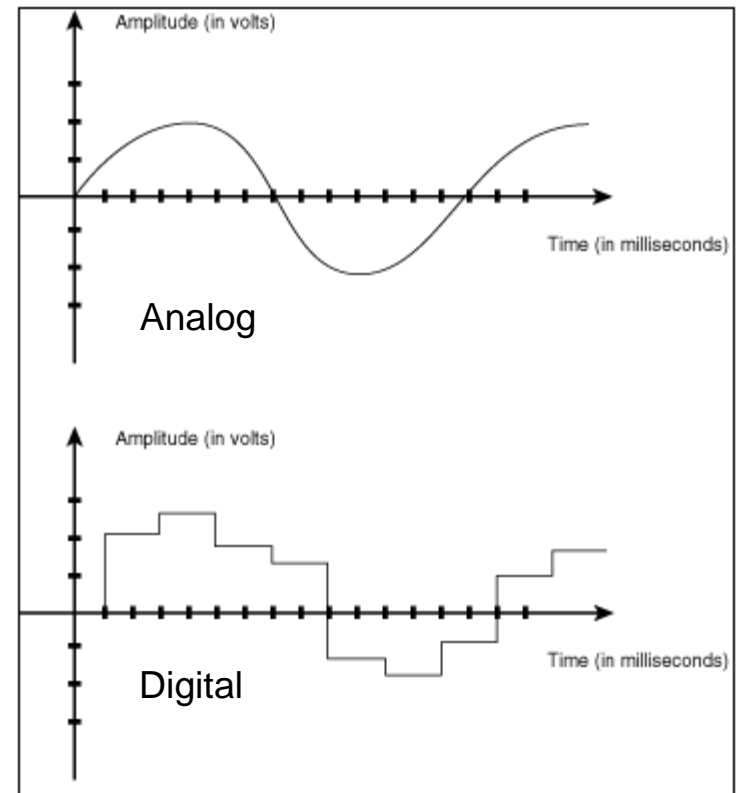   - Switch position, digital logic, Dow-Jones Industrial, lottery, batting-average

Digital is Ubiquitous

■ **Electronic Circuits based on Digital Principles are Widely Used**

  ■ Computers

  ■ Automotive Engine/Speed Controllers

  ■ Machine Controllers (fridge, microwave, etc..)
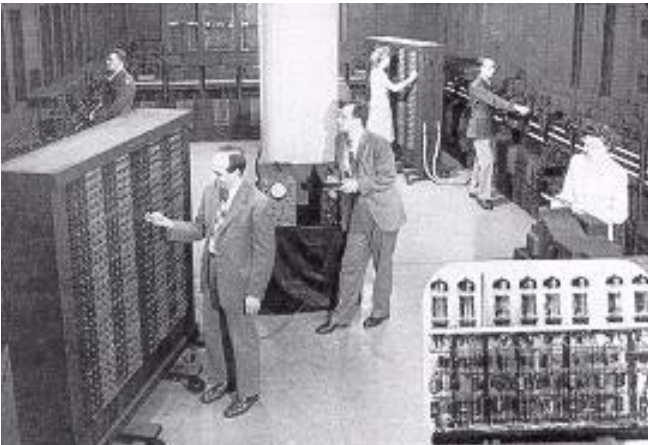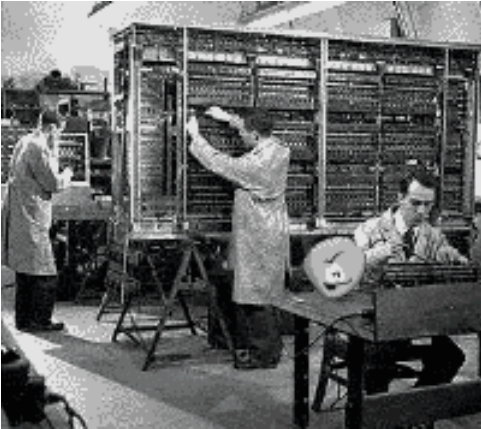
  ■ Cellular Phones

  ■ Video-game Consoles

Amplitude (in volts)

Time (in milliseconds)

Analog

Amplitude (in volts)

Time (in milliseconds)

Digital

Why Digital?

- Increased Noise Immunity
- Reliable
- Inexpensive
- Programmable
- Reproducible
- Small


Analog

Digital

# History Note

Computer Hardware today

- Three main classes of computers

  - PCs (Personal Computer)
    - Relatively small used by one person at a time

  - Workstation
    - Larger and more powerful than a PC

  - Mainframe
    - Still larger
    - Requires support staff
   - Shared by multiple users

Computer Networks

- A number of computers connected to share resources
  - Share printers and other devices
  - Share information
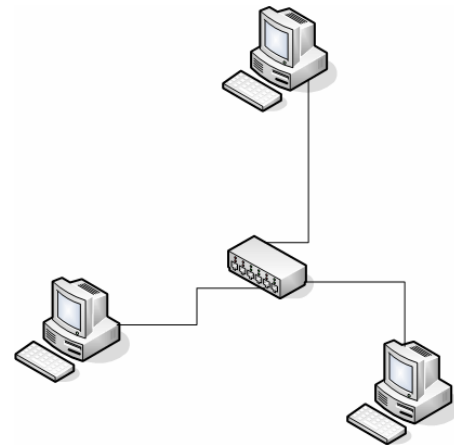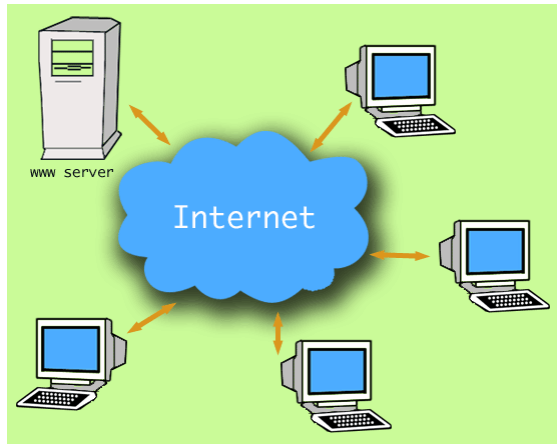
Computer Organization

- Five main components
  - Input devices
    - Allows communication to the computer
  - Output devices
    - Allows communication to the user
  - Processor (CPU)

  - Main memory
    - Memory locations containing the running program
  - Secondary memory
    - Permanent record of data often on a disk

Main Components of a Computer
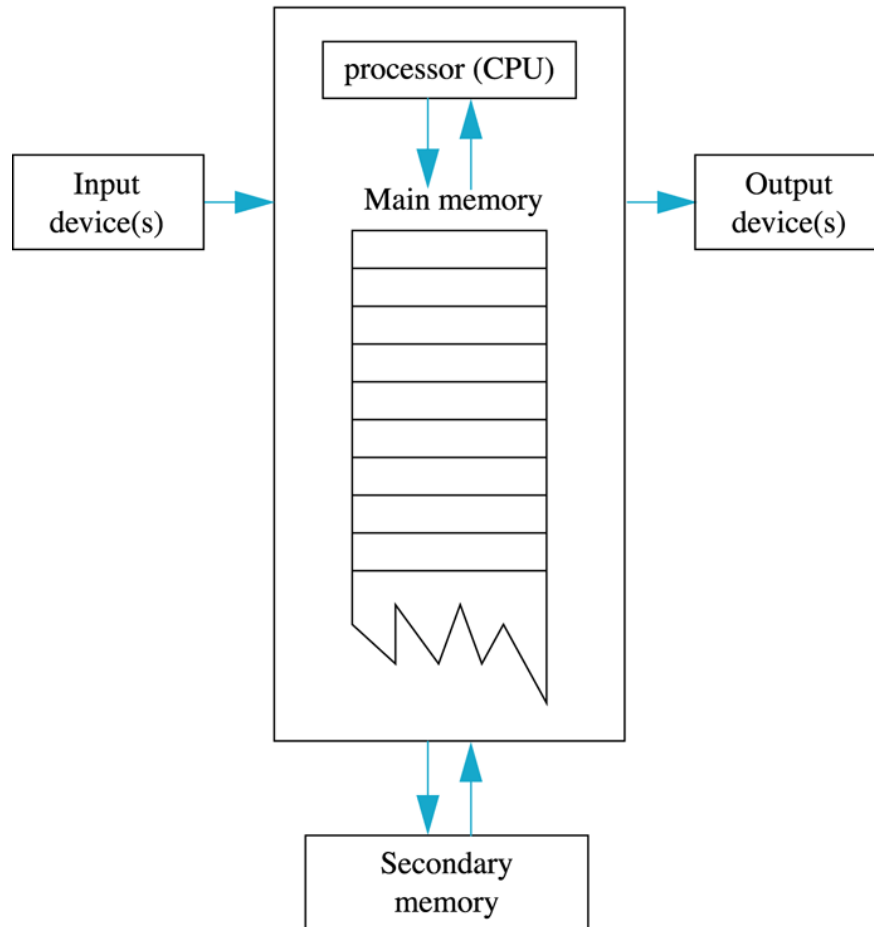
The Processor

- Typically called the CPU
  - Central Processing Unit
  - Follows program instructions
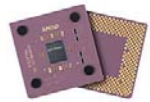 - Typical capabilities of CPU include:
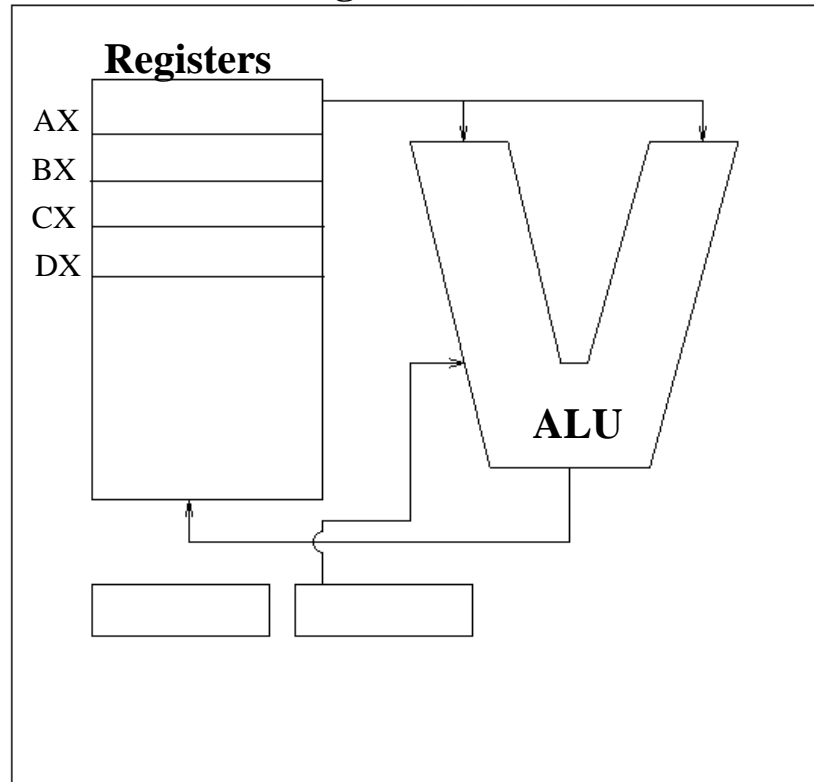
    add
    subtract
    multiply
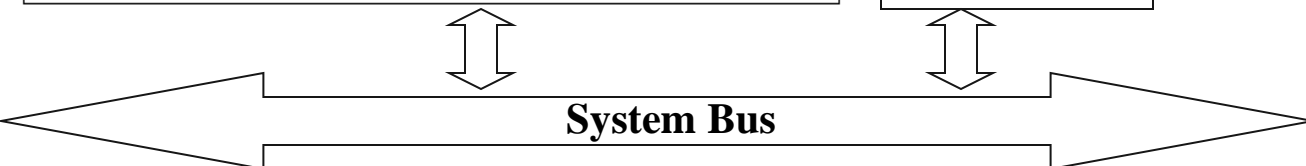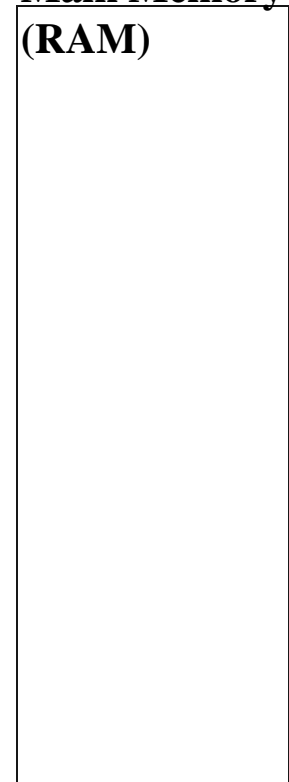   divide
    move data from location to location

The Processor

Central Processing Unit (CPU)

Registers

AX

BX

CX

DX

ALU

Main Memory (RAM)

System Bus

Computer Memory

- **Main Memory**
  - **Long list of memory locations**
    - Each contains zeros and ones
    - Can change during program execution
  - **Binary Digit or Bit**
    - A digit that can only be zero or one
  - **Byte**
    - Each memory location has eight bits
  - **Address**
    - Number that identifies a memory location

Larger Data Items

- Some data is too large for a single byte
  - Most integers and real numbers are too large

  - Address refers to the first byte

  - Next few consecutive bytes can store the additional
    bits for larger data

Memory Locations and Bytes

byte 1
byte 2 — 3 byte location with address 1
byte 3

byte 4 — 2 byte location with address 4
byte 5

byte 6 — 1 byte location with address 6

byte 7
byte 8 — 3 byte location with address 7
byte 9