IS114 Computing Fundamentals

Week 1: Hardware

Consider the following computer specification:

- Intel Core i7 (2.8 GHz Quad-Core)
- 12 MB Intel Smart Cache
- 15-inch HD LED Display (1920 × 1080)
- Intel Iris Xe GPU
- 20 GB RAM

- 1 TB SSD
- WiFi 7, Bluetooth 5
- 2 USB Type-C ports
- 1 HDMI port
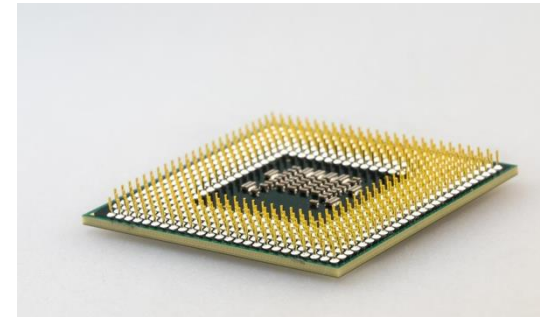- 3 kg
- Windows 11 Home

Sizes in Perspective

Valuex	Prefix	Abbreviation
10^3	Kilo-	K
10^6	Mega-	M
10^9	Giga-	G
10^{12}	Tera-	T

Processors

> ▪ Intel Core i7
>
> (2.8 GHz Quad-Core)

- Synonyms: CPU, microprocessor, microcontroller
- **Functions:**
  - Fetch & execute instructions
  - Process data (text, images, numbers)
- **Multi-core Processors:**
  - More cores = better performance & higher power usage

Processor in the ad

- Intel Core i7
  (2.8 GHz Quad-Core)
- 12 MB Intel Smart Cache

- **Core i7**: CPU model
- **2.8 GHz**: Clock speed = 2.8 billion cycles/second
- **Quad-Core**: 4 cores for parallel processing
- **12 MB Cache**: Fast memory for quick access

Memory

■ 20 GB RAM

- Synonyms: RAM, primary storage
- **Characteristics:**
  - Volatile
  - Stores active data and instructions for running programs
- **Interaction:**
  - Read from memory
  - Write to memory
- Typical range: 4–32 GB in laptops/phones

Storage

▪ 1 TB SSD

- Synonyms: Secondary storage, disk
- **Characteristics:**
  - Non-volatile
  - Retains data when powered off
- Typical range: 200 GB – 1 TB

Display & GPU

- 15-inch HD LED Display
  (1920 × 1080)
- Intel Iris Xe GPU

- **15-inch HD LED Display**
  - 1920 × 1080 resolution (pixels)
  - LED: long-lasting, mercury-free
- **Intel Iris Xe GPU**
  - Handles graphics processing
  - Frees CPU for other tasks

Networking & Ports

> - WiFi 7, Bluetooth 5
> - 2 USB Type-C ports
> - 1 HDMI port

- **WiFi 7 & Bluetooth 5**
  - Wireless connectivity
  - Bluetooth for short-range devices
- **USB Type-C Ports**
  - Universal connections (storage, peripherals)
- **HDMI Port**
  - Video & audio output to external displays

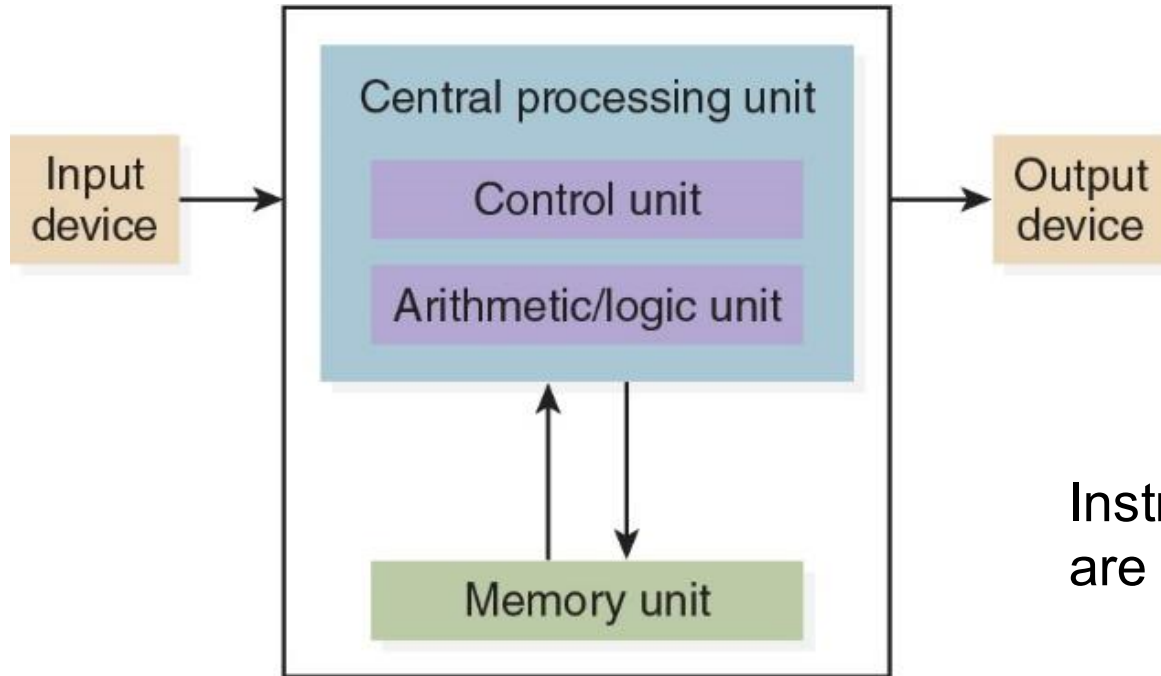# Consider the following computer specification:

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- 3 kg
- **Windows 11 Home** ← software

Computing System Overview

- Computers consist of:
  - **Hardware** (physical components)
  - **Software** (programs and instructions)

HARDWARE + SOFTWARE

How Does a Computer Work? (optional)

Instructions (software) and data are both stored in memory unit

Figure: The von Neumann architecture
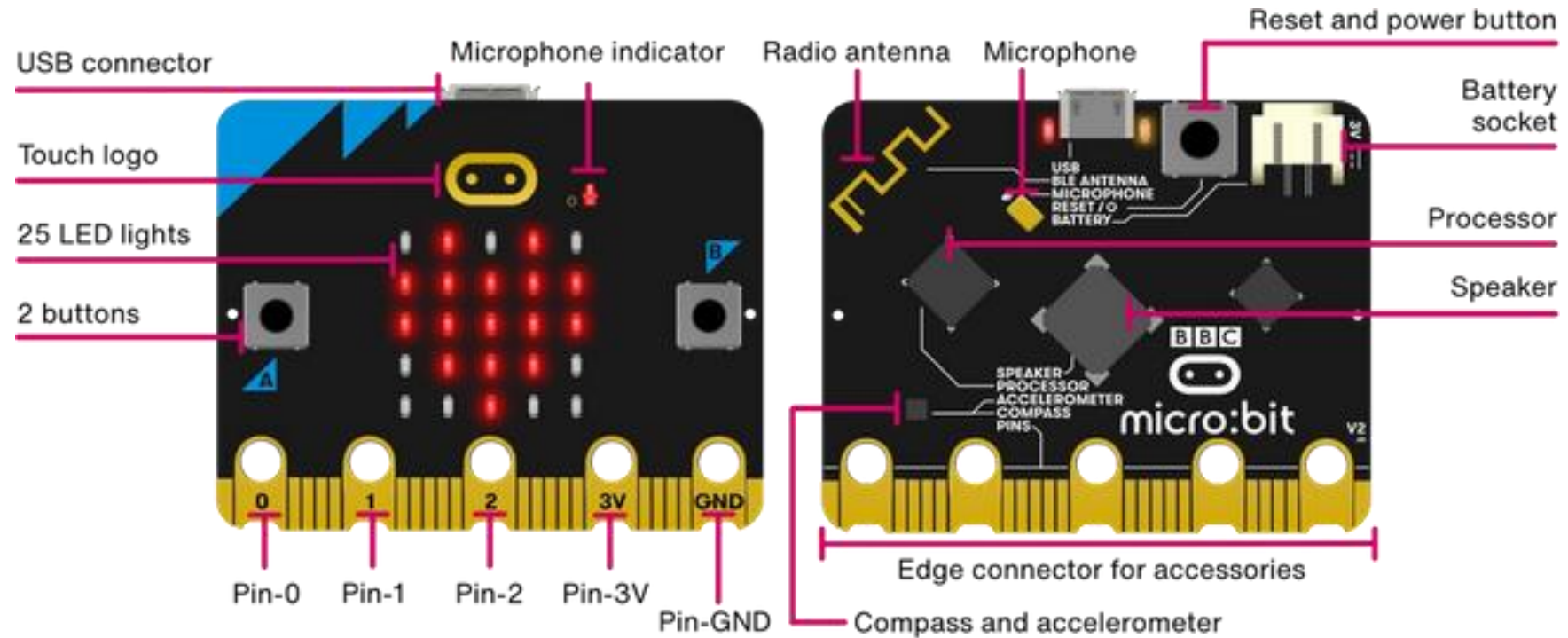
Embedded Systems

- Computers that are dedicated to perform a narrow range of functions as part of a larger system

The BBC micro:bit v2

- Tiny embedded computer
- Components:
  - Processor
  - Memory
  - Storage
  - Sensors

Lab Session

micro:bit overview

Summary

- **Hardware Components:**
  - Processor
  - Memory
  - Storage
- **Embedded Systems:**
  - Specialized, purpose-built computers
- **Micro:bit:**
  - A platform to practice coding and sensor integration