COMPUTER SKILLS

College of Science and Engineering
Department of Computer Science

LECTURE 1

Bahast A.

TEACHING

- Lectures
- Tutorials
- Labs

INSTRUCTOR CONTACT DETAILS

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Google Classroom

MODULE

- Basics of computer hardware and software
- Internet Fundamentals
- Application software
- Word processing software
- PowerPoint
- Spreadsheet & data manipulation
- File management on Windows
- Cyber Security Fundamentals
- Artificial Intelligence
- Research
- Ethical use of ICT

TOPICS COVERED

Foundational Computer Literacy

Office & Productivity Software

Web & Security

AI & research tools

ASSESSMENT

- Exams
- Quizzes
- Practical Demonstrations
- Written Reports

TODAY

- What is a computer
- What is Hardware
- Components of computers

LEARNING OUTCOMES

By the end of this lesson, you should be able to:

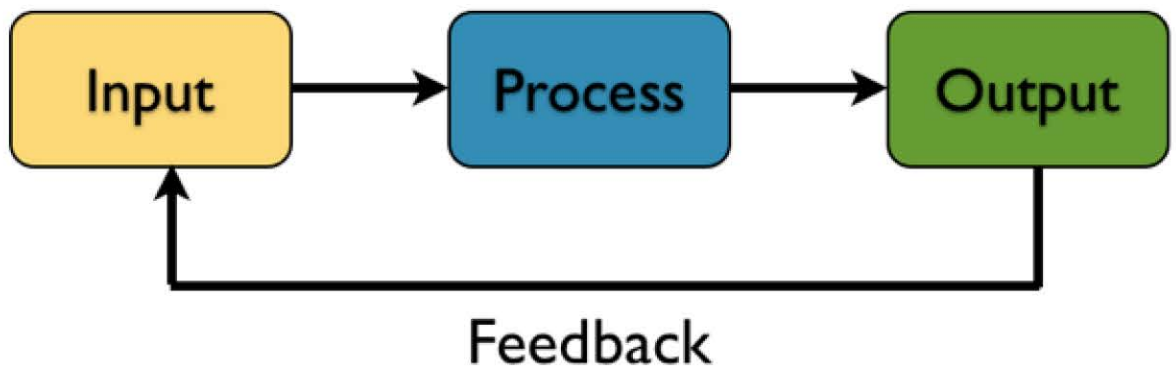
- **Identify** the Components of a Computer System
- **Explain** the what hardware is and how it relates to the overall computer System.
- **Classify** components as input or output devices
- **Explain** the function of the CPU, RAM, & storage media & analyse how their speed & capacity affect overall computer performance
- **Distinguish** components as input devices or output device

WHAT IS A COMPUTER

Computers were not always a device; it used to be an occupation. This was before electronic and mechanical machines.

WHAT IS A COMPUTER

A computer is an electronic *device* that can ***accept data***, ***process*** it, and ***produce*** information by following a set of instructions stored in its memory



WHAT IS A COMPUTER

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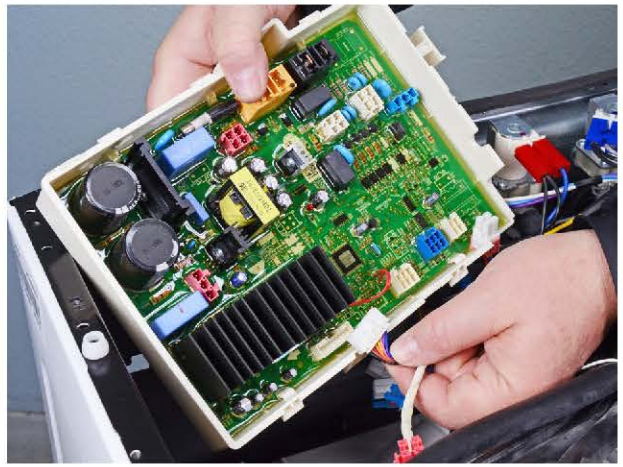


COMPUTERS IN HEALTHCARE

- Patient data management (EHR)
- Imaging (X-Ray, Ultrasound (sonar))
- Advanced imaging (MRI, CT)
- Scans & data gathering (ECG, EEG)
- Monitoring devices (blood pressure, heart rate, ventilators)
- Robot-assisted surgery
- Etc.

COMPUTERS IN HEALTHCARE

WHY COMPUTERS

Healthcare professionals need to have computer skills because:

- To enhance patient safety
- To improve efficiency & productivity
- Evidence-based information
- Informed decision-making
- To improve research & training

COMPUTER TYPES

- Supercomputers
- Mainframes
- Workstation
- Personal Computer
  - Tablet, mobile and PDA
- Embedded computer

SUPERCOMPUTER

- Extremely fast computer designed for complex data calculation and processing
- Used by multi-national corporations and organisations
  - e.g. Facebook, Amazon, Google, NASA, SETI, Apple, OpenAI
- Applications:
  - Scientific & engineering
  - Weather forecasting
  - AI
  - Etc.

MAINFRAMES

- Large-scale and high-performance designed for throughput and reliability.
- Used by Banks, Insurance companies, Governments, Airlines, and Inventory management

WORKSTATION

- High-performance & designed for professional & creative tasks
- Used by a single person at a time.
  - Can support multi-users
- Applications:
  - 3D modelling
  - Video editing
  - Scientific simulations
  - Animations

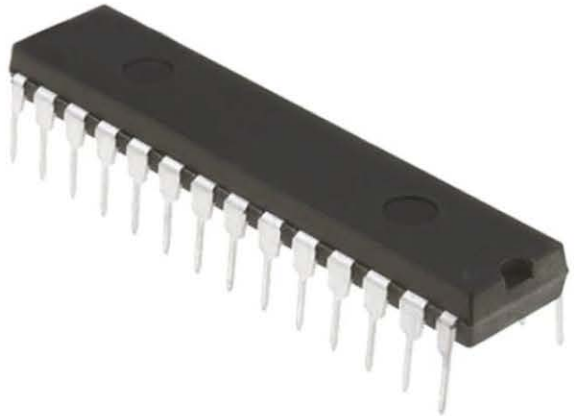
PC TYPES

- Desktop
- All-in-one
- Laptops, notebooks, Ultrabooks
- Tablets
- Smart Phones
- PDA (Personal Digital Assistant

COMPUTER COMPONENTS

Input

Process



Output

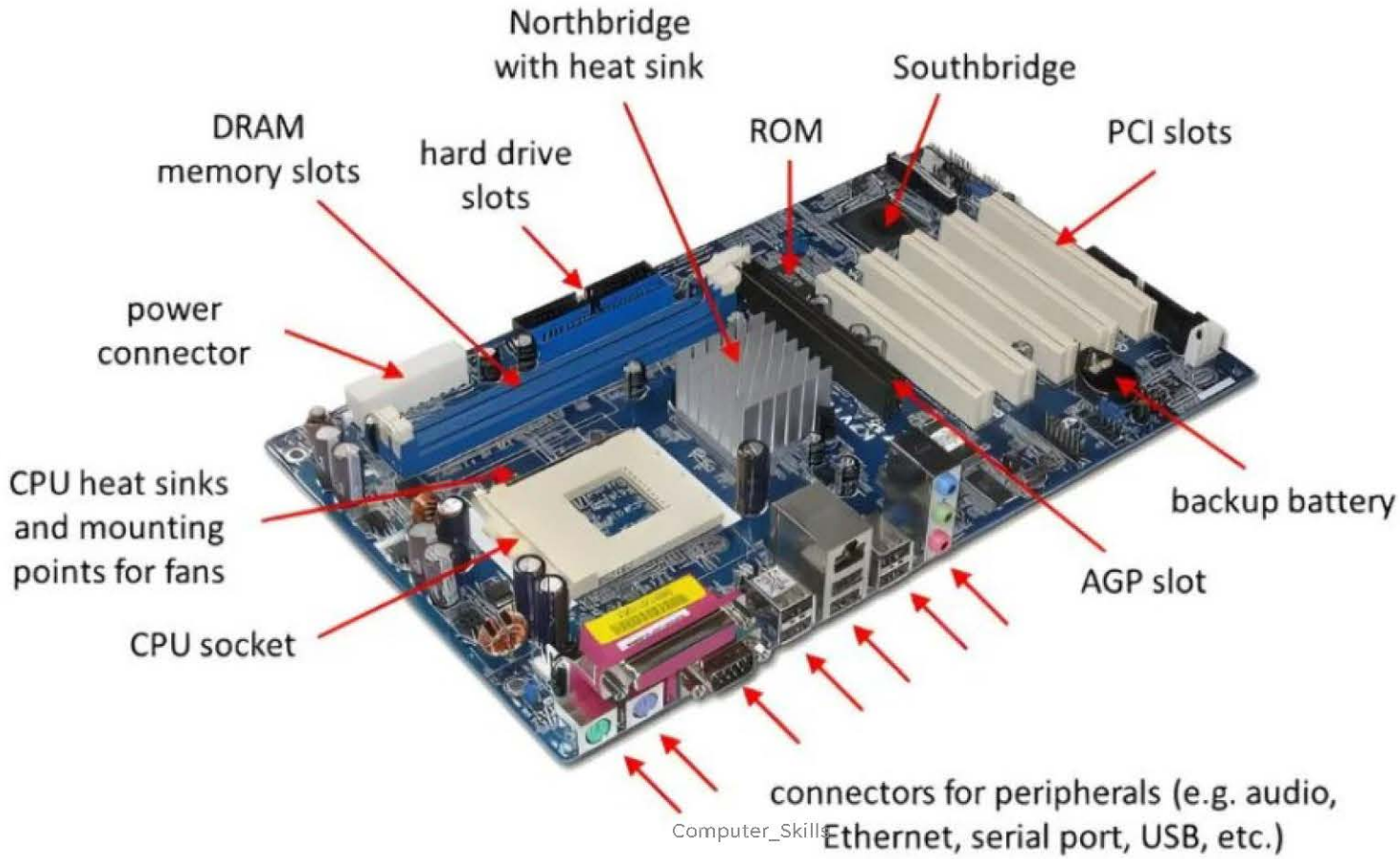
COMPUTER COMPONENTS

Main components of a computer:

- Motherboard
- CPU
- RAM
- Storage media
- GPU
- PSU

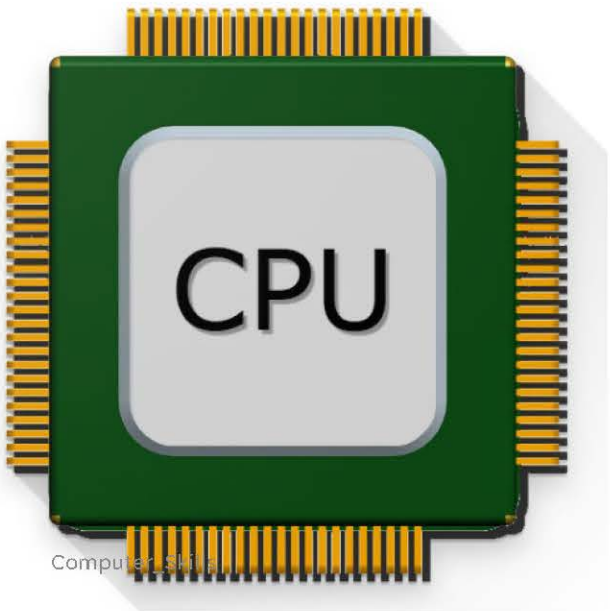
MOTHERBOARD

- Sometimes referred to as PCB. It connects all essential components to enable communication
- Allocates power to the CPU, RAM, PCI slots, Storage media, Fans



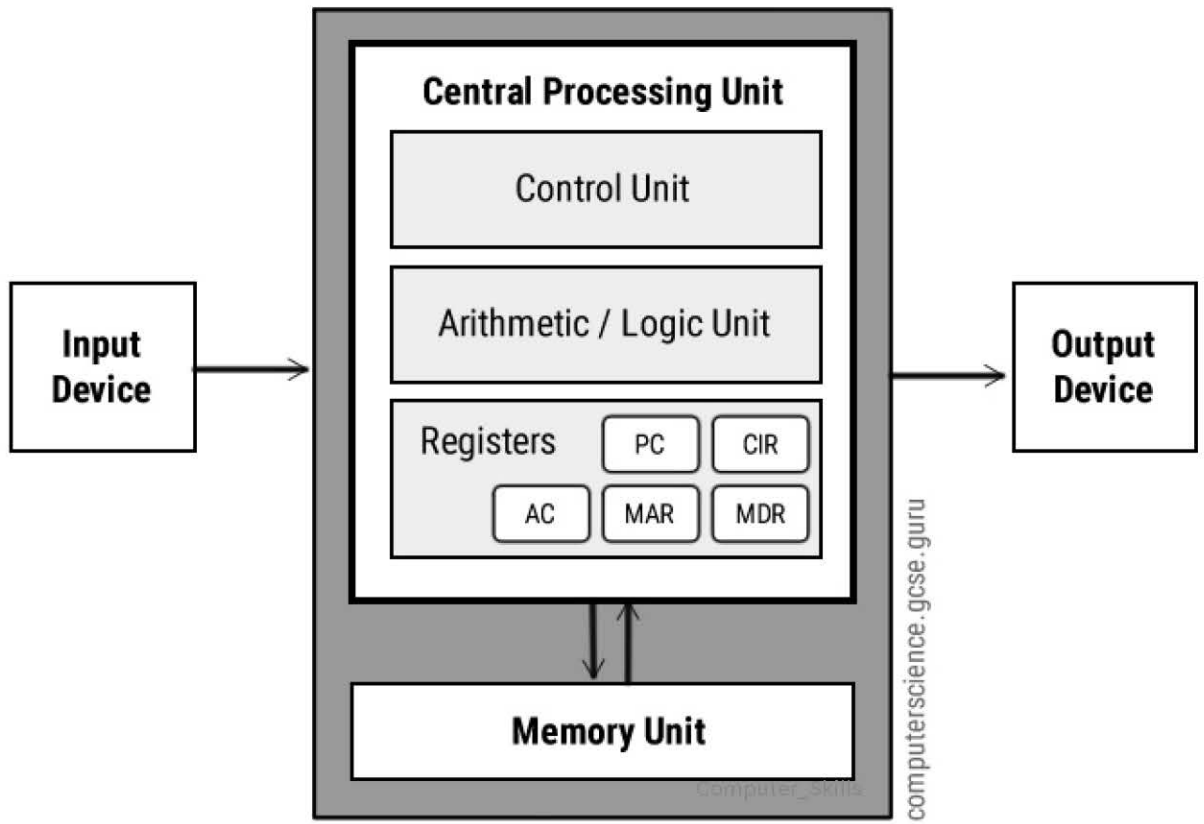
CENTRAL PROCESSING UNIT

- Often referred to as the ‘brain’ of the computer
- Handles instructions and processes data
- The CPU speed can greatly affect the overall performance of the computer
- CPU speed is measured in **Hz**
- Many different manufacturers, i.e. Intel, AMD, Qualcomm, MediaTek, Samsung, etc.



CPU

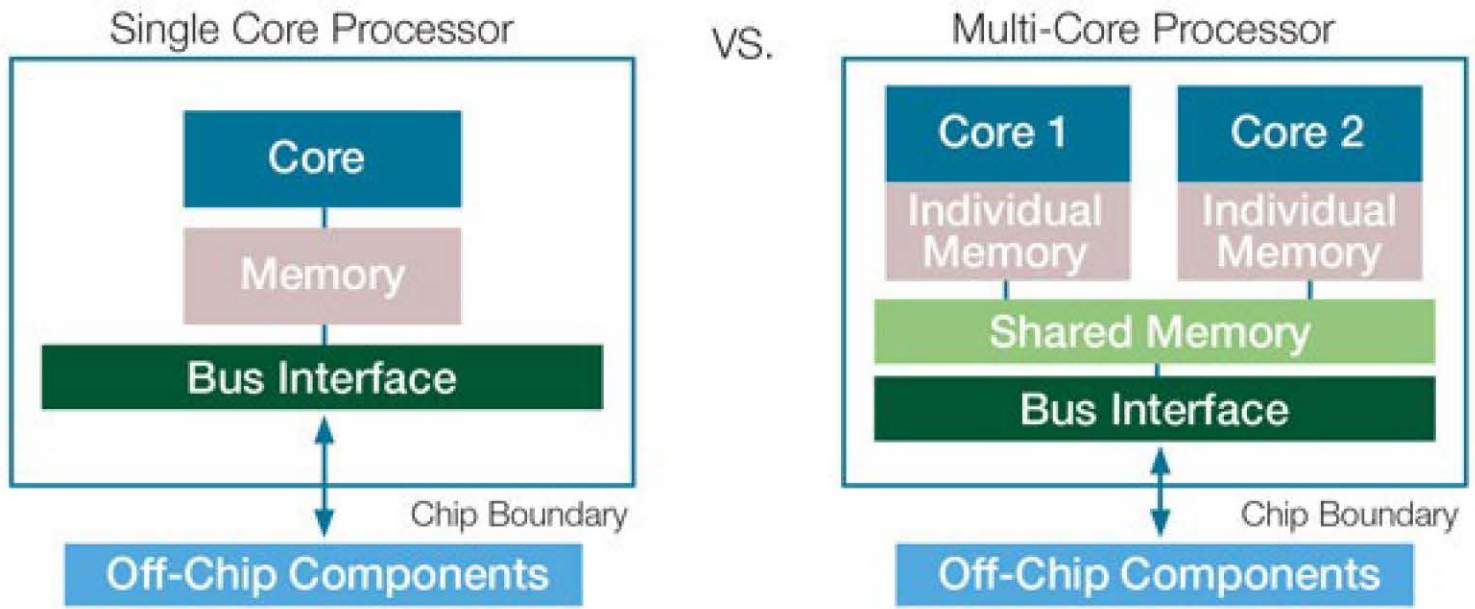
- The power of a CPU is measured by the **Speed** & the **amount of data** it can process
- The speed is rated in cycles per second. Hence, **Hz**
- The speed of current CPUs is in the billions of Hz i.e. GHz



CPU

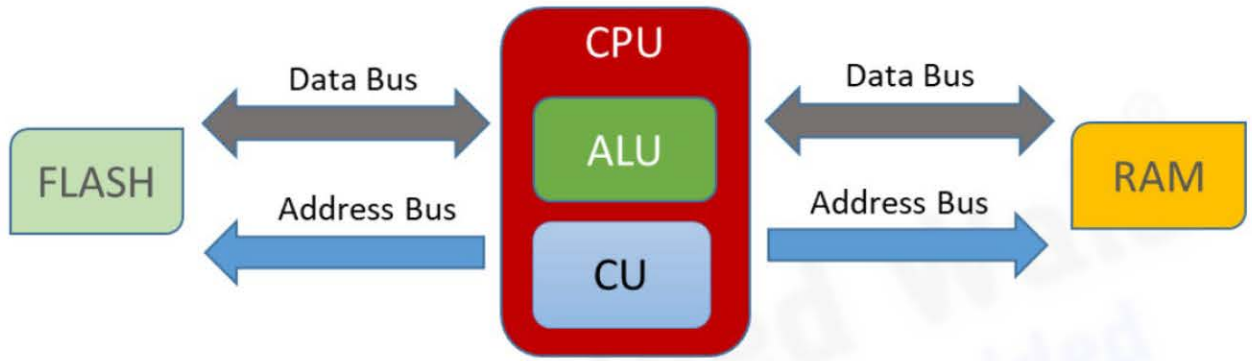
- The need for more power has resulted in manufacturers finding ways to incorporate more than 1 core into a single chip
- Modern chips are capable of processing multiple instructions at a time (concurrency)

- Single core
- Dual Core
- Quad Core
- Etc.



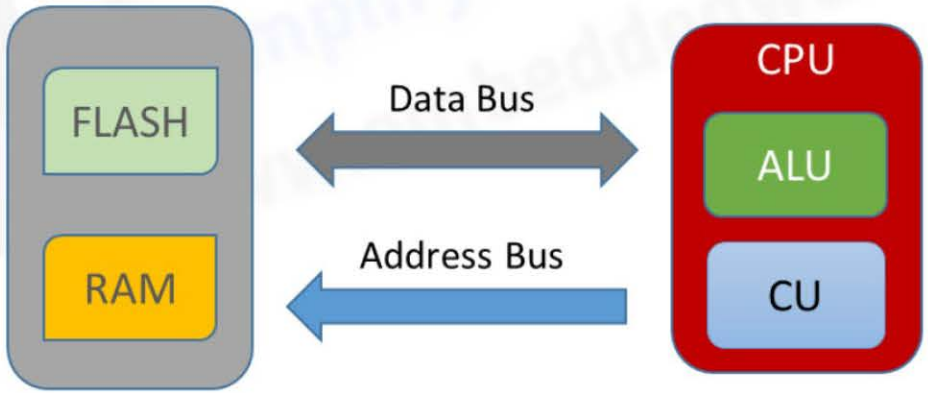
BASIC ARCHITECTURE

Von-Neumann
- Simple but slow
- Cost-effective
- Traditional implementation



Harvard Architecture

Harvard
- Complex but fast
- Expensive
- Can perform concurrent operations
- New and emerging



Von-Neumann Architecture

RANDOM ACCESS MEMORY

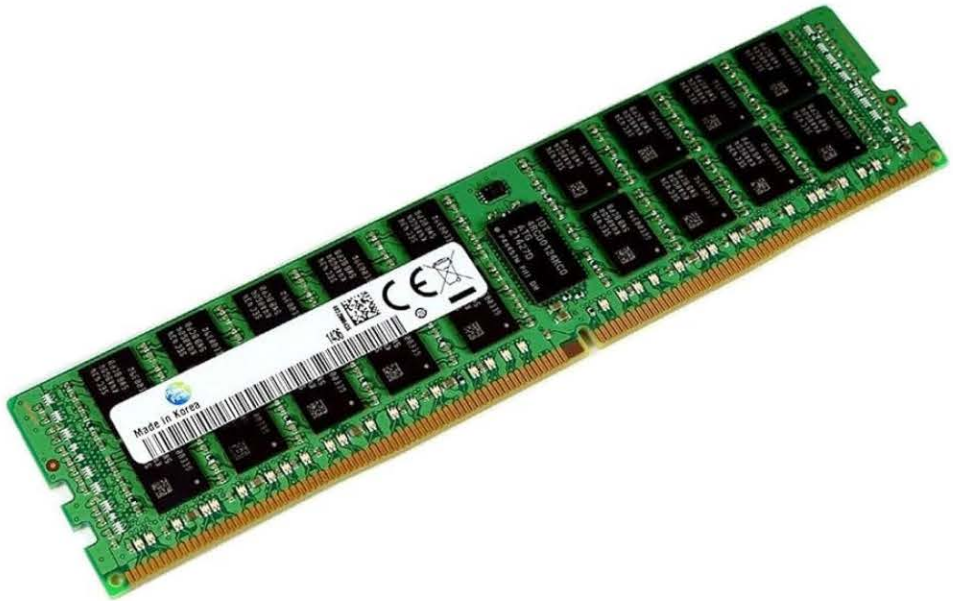
Temporary storage for data and programs being accessed by the CPU

Volatile memory, all contents are erased when it loses power

Measured in (1) storage **capacity**, (2) speed of **reading & writing** data

More RAM means more capacity to hold and process large programs and files

Capacity measured in **Bytes**
speed measured in **Hz**



STORAGE MEDIUM

There are many types of storage devices, Solid-State (SSD), Hard Disk Drive, and Optical

SSD: fastest, most reliable but also most expensive
HDD: magnetic, mechanical (produces sound), fairly cheap
Optical: CD, DVD, Blu-ray, etc. prone to scratches,
Magnetic tape: Reel-to-Reel, VHS. Can storage massive amount of data, but very slow

SPEED-RELATED HARDWARE

The performance of the computer is heavily reliant on the speed and capacity of the following:

- CPU
- RAM
- Storage Drive

PERIPHERALS AND MISC

Physical ports allows data transfer between devices

- USB: has been a common standard
- Serial/Parallel
- PS/2
- HDMI/ DVI/ VGA

MONITORS

There are many types of monitors, ranging from CRT, LCD, and LED. Display screens are measured in the following specifications:

- Screen size – normally in inches
- Aspect ratio - 1:1, 16:9, 21:9, etc.
- Refresh rate – Hz
- Resolution – 720p, 1080p, 2k, 4k, etc.

SUMMARY

This introductory lecture outlines the foundational concepts of computer systems, defining a computer as an **electronic device** that processes **input** data to generate **output** information based on stored instructions.

The critical role of computers in healthcare for applications such as patient data management, advanced imaging (MRI, CT), and robotic surgery, emphasizes their necessity for improving patient safety and decision-making.

There are different types of computers, including supercomputers, mainframes, workstations, and personal computers, while distinguishing between Von-Neumann and Harvard architectures.

The speed and capacity of essential hardware components—such as the motherboard, CPU, RAM, and storage media (SSD and HDD)— determines overall system performance.