

#### **UNIT-V**



### What is Computer Hardware?

Hardware refers to the physical components of a computer system that you can see, touch, and interact with. Without hardware, the software cannot operate. Hardware works closely with software to make computing possible.

### **1.** Central Processing Unit (CPU)

The Central Processing Unit (CPU) is the primary component responsible for executing instructions in a computer. It performs all the basic arithmetic, logical, and control operations. The CPU interprets and processes data from software programs and hardware inputs. It consists of two main sub-units: the Arithmetic Logic Unit (ALU) and the Control Unit (CU). The ALU handles mathematical and logical calculations, while the CU manages the execution of instructions by directing the movement of data between memory and the processor. Most modern CPUs are multi-core, meaning they contain two or more processing units (cores) that allow multiple tasks to be processed simultaneously, increasing performance. CPU speed is measured in gigahertz (GHz), which determines how many operations it can perform in a second. The CPU fits into a socket on the motherboard and is covered by a heat sink and fan to keep it cool. It is essential for running the operating system, applications, and games. Without the CPU, a computer cannot perform any logical task or run software.

**Examples:** Intel Core i3, i5, i7, AMD Ryzen 5, Ryzen 7.

## ② 2. Motherboard

The motherboard is the main printed circuit board (PCB) in a computer. It acts as the backbone that holds and connects all the essential hardware components of the system. The CPU, RAM, storage devices, power connectors, and expansion cards (like graphics cards) all plug into the motherboard. It contains the **chipset**, which controls how data travels between the CPU, memory, and peripherals. The BIOS/UEFI firmware is also located on the motherboard, which helps initialize the hardware when the computer starts. Motherboards come in various form factors like ATX, Micro-ATX, and Mini-ITX, which determine their size and compatibility. Modern motherboards have ports for USB, audio, Ethernet, and video connections. They also include slots such as PCIe for adding graphics cards or other expansion cards. The quality of a motherboard affects system stability, performance, and upgradability. Without the motherboard, other components wouldn't be able to communicate with each other.

**Examples:** ASUS ROG Strix B550, MSI Z690 Pro, Gigabyte Aorus Elite.



### ☐ 3. Random Access Memory (RAM)

RAM is a type of volatile memory that temporarily stores data and instructions currently being used by the CPU. It allows for fast read and write operations, which helps programs run smoothly and respond quickly. Because RAM is volatile, all its contents are lost when the computer is turned off. The more RAM a system has, the more data it can process at once, which enhances multitasking capabilities. RAM works much faster than storage devices like hard drives or SSDs. Programs, operating system files, and active documents are loaded into RAM so the CPU can access them quickly. RAM is installed in slots on the motherboard and can often be upgraded if more performance is needed. Different types of RAM include DDR3, DDR4, and the latest DDR5, each offering improvements in speed and efficiency. Having insufficient RAM can cause lagging and slow performance, especially when using heavy software like video editors or games.

**Examples:** Kingston 8GB DDR4, Corsair Vengeance 16GB DDR5, Crucial Ballistix 32GB.

# 4. Read-Only Memory (ROM)

ROM is a type of non-volatile memory that stores essential instructions needed for the computer to start and function. Unlike RAM, the contents of ROM are permanent and cannot be easily modified. ROM typically holds the BIOS (Basic Input/Output System) or UEFI (Unified Extensible Firmware Interface) firmware, which checks hardware components and loads the operating system during boot-up. These instructions are written by the manufacturer and are critical for basic operations. ROM ensures that even if the computer is powered off, the essential startup instructions remain intact. It cannot be used to store regular data like files or apps. ROM is located on the motherboard and is smaller in size compared to RAM. Some types of ROM, like EEPROM (Electrically Erasable Programmable ROM), can be updated but not frequently.

**Examples:** BIOS chip, EEPROM, Flash ROM on embedded devices.

# **⑤** 5. Hard Disk Drive (HDD) / Solid State Drive (SSD)

HDDs and SSDs are the main storage devices in computers, used for saving the operating system, applications, and personal files. HDDs use spinning magnetic platters to store data, and a read/write head accesses the data mechanically. SSDs, on the other hand, have no moving parts and store data on flash memory chips, making them much faster, quieter, and more durable. While HDDs offer more storage at a lower cost, SSDs provide faster boot times and file transfers. Most modern computers use SSDs as the primary drive and HDDs for additional storage. These drives are connected to the motherboard via SATA or NVMe interfaces. Proper



storage is essential for saving documents, games, videos, and other files. SSDs also consume less power and generate less heat compared to HDDs.

#### **Examples:**

- HDD: Seagate 1TB, WD Blue 2TB
- SSD: Samsung 970 EVO Plus 500GB (NVMe), Crucial MX500 1TB (SATA)

# **%** 6. Power Supply Unit (PSU)

The **Power Supply Unit (PSU)** converts **AC (Alternating Current)** from your wall outlet into **DC (Direct Current)** that computer components can use. It provides the appropriate voltage and wattage to components like the CPU, motherboard, and storage devices. The PSU ensures a stable and consistent power flow, which is critical for performance and the safety of hardware components. It comes with multiple cables and connectors such as 24-pin ATX, 8-pin CPU, SATA, and PCIe. The wattage rating of a PSU (e.g., 450W, 650W, 750W) determines how much power it can deliver — higher-end systems with graphics cards and multiple drives require higher wattage. A faulty or low-quality PSU can cause crashes, overheating, or even damage the components. Some PSUs come with **modular cables**, allowing for better cable management.

**Examples:** Corsair CX650, Cooler Master MWE 550W, Antec 750W.

# **3.** Cooling System

The **cooling system** maintains an optimal temperature for internal components, preventing overheating. It includes **fans**, **heat sinks**, and **liquid cooling** setups. The CPU and GPU generate a lot of heat during processing, which can affect performance or even cause hardware failure if not controlled. A basic cooling system uses air fans to circulate air and dissipate heat through aluminum or copper heat sinks. Advanced systems use **liquid cooling** (closed-loop or custom-loop) for high-performance PCs, especially in gaming or video rendering. Proper ventilation inside the computer case is also crucial for maintaining airflow. Keeping components cool improves their performance, efficiency, and lifespan.

#### **Examples:**

- Air Cooling: Intel stock fan, Cooler Master Hyper 212
- Liquid Cooling: NZXT Kraken X53, Corsair H100i



#### **Difference Between Hardware and Software**

Hardware	Software
Physical components	Programs and instructions
Can be touched	Cannot be touched
Examples: CPU, RAM, Keyboard	Examples: Windows OS, MS Word
Wears out over time	Does not wear out physically