

Module 1: Introduction to Computer Hardware (Classes 1–3)

Module Duration: 6 Hours (3 Classes × 2 Hours)

Software & Tools: Desktop Computer, Laptop, Motherboard, RAM, CPU, SSD/HDD, Power Supply, Projector, Screwdriver Set

Module Learning Objectives

By the end of this module, students will be able to:

- Understand the fundamentals of computer hardware.
 - Identify different types of computers and their applications.
 - Explain the evolution of computer generations.
 - Differentiate between hardware and software.
 - Identify the major components inside a computer.
 - Recognize motherboard components, ports, and connectors.
 - Understand how data flows through a computer system.
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Class 1 (2 Hours)

Introduction to Computers

Learning Outcomes

After completing this class, students will be able to:

- Define a computer and explain its functions.
 - Identify different types of computers.
 - Describe the five generations of computers.
 - Differentiate between hardware and software.
 - Identify the basic components of a computer system.
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1.1 What is a Computer?

A **computer** is an electronic device that accepts data (input), processes it according to instructions, stores it, and produces meaningful information (output).

Basic Functions of a Computer

- Input
 - Processing
 - Storage
 - Output
 - Communication
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1.2 Characteristics of a Computer

- High Speed
 - Accuracy
 - Automation
 - Reliability
 - Large Storage Capacity
 - Multitasking
 - Versatility
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1.3 Types of Computers

Supercomputer

- Highest processing power
- Used for scientific research, weather forecasting, and simulations

Mainframe Computer

- Supports thousands of users simultaneously
- Used by banks, airlines, and government organizations

Minicomputer

- Mid-range computer
- Used in small and medium-sized businesses

Microcomputer (Personal Computer)

- Desktop Computer
- Laptop
- Tablet
- Smartphone

Embedded Computer

- Built into devices such as washing machines, smart TVs, routers, and vehicles

1.4 Computer Generations

Generation	Technology	Features
First (1940–1956)	Vacuum Tubes	Large size, high power consumption
Second (1956–1963)	Transistors	Faster and more reliable
Third (1964–1971)	Integrated Circuits (ICs)	Smaller size and improved performance
Fourth (1971–Present)	Microprocessors	Personal computers and laptops
Fifth (Present & Future)	Artificial Intelligence (AI)	Machine learning, robotics, and intelligent systems

1.5 Hardware vs Software

Hardware	Software
Physical components	Programs and applications
Can be touched	Cannot be touched
Manufactured	Developed by programmers
CPU, RAM, Keyboard	Windows, Linux, Microsoft Office

1.6 Components of a Computer System

Major hardware components include:

- Motherboard
- CPU (Processor)
- RAM
- Storage (HDD/SSD)
- Power Supply Unit (PSU)
- Graphics Card (GPU)

- Network Card (NIC)
 - Cooling System
 - Cabinet (Computer Case)
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1.7 Input Devices

Devices used to enter data into a computer.

Examples:

- Keyboard
 - Mouse
 - Scanner
 - Webcam
 - Microphone
 - Barcode Scanner
 - Fingerprint Scanner
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1.8 Output Devices

Devices that display processed information.

Examples:

- Monitor
 - Printer
 - Speakers
 - Projector
 - Plotter
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1.9 Processing Devices

The **CPU (Central Processing Unit)** is the primary processing device.

Main parts of a CPU:

- Arithmetic Logic Unit (ALU)

- Control Unit (CU)
 - Registers
 - Cache Memory
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1.10 Storage Devices

Primary Storage

- RAM
- ROM
- Cache Memory

Secondary Storage

- Hard Disk Drive (HDD)
 - Solid State Drive (SSD)
 - NVMe SSD
 - USB Flash Drive
 - Memory Card
 - External Hard Drive
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Practical Exercise

Students will identify:

- Motherboard
 - CPU
 - RAM
 - HDD
 - SSD
 - Power Supply
 - Keyboard
 - Mouse
 - Monitor
 - Printer
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Assignment

Draw a block diagram of a computer system and label:

- Input Devices
 - CPU
 - Memory
 - Storage
 - Output Devices
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Class 2 (2 Hours)

Motherboard & Internal Components

Learning Outcomes

Students will be able to:

- Identify motherboard components.
 - Explain the functions of the CPU, RAM, ROM, and chipset.
 - Understand BIOS, UEFI, and the CMOS battery.
 - Recognize CPU sockets and memory slots.
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2.1 Motherboard Overview

The **motherboard** is the main printed circuit board (PCB) that connects all hardware components.

Functions

- Connects all devices
 - Supplies power
 - Enables communication between components
 - Supports expansion cards
 - Hosts CPU and RAM
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2.2 Motherboard Components

- CPU Socket
 - RAM Slots
 - Chipset
 - PCIe Slots
 - SATA Ports
 - M.2 Slot
 - CMOS Battery
 - BIOS/UEFI Chip
 - Power Connectors
 - Fan Headers
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2.3 CPU (Processor)

The CPU is known as the **brain of the computer**.

Main Functions

- Execute instructions
- Perform calculations
- Control hardware operations

CPU Specifications

- Clock Speed (GHz)
 - Number of Cores
 - Threads
 - Cache Memory
 - TDP (Thermal Design Power)
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2.4 RAM (Random Access Memory)

RAM is temporary memory used while the computer is running.

Characteristics

- Volatile memory
- High speed
- Temporary storage
- Improves multitasking

Common Types:

- DDR3
 - DDR4
 - DDR5
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2.5 ROM (Read Only Memory)

ROM stores permanent instructions required to start the computer.

Types

- PROM
 - EPROM
 - EEPROM
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2.6 Chipset

The chipset manages communication between:

- CPU
 - RAM
 - Storage Devices
 - USB Devices
 - PCIe Devices
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2.7 BIOS & UEFI

BIOS

Basic Input/Output System.

Functions:

- Hardware initialization
- POST (Power-On Self-Test)
- Boot device selection

UEFI

Unified Extensible Firmware Interface.

Advantages over BIOS:

- Faster boot time
 - Better security
 - Larger drive support
 - Modern graphical interface
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2.8 CMOS Battery

The CMOS battery powers the motherboard's memory chip that stores:

- Date & Time
- BIOS Settings
- Hardware Configuration

If the battery fails:

- Date and time reset
 - BIOS settings may be lost
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Practical Exercise

Students will identify:

- CPU Socket
 - RAM Slots
 - Chipset
 - SATA Ports
 - PCIe Slots
 - CMOS Battery
 - BIOS Chip
 - Power Connectors
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Assignment

Draw and label a motherboard showing all major components.

Class 3 (2 Hours)

Computer Ports, Storage Interfaces & Expansion Components

Learning Outcomes

Students will be able to:

- Identify common computer ports and connectors.
 - Differentiate between SATA, NVMe, and M.2 storage technologies.
 - Explain the function of the Power Supply Unit (PSU).
 - Understand computer cooling methods.
 - Recognize expansion cards and computer case types.
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3.1 Computer Ports & Connectors

USB Ports

Types:

- USB 2.0
- USB 3.0
- USB 3.2
- USB Type-C

Used for:

- Keyboard
- Mouse
- Printer
- External Storage
- Smartphones

Video Ports

- VGA
- DVI
- HDMI
- DisplayPort

Used to connect monitors and projectors.

Audio Ports

- Microphone Input
 - Speaker Output
 - Line-In
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Network Port

- RJ-45 Ethernet Port

Used for wired network connections.

Legacy Ports

- PS/2
 - Serial (COM)
 - Parallel (LPT)
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3.2 Storage Interfaces

SATA (Serial ATA)

- Used for HDDs and SATA SSDs
- Standard interface for storage devices

M.2

- Compact slot on the motherboard
- Supports SATA and NVMe SSDs

NVMe (Non-Volatile Memory Express)

- Uses PCIe lanes
 - Much faster than SATA
 - Ideal for operating systems and high-performance applications
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3.3 Power Supply Unit (PSU)

The PSU converts AC power from a wall outlet into DC power required by computer components.

Main Connectors

- 24-pin Motherboard Connector
- 4/8-pin CPU Connector
- SATA Power Connector
- PCIe Power Connector
- Molex Connector

PSU Ratings

- 450W
 - 550W
 - 650W
 - 750W
 - 850W and above
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3.4 Cooling Systems

Air Cooling

Uses heat sinks and fans to remove heat.

Liquid Cooling

Uses coolant and radiators for improved cooling performance.

3.5 Computer Cases (Cabinets)

Common Sizes:

- Full Tower
- Mid Tower
- Mini Tower
- Small Form Factor (SFF)

Features:

- Airflow
 - Cable Management
 - Drive Bays
 - Front Panel Connectors
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3.6 Expansion Cards

Common types include:

- Graphics Card (GPU)
- Sound Card
- Network Interface Card (NIC)
- Wi-Fi Adapter
- Video Capture Card

Expansion cards are installed into PCIe slots on the motherboard.

Practical Exercise

Students will:

- Identify rear and front panel ports.
- Connect peripherals to the correct ports.
- Locate SATA ports, M.2 slots, and PCIe slots.

- Identify PSU connectors and connect them to compatible hardware.
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Module 1 Assessment

Assessment	Marks
Hardware Fundamentals Quiz	10
Practical Identification Exercises	20
Assignments	20
Motherboard & Hardware Identification Test	40
Class Participation & Viva	10
Total	100

Module 1 Learning Outcomes

After completing **Module 1: Introduction to Computer Hardware**, students will be able to:

- Explain the basic concepts and evolution of computers.
- Differentiate between hardware and software components.
- Identify input, output, processing, and storage devices.
- Recognize and describe the functions of motherboard components, CPU, RAM, ROM, chipset, BIOS/UEFI, and CMOS battery.
- Identify common computer ports, connectors, storage interfaces, and expansion cards.
- Demonstrate the ability to recognize and safely handle essential computer hardware components during practical sessions.