

Module 2: Computer Assembly & Installation (Classes 4–7)

Module Duration: 8 Hours (4 Classes × 2 Hours)

Software & Tools: Desktop Computer Components, Motherboard, CPU, RAM, SSD/HDD, NVMe SSD, Power Supply Unit (PSU), Screwdriver Set, Anti-static Wrist Strap, Thermal Paste, Windows 10/11 Installation USB, BIOS/UEFI, Device Drivers

Module Learning Objectives

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

- Assemble a desktop computer safely using proper tools.
 - Apply Electrostatic Discharge (ESD) protection during hardware installation.
 - Install the CPU, CPU cooler, RAM, storage devices, and PSU correctly.
 - Configure BIOS/UEFI settings and boot options.
 - Install Windows operating system and essential device drivers.
 - Perform basic hardware troubleshooting during assembly.
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Class 4 (2 Hours)

Computer Safety & CPU Installation

Learning Outcomes

After completing this class, students will be able to:

- Follow computer hardware safety procedures.
 - Prevent Electrostatic Discharge (ESD) damage.
 - Identify essential computer repair tools.
 - Install a CPU safely.
 - Apply thermal paste correctly.
 - Install a CPU cooling system.
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4.1 Computer Safety

Working inside a computer requires proper safety practices to protect both the technician and the hardware.

Safety Rules

- Turn off the computer before opening the case.
 - Disconnect the power cable.
 - Press the power button for a few seconds to discharge residual electricity.
 - Work on a clean, dry, and non-conductive surface.
 - Avoid touching electronic circuits unnecessarily.
 - Keep liquids away from computer components.
 - Handle components by their edges.
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4.2 Electrostatic Discharge (ESD) Protection

Electrostatic Discharge is the sudden transfer of static electricity, which can permanently damage sensitive electronic components.

ESD Protection Methods

- Wear an anti-static wrist strap.
 - Use an anti-static mat.
 - Ground yourself before touching components.
 - Store components in anti-static bags.
 - Avoid working on carpets or in dry environments.
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4.3 Computer Repair Tools

Common tools used in hardware assembly:

- Phillips Screwdriver
- Flat Screwdriver
- Anti-static Wrist Strap
- Thermal Paste
- Cleaning Brush
- Compressed Air Can
- Cable Ties
- Flashlight
- Tweezers
- Multimeter (Advanced)

4.4 Installing the CPU

The CPU is the central processing unit and must be installed carefully.

Installation Steps

1. Open the CPU socket lever.
2. Align the CPU using the alignment triangle.
3. Place the CPU gently into the socket without applying force.
4. Lower and lock the socket lever.

Precautions

- Never force the CPU into the socket.
- Do not touch the CPU pins or contacts.
- Verify the correct socket type before installation.

4.5 Applying Thermal Paste

Thermal paste improves heat transfer between the CPU and the cooler.

Application Guidelines

- Clean old thermal paste if replacing a cooler.
- Apply a small pea-sized drop in the center of the CPU.
- Allow the cooler pressure to spread the paste evenly.
- Avoid applying too much paste.

4.6 Installing the CPU Cooler

Air Cooler Installation

1. Position the cooler over the CPU.
2. Secure the mounting clips or screws.
3. Tighten screws evenly in a cross pattern.
4. Connect the cooler fan to the **CPU_FAN** header.

Common Mistakes

- Forgetting thermal paste.
 - Connecting the fan to the wrong header.
 - Uneven screw tightening.
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Practical Exercise

Students will:

- Wear ESD protection.
 - Install a CPU.
 - Apply thermal paste.
 - Install and secure the CPU cooler.
 - Verify the CPU fan connection.
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Assignment

Prepare a checklist describing the correct procedure for installing a CPU and CPU cooler.

Class 5 (2 Hours)

Installing RAM, Storage Devices & Power Supply

Learning Outcomes

Students will be able to:

- Install RAM modules correctly.
 - Install HDDs, SATA SSDs, and NVMe SSDs.
 - Install and connect the Power Supply Unit.
 - Perform proper cable management.
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5.1 Installing RAM

Random Access Memory (RAM) provides temporary storage for active programs.

Installation Steps

1. Open the RAM slot clips.
2. Align the notch on the RAM module.
3. Insert the RAM firmly until both clips lock.

Dual-Channel Installation

Use the recommended slots (commonly A2 and B2) for optimal performance.

5.2 Installing Storage Devices

Hard Disk Drive (HDD)

- Mount the drive in a drive bay.
 - Connect SATA data cable.
 - Connect SATA power cable.
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SATA SSD

Installed similarly to HDDs but with no moving parts.

NVMe SSD

1. Insert into the M.2 slot at an angle.
 2. Press down gently.
 3. Secure with the retaining screw.
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5.3 Installing the Power Supply Unit (PSU)

PSU Installation Steps

1. Place the PSU into the case.
2. Secure it with screws.
3. Connect the main power cables.

Main Connectors

- 24-pin Motherboard Connector
 - 8-pin CPU Connector
 - SATA Power Connector
 - PCIe Power Connector
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5.4 Cable Management

Proper cable management:

- Improves airflow
- Reduces dust accumulation
- Makes maintenance easier
- Enhances system appearance

Best Practices

- Route cables behind the motherboard tray.
 - Bundle cables with cable ties.
 - Keep cables away from cooling fans.
 - Avoid excessive cable tension.
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Practical Exercise

Students will:

- Install RAM modules.
 - Install SSD or HDD.
 - Mount and connect the PSU.
 - Organize cables neatly inside the computer case.
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Assignment

Draw a diagram showing all PSU power connectors and their destinations.

Class 6 (2 Hours)

BIOS Configuration & System Setup

Learning Outcomes

Students will be able to:

- Access the BIOS/UEFI setup utility.
 - Configure system settings.
 - Modify the boot sequence.
 - Update the BIOS safely.
 - Configure storage options.
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6.1 Introduction to BIOS & UEFI

BIOS/UEFI initializes hardware during startup and prepares the system to load the operating system.

Common BIOS Keys

- Delete (Del)
- F2
- F10
- Esc

(Depends on motherboard manufacturer.)

6.2 BIOS Interface

Typical BIOS sections:

- Main
 - Advanced
 - Boot
 - Security
 - Hardware Monitor
 - Save & Exit
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6.3 Boot Sequence

The boot sequence determines which device the computer attempts to boot from first.

Common boot devices:

- USB Flash Drive
 - NVMe SSD
 - SATA SSD
 - HDD
 - DVD Drive
 - Network (PXE)
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6.4 Storage Configuration

Configure storage controllers:

- AHCI (Recommended for SSDs)
 - RAID (For redundancy or performance)
 - IDE (Legacy systems)
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6.5 BIOS Update

Reasons to update BIOS:

- Hardware compatibility
- Bug fixes
- Security improvements
- Performance enhancements

Precautions

- Use the correct BIOS file.
 - Ensure uninterrupted power.
 - Never interrupt the update process.
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6.6 Hardware Monitoring

Monitor:

- CPU Temperature
 - Fan Speed
 - System Voltage
 - Boot Status
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Practical Exercise

Students will:

- Enter BIOS.
 - Configure boot priority.
 - Verify installed RAM and storage.
 - Check CPU temperature and fan speed.
 - Save settings and restart.
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Assignment

Record the BIOS version and hardware information of a lab computer.

Class 7 (2 Hours)

Windows Installation & Driver Setup

Learning Outcomes

Students will be able to:

- Install Windows 10/11.
 - Partition and format storage drives.
 - Install hardware drivers.
 - Verify system functionality after installation.
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7.1 Preparing Installation Media

Create a bootable USB drive using:

- Rufus
 - Windows Media Creation Tool
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7.2 Windows Installation Process

Steps:

1. Boot from the USB drive.
 2. Select language and keyboard settings.
 3. Choose **Custom Installation**.
 4. Select or create a partition.
 5. Install Windows.
 6. Complete the initial setup.
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7.3 Disk Partitioning

Purpose:

- Organize data
- Separate operating system and personal files
- Simplify backups

Example Partition Layout:

- Drive C: Operating System
 - Drive D: Applications
 - Drive E: Personal Data
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7.4 Formatting Drives

Common File Systems:

- NTFS (Recommended for Windows)
 - FAT32 (USB drives)
 - exFAT (Large external drives)
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7.5 Installing Device Drivers

Install drivers for:

- Chipset
 - Graphics Card (GPU)
 - Audio Device
 - Network Adapter
 - Wi-Fi Adapter
 - Printer (if applicable)
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7.6 Windows Update

After installation:

- Install security updates.
 - Update hardware drivers.
 - Enable Windows Defender.
 - Check Device Manager for missing drivers.
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7.7 Device Manager

Verify that all devices are functioning correctly.

Look for:

- Unknown Devices
 - Driver Errors
 - Disabled Devices
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Practical Exercise

Students will:

- Install Windows 10 or Windows 11.
 - Partition and format the storage drive.
 - Install motherboard, graphics, audio, and network drivers.
 - Verify all hardware is recognized in Device Manager.
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Module Project

Students will assemble a complete desktop computer and prepare it for use by:

- Installing the CPU and cooler
 - Installing RAM and storage devices
 - Mounting the PSU
 - Managing cables
 - Configuring BIOS settings
 - Installing Windows
 - Installing device drivers
 - Performing a successful system boot and hardware verification
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Module Assessment

Assessment	Marks
Assembly & Installation Quiz	10
Practical Exercises	20
Assignments	20

Assessment	Marks
Complete PC Assembly & Windows Installation Project	40
Viva & Practical Demonstration	10
Total	100

Module 2 Learning Outcomes

After completing **Module 2: Computer Assembly & Installation**, students will be able to:

- Assemble a desktop computer safely using industry-standard procedures.
- Install the CPU, cooler, RAM, storage devices, and power supply correctly.
- Configure BIOS/UEFI settings, including boot order and storage options.
- Install Windows and partition storage devices effectively.
- Install and verify all required hardware drivers.
- Apply proper cable management and ESD safety techniques.
- Diagnose and resolve common issues encountered during computer assembly and operating system installation.