

Module 6: Advanced Hardware & Final Project (Classes 21–24)

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

Required Equipment: Desktop PC Components, Gaming GPU, Workstation Components, Motherboard, CPU, RAM, SSD/NVMe SSD, HDD, Power Supply Unit (PSU), Computer Case, Monitor, Keyboard, Mouse, Network Devices (Router/Switch), Anti-static Wrist Strap, Screwdriver Set

Software & Utilities: Windows 10/11, BIOS/UEFI, CPU-Z, GPU-Z, HWMonitor, CrystalDiskMark, CrystalDiskInfo, Cinebench, MemTest86, Prime95 (or equivalent CPU stress testing tool), Windows Performance Monitor, Device Manager

Module Learning Objectives

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

- Select compatible hardware components for different computer builds.
 - Design desktop computers for gaming, office, and professional workstation use.
 - Perform hardware benchmarking and stress testing.
 - Monitor system performance and temperatures.
 - Apply professional IT troubleshooting workflows.
 - Document hardware service activities.
 - Assemble, configure, and present a complete computer system.
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Class 21 (2 Hours)

Custom PC Building & Hardware Selection

Learning Outcomes

After completing this class, students will be able to:

- Design custom desktop computers.
- Select compatible hardware components.
- Build PCs based on different user requirements.

- Prepare hardware budgets.
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21.1 Introduction to Custom PC Building

A custom-built computer is assembled by selecting individual components that meet the user's specific needs.

Advantages

- Better performance
 - Easy upgrades
 - Lower long-term cost
 - Greater customization
 - Improved cooling options
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21.2 Types of Custom PCs

Office PC

Suitable for:

- Microsoft Office
- Internet Browsing
- Email
- Accounting Software

Typical Components

- Mid-range CPU
 - Integrated Graphics
 - 8–16 GB RAM
 - SATA SSD
 - 450–550 W PSU
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Gaming PC

Designed for:

- Modern Games
- Streaming
- VR Applications
- High Refresh Rate Gaming

Typical Components

- High-performance CPU
- Dedicated Graphics Card
- 16–32 GB RAM
- NVMe SSD
- 650–850 W PSU
- High-Airflow Case

Workstation PC

Designed for:

- Video Editing
- Graphic Design
- CAD Applications
- Software Development
- Virtualization

Typical Components

- Multi-core CPU
- Professional or High-end GPU
- 32–64 GB RAM
- NVMe SSD
- High-capacity Storage

21.3 Budget Planning

When planning a build, allocate the budget based on the intended use.

Example Distribution

Component	Approximate Budget Share
CPU	20–25%

Component	Approximate Budget Share
Motherboard	10–15%
RAM	10–15%
Storage	10–15%
Graphics Card	25–35% (Gaming PC)
Power Supply	8–10%
Computer Case	5–8%
Cooling	3–5%

21.4 Hardware Compatibility

Before purchasing components, verify compatibility.

CPU and Motherboard

- Socket Type
 - Chipset Support
 - BIOS Compatibility
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RAM Compatibility

- DDR Generation
 - Maximum Capacity
 - Supported Speed
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Storage Compatibility

- SATA
 - M.2
 - NVMe
 - Available Storage Slots
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Power Supply Compatibility

Ensure sufficient wattage for all installed components.

Graphics Card Compatibility

Check:

- PCIe Slot
- PSU Power Connectors
- Case Clearance
- Cooling Requirements

21.5 PC Assembly Planning Checklist

- Select compatible motherboard
- Choose supported CPU
- Verify RAM compatibility
- Select appropriate storage
- Choose suitable PSU
- Verify case dimensions
- Plan cooling solution

Practical Exercise

Students will:

- Design an Office PC.
- Design a Gaming PC.
- Design a Workstation PC.
- Prepare a complete hardware compatibility checklist.

Assignment

Create a PC build proposal with specifications and an estimated budget for a client.

Class 22 (2 Hours)

Hardware Benchmarking & Performance Monitoring

Learning Outcomes

Students will be able to:

- Measure hardware performance.
 - Perform stress testing.
 - Monitor system health.
 - Interpret benchmark results.
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22.1 What is Benchmarking?

Benchmarking measures the performance of hardware components using standardized tests.

22.2 CPU Benchmarking

Purpose

- Measure processing performance
- Compare processors
- Verify system stability

Common Software

- Cinebench
 - CPU-Z Benchmark
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22.3 RAM Testing

Purpose

- Detect faulty memory
- Verify stability
- Test memory performance

Common Software

- Windows Memory Diagnostic
 - MemTest86
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22.4 Storage Benchmarking

Measure:

- Read Speed
- Write Speed
- Access Time

Software

- CrystalDiskMark
 - CrystalDiskInfo
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22.5 GPU Benchmarking

Purpose

- Measure graphics performance
- Test gaming capability
- Verify graphics stability

Example Benchmark Tasks

- Rendering tests
 - Graphics stress tests
 - Frame rate measurements
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22.6 Stress Testing

Stress testing checks hardware stability under heavy workloads.

Components Tested

- CPU
- RAM
- GPU
- Storage

22.7 Performance Monitoring

Monitor:

- CPU Usage
- Memory Usage
- Disk Usage
- GPU Usage
- Fan Speed
- Power Consumption

Tools

- Task Manager
- Resource Monitor
- Performance Monitor
- HWMonitor

22.8 Temperature Monitoring

Typical Temperature Ranges

Component Normal Temperature

CPU (Idle)	30–45°C
CPU (Load)	60–85°C
GPU (Idle)	30–50°C
GPU (Load)	65–85°C
SSD	30–60°C

Actual temperatures vary depending on hardware model, cooling solution, and ambient room temperature.

Practical Exercise

Students will:

- Benchmark CPU performance.
 - Test RAM stability.
 - Measure storage performance.
 - Monitor CPU and GPU temperatures during load.
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Assignment

Prepare a benchmark report comparing two computer systems.

Class 23 (2 Hours)

Customer Support & IT Service Management

Learning Outcomes

Students will be able to:

- Communicate effectively with customers.
 - Document technical issues.
 - Apply structured troubleshooting methods.
 - Follow IT service best practices.
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23.1 Customer Support

Good customer support requires:

- Professional communication
 - Active listening
 - Patience
 - Accurate documentation
 - Timely follow-up
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23.2 Service Documentation

Every service report should include:

- Customer Name
 - Device Information
 - Reported Problem
 - Diagnosis
 - Solution Applied
 - Parts Replaced
 - Date
 - Technician Name
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23.3 Troubleshooting Workflow

Recommended Process

1. Identify the problem.
 2. Gather information.
 3. Inspect hardware.
 4. Test possible causes.
 5. Apply the solution.
 6. Verify system functionality.
 7. Document the work.
 8. Educate the customer.
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23.4 IT Service Best Practices

- Maintain data privacy.

- Obtain user permission before making changes.
 - Keep software updated.
 - Follow ESD safety procedures.
 - Maintain detailed service records.
 - Recommend preventive maintenance.
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23.5 Communication Skills

Technicians should:

- Explain technical issues in simple language.
 - Avoid unnecessary technical jargon.
 - Provide realistic repair estimates.
 - Maintain professionalism.
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Practical Exercise

Students will solve real-world troubleshooting cases such as:

- Computer fails to boot.
 - Slow system performance.
 - No display on monitor.
 - No Internet connection.
 - Printer not detected.
 - Overheating computer.
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Assignment

Complete a professional IT service report for a troubleshooting case.

Class 24 (2 Hours)

Final Practical Project & Viva

Learning Outcomes

Students will be able to:

- Assemble a complete desktop computer.
 - Install Windows and drivers.
 - Configure networking.
 - Test hardware functionality.
 - Present and explain their completed project.
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24.1 Final Project Requirements

Students will build a fully functional desktop computer from individual components.

24.2 Hardware Assembly

Install:

- Motherboard
 - CPU
 - CPU Cooler
 - RAM
 - SSD/NVMe SSD
 - HDD (Optional)
 - Power Supply
 - Graphics Card (if applicable)
 - Case Fans
 - Cables
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24.3 BIOS Configuration

Verify:

- CPU Detection
- RAM Capacity
- Storage Detection
- Boot Order
- Fan Operation

- System Date and Time
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24.4 Windows Installation

Tasks

- Create Bootable USB
 - Install Windows
 - Partition Storage
 - Format Drives
 - Create User Account
 - Apply Windows Updates
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24.5 Driver Installation

Install and verify drivers for:

- Chipset
- Graphics
- Audio
- Network
- Wi-Fi
- Bluetooth (if available)

Confirm that no unknown devices remain in **Device Manager**.

24.6 Network Configuration

Configure:

- IP Address (Static or DHCP)
 - Internet Connection
 - Printer Sharing (Optional)
 - File Sharing (Optional)
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24.7 System Testing

Verify:

- Successful POST
 - Stable Windows Operation
 - Internet Connectivity
 - Audio Output
 - USB Ports
 - Storage Performance
 - CPU Temperature
 - Overall System Stability
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24.8 Project Presentation

Each student will present:

- Computer Specifications
 - Hardware Selection Rationale
 - Assembly Process
 - Installation Steps
 - Troubleshooting Performed
 - Performance Test Results
 - Lessons Learned
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Practical Exercise

Students will:

- Assemble a desktop computer.
 - Configure BIOS/UEFI settings.
 - Install Windows and all required drivers.
 - Configure network connectivity.
 - Test hardware functionality and system performance.
 - Deliver a final project presentation and participate in a viva examination.
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Final Course Project

Students will complete a **Professional Desktop Computer Build & Deployment Project** that includes:

- Complete Hardware Assembly
- BIOS/UEFI Configuration
- Windows Installation
- Driver Installation
- Network Configuration
- Storage Verification
- Benchmark Testing
- Performance Monitoring
- Troubleshooting and Optimization
- System Documentation
- Final Presentation and Viva

Module Assessment

Assessment	Marks
Hardware Planning & Benchmarking Quiz	10
Practical Exercises	20
Assignments	20
Final Computer Assembly & Deployment Project	40
Viva & Project Presentation	10
Total	100

Overall Course Learning Outcomes

After successfully completing the **Computer Hardware (48 Hours)** course, students will be able to:

- Identify, install, and configure modern computer hardware components.
- Assemble desktop computers while following ESD safety and industry best practices.
- Install and configure Windows operating systems, device drivers, and basic networking.
- Diagnose and resolve hardware, software, boot, and performance issues using systematic troubleshooting methods.
- Perform hardware benchmarking, stress testing, and system performance monitoring.
- Upgrade and maintain desktop and laptop computers through preventive maintenance and component replacement.
- Design cost-effective and compatible PC builds for office, gaming, and workstation environments.
- Document technical work professionally and provide effective customer support.
- Complete an end-to-end computer build project, from component selection to deployment, testing, documentation, and presentation, demonstrating job-ready skills for

roles such as Computer Hardware Technician, IT Support Technician, Desktop Support Engineer, or Freelance Computer Service Professional.