Software & Tools

The following software and tools will be used throughout the **48-Hour Computer Hardware Course** to assemble computers, install operating systems, diagnose hardware, benchmark performance, troubleshoot issues, and perform preventive maintenance.

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1. Windows 10 / Windows 11

Description

Microsoft Windows is the most widely used desktop operating system for personal and business computers.

Features

- User-friendly graphical interface
- Plug-and-Play hardware support
- Driver management
- File and folder management
- Networking capabilities
- Built-in security features
- System recovery tools

Practical Activities

- Install Windows
- Configure user accounts
- Install updates
- Configure system settings
- Install applications

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2. BIOS / UEFI Setup

Description

BIOS (Basic Input/Output System) and UEFI (Unified Extensible Firmware Interface) initialize hardware before the operating system loads.

Functions

- Detect installed hardware
- Configure boot order
- Monitor hardware status
- Configure storage modes (AHCI/RAID)
- Enable or disable onboard devices
- Update firmware

Practical Activities

- Enter BIOS/UEFI
- Configure boot sequence
- Check CPU and RAM information
- Detect storage devices
- Save BIOS settings

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3. CPU-Z

Description

CPU-Z is a free hardware information utility that displays detailed specifications of the processor, motherboard, memory, and graphics hardware.

Features

- CPU Information
- Motherboard Information
- RAM Details
- Cache Information
- Graphics Information
- Benchmark (available in supported versions)

Practical Activities

- Identify processor model
- Check RAM speed
- Verify motherboard chipset
- Compare hardware specifications

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4. CrystalDiskInfo

Description

CrystalDiskInfo monitors the health and status of HDDs and SSDs using SMART (Self-Monitoring, Analysis, and Reporting Technology).

Features

- Drive Health Status
- Drive Temperature
- SMART Information
- Power-On Hours
- Error Detection
- Firmware Information

Practical Activities

- Check SSD/HDD health
- Monitor storage temperature
- Identify failing storage devices

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5. HWMonitor

Description

HWMonitor monitors real-time hardware temperatures, voltages, and fan speeds.

Features

- CPU Temperature
- GPU Temperature
- Motherboard Temperature
- Fan Speed Monitoring
- Voltage Monitoring
- Power Consumption (supported hardware)

Practical Activities

- Monitor CPU temperature
- Monitor GPU temperature
- Detect overheating
- Verify cooling system performance

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6. MemTest86

Description

MemTest86 is a memory diagnostic utility used to test RAM for errors and stability.

Features

- Memory Error Detection
- Stress Testing
- RAM Stability Testing
- Bootable Testing Environment

Practical Activities

- Test RAM modules
- Diagnose memory-related crashes
- Verify memory stability after upgrades

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7. Rufus

Description

Rufus is a utility for creating bootable USB flash drives.

Features

- Create Windows installation USB drives
- Create Linux bootable media
- Support for BIOS and UEFI systems
- Format USB storage devices

Practical Activities

- Create a Windows installation USB
- Prepare recovery media
- Configure bootable USB devices

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8. Device Manager

Description

Device Manager is a built-in Windows tool used to manage and troubleshoot hardware devices.

Features

- View installed hardware
- Install and update drivers
- Enable or disable devices
- Detect hardware conflicts
- Uninstall devices

Practical Activities

- Install drivers
- Update device drivers
- Verify hardware installation
- Troubleshoot unknown devices

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9. Command Prompt (CMD)

Description

Command Prompt is a command-line interface used for system administration, diagnostics, and troubleshooting.

Common Commands

Command	Purpose
`ipconfig`	Display IP configuration
`ping`	Test network connectivity
`tracert`	Trace network route
`nslookup`	Test DNS resolution
`sfc /scannow`	Scan and repair Windows system files
`chkdsk`	Check and repair disk errors
`diskpart`	Manage disks and partitions
`systeminfo`	Display detailed system information

Practical Activities

- Test network connectivity
- Repair Windows system files
- Check storage health
- Display hardware information

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10. Basic Computer Toolkit

A computer hardware technician requires proper tools to assemble, repair, and maintain computer systems safely.

Phillips Screwdriver

Purpose

Used to install and remove computer screws.

Practical Activities

- Open computer case
- Install motherboard
- Install PSU
- Secure storage devices

Flat-head Screwdriver

Purpose

Used for certain connectors, screws, and small adjustments.

Anti-static Wrist Strap (ESD Strap)

Purpose

Protects sensitive electronic components from electrostatic discharge (ESD).

Practical Activities

- CPU installation
- RAM installation
- Motherboard handling
- Laptop servicing

Thermal Paste

Purpose

Improves heat transfer between the CPU and the CPU cooler.

Practical Activities

- CPU installation
- CPU cooler replacement
- Prevent overheating

Cleaning Brush

Purpose

Removes dust from computer components safely.

Compressed Air Can

Purpose

Blows dust out of fans, heat sinks, keyboards, and power supplies without physical contact.

Microfiber Cloth

Purpose

Cleans monitors, computer cases, and external surfaces without scratching.

Isopropyl Alcohol (90% or Higher)

Purpose

Safely removes old thermal paste and cleans electronic components before applying new thermal paste.

Cable Ties (Zip Ties)

Purpose

Organize cables inside the computer case to improve airflow and simplify maintenance.

Flashlight

Purpose

Provides better visibility when working inside computer cases or laptops.

Optional Professional Tools

Advanced technicians may also use:

- Digital Multimeter
- Power Supply Tester
- Cable Tester
- POST Diagnostic Card
- External USB-to-SATA Adapter
- Precision Screwdriver Set
- Thermal Camera (for advanced diagnostics)

Software & Tool Usage Summary

Software / Tool	Purpose
Windows 10/11	Operating System Installation and Configuration
BIOS/UEFI Setup	Hardware Configuration and Boot Management
CPU-Z	View CPU, RAM, Motherboard, and Hardware Information
CrystalDiskInfo	Monitor HDD/SSD Health and SMART Status
HWMonitor	Monitor Temperature, Fan Speed, and Voltages
MemTest86	Test RAM for Errors and Stability
Rufus	Create Bootable USB Installation Media
Device Manager	Install, Update, and Troubleshoot Device Drivers
Command Prompt	Perform System and Network Diagnostics
Phillips & Flat-head Screwdrivers	Assemble and Disassemble Hardware
Anti-static Wrist Strap	Protect Components from Electrostatic Discharge
Thermal Paste	Improve CPU Cooling Performance
Cleaning Brush & Compressed Air	Remove Dust and Maintain Hardware
Isopropyl Alcohol	Clean Components and Remove Old Thermal Paste
Cable Ties	Organize Internal Cables and Improve Airflow

Learning Outcomes

After using these software applications and tools, students will be able to:

- Install and configure Windows operating systems.
- Configure BIOS/UEFI settings for hardware initialization and boot management.

- Identify and verify hardware specifications using CPU-Z.
- Monitor storage device health using CrystalDiskInfo.
- Measure system temperatures and cooling performance with HWMonitor.
- Diagnose RAM issues using MemTest86.
- Create bootable USB drives using Rufus.
- Install, update, and troubleshoot hardware drivers with Device Manager.
- Perform system and network diagnostics using Command Prompt.
- Assemble, repair, and maintain computer systems safely using industry-standard hardware tools and ESD protection practices.