**Lab Experiments/Exercises**

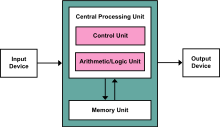
* Introduction to Computer hardware: Physical identification of major components of a computer system such as mother board, RAM modules, daughter cards, bus slots, SMPS, internal storage devices, interfacing ports. Specifications of desktop and server class computers. Installation of common operating systems for desktop and server use. (Students may be asked to formulate specification for computer to be used as Desktop, Web server).

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**Computer hardware** (usually simply called **hardware** when a computing context is concerned) is the collection of physical elements that constitutes a computer system. Computer hardware is the physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard disk drive (HDD), graphic cards, sound cards, memory, motherboard, and so on, all of which are physical objects that are tangible. In contrast, software is instructions that can be stored and run by hardware.

Software is any set of machine-readable instructions that directs a computer’s processor to perform specific operations. A combination of hardware and software forms a usable computing system.

## Von Neumann architecture



Von Neumann architecture scheme.

#### Power supply

A power supply unit (PSU) converts alternating current (AC) electric power to low-voltage DC power for the internal components of the computer. Laptops are capable of running from a built-in battery, normally for a period of hours.

#### Mainboard

The motherboard is the main component of a computer. It is a large rectangular board with integrated circuitry that connects the other parts of the computer including the CPU, the RAM, the disk drives (CD, DVD, hard disk, or any others) as well as any peripherals connected via the ports or the expansion slots.

Components directly attached to or part of the motherboard include:

* The **CPU** (Central Processing Unit) performs most of the calculations which enable a computer to function, and is sometimes referred to as the “brain” of the computer. It is usually cooled by a heat sink and fan. Most newer CPUs include an on-die Graphics Processing Unit (GPU).
* The **Chipset**, which includes the north bridge, mediates communication between the CPU and the other components of the system, including main memory.
* The **Random-Access Memory** (RAM) stores the code and data that are being actively accessed by the CPU.
* The **Read-Only Memory** (ROM) stores the BIOS that runs when the computer is powered on or otherwise begins execution, a process known as Bootstrapping, or “booting” or “booting up”. The **BIOS** (Basic Input Output System) includes boot firmware and power management firmware. Newer motherboards use Unified Extensible Firmware Interface (UEFI) instead of BIOS.
* **Buses** connect the CPU to various internal components and to expand cards for graphics and sound.
* The CMOS battery is also attached to the motherboard. This battery is the same as a watch battery or a battery for a remote to a car’s central locking system. Most batteries are CR2032, which powers the memory for date and time in the BIOS chip.

#### Storage devices

Computer data storage, often called storage or memory, refers to computer components and recording media that retain digital data. Data storage is a core function and fundamental component of computers. The price of solid-state drives (SSD), which store data on flash memory, has dropped a lot in recent years, making them a better choice than ever to add to a computer to make booting up and accessing files faster.

* Fixed media
  + Data is stored by a computer using a variety of media. Hard disk drives are found in virtually all older computers, due to their high capacity and low cost, but solid-state drives are faster and more power efficient, although currently more expensive than hard drives, so are often found in more expensive computers. Some systems may use a disk array controller for greater performance or reliability.
* Removable media
  + To transfer data between computers, a USB flash drive or Optical disc may be used. Their usefulness depends on being readable by other systems; the majority of machines have an optical disk drive, and virtually all have a USB port.

#### Input and output peripherals

Input and output devices are typically housed externally to the main computer chassis. The following are either standard or very common to many computer systems.

* Input
  + Input devices allow the user to enter information into the system, or control its operation. Most personal computers have a mouse and keyboard, but laptop systems typically use a touchpad instead of a mouse. Other input devices include webcams, microphones, joysticks, and image scanners.
* Output device
  + Output devices display information in a human readable form. Such devices could include printers, speakers, monitors or a Braille embosser.

**Memory module**

In computing, a memory module or RAM (random-access memory) stick is a printed circuit board on which memory integrated circuits are mounted.[1] Memory modules permit easy installation and replacement in electronic systems, especially computers such as personal computers, workstations, and servers. The first memory modules were proprietary designs that were specific to a model of computer from a specific manufacturer. Later, memory modules were standardized by organizations such as JEDEC and could be used in any system designed to use them.

**Daughter Card**

A daughter card or daughterboard is a type of circuit board that gets added to an existing one. Its name is appropriate for its use, since it is connected to a “motherboard” or “main board.” The motherboard is the primary circuit board for a device. It is usually in the device as it is shipped from the factory. A daughter card may be added later.

Daughter cards are different from some other types of additional circuit boards that tech enthusiasts call “expansion cards.” In expansion cards, the circuit board is often plugged in through a gap in the housing of a computer or device. These expansion boards help to give a device more functionality, often for additional sound play or for better visuals on a high-tech monitor or screen.

In contrast to the way expansion boards are used, a daughter card can be a more fundamental enhancement for a device. Adding a daughter card often requires getting into the guts of a device. That’s why some users might hire a professional to install it. Companies that make an electronic device might offer a daughter card as part of an essential upgrade that allows the product to be used in more various ways.

**MAIN DIFFERENCES BETWEEN A DESKTOP AND SERVER**

Many people mistakenly believe that a server is no different from a typical desktop computer. This couldn’t be further from the truth. While almost any computer that meets the minimum hardware requirements can run a server operating system that alone does not make a desktop computer a true server. Even if the desktop computer had similar processor speeds, memory and storage capacity compared to a server, it still isn’t a replacement for a real server. The technologies behind them are engineered for different purposes.

A desktop computer system typically runs a user-friendly operating system and desktop applications to facilitate desktop-oriented tasks. In contrast, a server manages all network resources. Servers are often dedicated (meaning it performs no other task besides server tasks). Because a server is engineered to manage, store, send and process data 24-hours a day it has to be more reliable than a desktop computer and offers a variety of features and hardware not typically used in the average desktop computer.

Operating systems usually come **pre-loaded** on any computer you buy. Most people use the operating system that comes with their computer, but it's possible to upgrade or even change operating systems. The three most common operating systems for personal computers are **Microsoft Windows**,**mac OS**, and **Linux**.

Modern operating systems use a **graphical user interface**, or **GUI** (pronounced **gooey**). A GUI lets you use your mouse to click **icons**, **buttons**, and **menus**, and everything is clearly displayed on the screen using a combination of **graphics** and **text**.

## Operating System Installation Tasks

The following is an overview of the procedures that are needed to install a new operating system (OS).

1. Set up the display environment.

If you are not using the optional DVD drive for preparing the system for OS installation and installing the OS.

2. Erase the primary boot disk.

If you have an operating system preinstalled on the server, you will need to remove it before installing a new operating system.

3. Set up the BIOS.

You need to make sure that the BIOS is set up for the operating system that you plan to install.

4. Install the operating system.

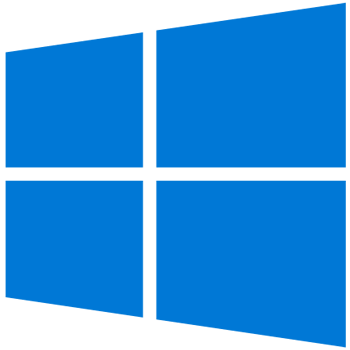
5. Configure your server for RAID.

If you plan to configure your server for RAID operation, you will need to perform some setup tasks before installing the operating system.

6. Install the operating system, update the drivers, and run operating system updates, as necessary.

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# How to install the Microsoft Windows operating system



Each version of Microsoft Windows is installed on a computer using similar steps. While there are steps in the installation process that differ between versions of Windows, the following general steps and guidelines help you install Windows on your computer.

The steps below are for all recent versions of Windows, including [Windows 98](https://www.computerhope.com/jargon/w/win98.htm), [Windows ME](https://www.computerhope.com/jargon/w/winme.htm), [Windows 2000](https://www.computerhope.com/jargon/w/win2000.htm), [Windows XP](https://www.computerhope.com/jargon/w/winxp.htm), [Windows Vista](https://www.computerhope.com/jargon/v/vista.htm), [Windows 7](https://www.computerhope.com/jargon/w/windows7.htm), [Windows 8](https://www.computerhope.com/jargon/w/windows8.htm), [Windows 10](https://www.computerhope.com/jargon/w/windows-10.htm), and [Windows 11](https://www.computerhope.com/jargon/w/windows-11.htm). These steps even work for earlier versions (e.g., Windows 95) as long as you use the disc version. The floppy diskette version is similar, but it requires additional steps.

## Check hardware compatibility

Before installing or upgrading Windows on your computer, check the hardware in the computer to make sure it's compatible with that version of Windows. Microsoft provides a [Windows Compatible Products List](https://partner.microsoft.com/en-us/dashboard/hardware/search/cpl) for checking if the hardware in your computer is compatible with the chosen version of Windows.

If one or more pieces of [hardware](https://www.computerhope.com/jargon/h/hardware.htm) is not compatible with the chosen Windows version, we recommend replacing that hardware with compatible hardware or purchasing a new computer. Having compatible hardware in your computer helps ensure the Windows install or upgrade process is successful.

## Genuine Windows CD, DVD, or USB thumb drive

First, you need a genuine copy of the Microsoft Windows [operating system](https://www.computerhope.com/jargon/o/os.htm) installation [CD](https://www.computerhope.com/jargon/c/compactd.htm), [DVD](https://www.computerhope.com/jargon/d/dvd.htm), or [USB thumb drive](https://www.computerhope.com/jargon/j/jumpdriv.htm). A genuine Windows [product key](https://www.computerhope.com/jargon/c/cdkey.htm) is included with the installation disc, which is required to activate Windows after installation. If you have an [OEM](https://www.computerhope.com/jargon/o/oem.htm) (original equipment manufacturer) computer, the Windows product key is often on the back or side of the computer.

If you have an OEM computer (e.g., [Acer](https://www.computerhope.com/comp/acer.htm), [Dell](https://www.computerhope.com/comp/dell.htm), [HP](https://www.computerhope.com/comp/hp.htm), etc.), the computer will not have a genuine Windows CD, DVD, or USB thumb drive. Instead, you would reinstall Windows and the software using a [hidden partition](https://www.computerhope.com/jargon/h/hiddpart.htm) or a set of restore discs. The steps mentioned on this page would still work, but you'd need a copy of Windows. You can borrow a friend's Windows disc, as long as it's the same version of Windows that came with the computer and have a [product key](https://www.computerhope.com/jargon/c/cdkey.htm).

## Installing or upgrading Windows

To start the Windows install or upgrade process, you need to configure your computer to boot from a CD or DVD before booting to the hard drive. Changing the boot process forces the computer to look for the Windows installation disc before booting from the [hard drive](https://www.computerhope.com/jargon/h/harddriv.htm).

1. Open the CMOS setup.

* [How to enter the BIOS or CMOS setup.](https://www.computerhope.com/issues/ch000192.htm)

1. Change the computer's [boot order](https://www.computerhope.com/jargon/b/bootsequ.htm). Set the CD, DVD, or disc drive as the first boot device if you are trying to boot from a disc. Or, set the first boot device to your USB drive if you're trying to boot from a USB thumb drive. If the drive is not shown, keep the disc is inserted and reboot the computer. With the disc in the drive, BIOS should recognize and include it in the list.
2. Save the settings change and exit BIOS.

Once you have updated the boot order, you can begin the Windows installation process.

1. Place the Windows disc in the CD/DVD drive or USB thumb drive into the back of the computer.
2. Turn on or [restart the computer](https://www.computerhope.com/jargon/r/reboot.htm). As the computer starts up, it should detect the installation disc or drive and show a message similar to *Press any key to boot from CD*. Press any key on the keyboard to have the computer boot from the Windows disc or drive.
3. After the Windows install begins, there are several prompts that you need to answer. Select either **Yes** or the appropriate option to install Windows.
4. When asked which [partition](https://www.computerhope.com/jargon/p/partition.htm) to install Windows onto, select the main partition, usually the C: drive or one labeled "Unallocated partition". If upgrading Windows, select the existing installation of Windows on the hard drive.
5. You may be asked if you want to erase all contents on the hard drive, then install Windows. We recommend you choose this option, as it also formats the hard drive to allow the Windows operating system to be installed.
6. The computer may need to restart several times during the Windows install process. The restarts are normal and if prompted to restart, select the **Yes** option.
7. When the install process is nearly complete, the Windows configuration option screens are shown. On these screens, you may be asked to select the time zone you live in, your preferred language, and the account's name you use to access Windows. Select the appropriate options and enter the appropriate information on each configuration screen.

The Windows install process is completed when the computer prompts you to log in or when it loads into Windows.

## Final Windows and computer configuration

After Windows is installed on the computer, you need to install the [drivers](https://www.computerhope.com/jargon/d/driver.htm) and related software for the hardware in the computer. You can use the installation discs that came with the hardware or [download](https://www.computerhope.com/jargon/d/download.htm) the drivers from the hardware manufacturer's website.

* [How to install and update a computer driver.](https://www.computerhope.com/issues/ch000834.htm)

We strongly recommend you install the latest drivers for each piece of hardware.

To determine which hardware needs drivers to be installed, check the [Device Manager](https://www.computerhope.com/jargon/d/devicema.htm) and look for the [exclamation mark](https://www.computerhope.com/jargon/e/exclamation-mark.htm) "!" next to hardware devices. The exclamation point means drivers are needed for that device.

After installing the necessary hardware device drivers, install any software programs on the computer that you want to use.

Finally, download and install any available Windows updates. Updating Windows improves the operating system's performance, the hardware in the computer, and the software programs you use. It can also improve security by fixing potential security holes and flaws in Windows.

* [How to update a Microsoft Windows computer.](https://www.computerhope.com/issues/ch000545.htm)

## Long-term maintenance of Windows

Microsoft frequently releases new [updates](https://www.computerhope.com/jargon/u/update.htm) for Windows, so we recommend you check for and install available updates. Doing so helps keep Windows running better and keep your computer protected.

Also, periodically check for updated hardware device drivers from manufacturers' websites. Keeping hardware drivers updated helps the hardware devices in the computer run at peak performance and improves compatibility with other computer hardware and software.

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