Lecture 1

Learning outcomes:

- *Personal Computer (PC) hardware basic concepts*

What is a computer?

- A computer is a machine that can be programmed to automatically carry out sequences of ***arithmetic*** or ***logical*** operations (computation).
  - ✓***Arithmetic operations*** is a branch of mathematics, that involves the study of numbers, operation of numbers that are useful in all the other branches of mathematics. It basically comprises operations such as Addition, Subtraction, Multiplication and Division.
  - ✓***A logical operator*** is a symbol or word used to connect two or more expressions such that the value of the compound expression produced depends only on that of the original expressions and on the meaning of the operator. Common logical operators include AND, OR, and NOT.
- The computer is also defined as an electronic device that manipulates information, or data and it has the ability to store, retrieve, and process data.

Types of Computer

- There are two bases (size and data handling capabilities) on which we can define the types of computers.
- Here are some types of computers:

- Super Computer
- Mainframe computer
- Mini Computer
- Workstation Computer
- ***Personal Computer (PC)***
- Server Computer
- Analog Computer
- Digital Computer
- Hybrid Computer
- Tablets and Smartphone

Personal Computer (PC)

- A PC can be defined as a small, relatively inexpensive computer designed for an individual user.
- PCs are based on the microprocessor technology that enables manufacturers to put an entire Central Processing Unit (CPU) on one chip.
- Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications.
- At home, the most popular use for personal computers is playing games and surfing the Internet.
- Although personal computers are designed as single-user systems, these systems are normally linked together to form a network.

Personal Computer (PC) hardware basic concepts

❖ A Computer is an electronic device that can perform various operations of computation at a greater speed than what an ordinary machine or human mind can do. It is driven by many entities including the physical and tangible components that we can touch or feel, called the ***Hardware*** and programs and commands that drive the hardware, called the ***Software.***

❑ **Computer hardware** refers to the physical parts of a computer and related devices that we can see and touch.

➢ The internal hardware parts of a computer are often referred to as components

➢ And the external hardware devices are usually called peripherals.

Types of Computer Hardware

❖ *In general, computer hardware components are divided into the following categories, which are:*

- Input Devices
- Output Devices
- Storage Devices
- Processing Devices

❑ Input devices:

An input device allows the user to interact directly with a computer, and these devices give data and instructions to the computer, such as:

- keyboards
- pointing devices (mouse)
- touchscreens
- touchpads
- tablet/pen input devices
- game controllers
- cameras
- microphones
- video capture devices
- scanners
- optical readers
- biometric devices
- data collection devices

DEVICE	USES	PHOTO
Game controllers	Game controllers are input devices designed specifically for use in games. They have directional inputs as well as action buttons linked to specific actions inside a game.	
Cameras	Cameras allow you to capture images. They are used for making video calls, participating in video conferences and recording videos from your computer.	
Microphones	Microphones allow you to record sounds and interact with a computer using your voice.	
Video capture devices	Video capture devices allow you to record a live video stream using your computer.	
Scanners	Scanners allow you to scan pictures of pages (such as, photos or contracts) directly onto your computer. Scanners are often packaged with optical character recognition (OCR) software that converts the text on a picture to text that can be used in a word processing application.	
Optical readers	Optical readers are devices that can read data from a physical object (such as, a QR code, barcode or a magnetic strip) into a computer.	
Biometric devices	These devices read data presented to a computer and compare it with the saved data. Biometric devices include fingerprint, iris and retina scanners, but these are not commonly used with desktop computers.	
Data collection devices	Data collection devices obtain data directly from a location where an event or transaction takes place.	

❑ Output devices

- An output device is any device that takes data stored on a computer and makes it available to the user in an easy to understand way.
- This data may be made available using pictures (such as on a monitor or printed to a page) or using sounds (such as with speakers and earphones).
- The output devices can be divided into the following:

➢display devices – monitors (LCD, LED, OLED)

➢printers (Inkjet, Ink tank, Laser, 3-D)

➢data projectors (HDMI, VGA)

➢Speakers and headphones

❖ Display Devices – Monitors (LCD, LED, OLED)

➢ All computer software is built around a visual representation of data, therefore the monitor is one of the most important output devices for any computer.

- Light-emitting diode (LED) screens offer higher resolutions than Liquid Crystal Display (LCD) and can achieve better contrast ratios due to their backlighting system.

- On the other hand, Organic Light-emitting diode (OLED) displays have an even higher resolution than LED displays, as well as very good black levels and wide viewing angles.

❖Printers (Inkjet, Ink tank, Laser, 3-D)

A printer allows a computer to use data and output it to paper.

❖Data Projectors (HDMI, VGA)

- Projectors use a bright light to project the content displayed on a computer monitor onto any flat surface. One example of where projectors are used is at the cinema. They use large, high quality projectors to display the movie on the screen in front of you.
- However, projectors can also be connected to computers at home or in office settings, to display your computer's screen on a wall or screen.
- There are two types of cables connecting video output devices:

✓VGA – an analog video-only connection.

✓HDMI – a digital video audio connection.

❖ Speakers and Headphones

They are very popular output devices and give sound as output.

Closed-back headphones 	It creates an isolated audio experience so that only you can hear the sounds you want to hear.
In-ear headphones 	Known for portability, versatility, and convenience. They go a little more deeply into the ear to provide comfort, sound isolation, and sound accuracy.
Bluetooth headphones 	Offer wireless connectivity to various devices through radio transmitter technology (RF). They have a small computer chip inside of them that allows you to pair with the device you are playing music from.

❑ Storage Devices

- Storage devices all serve the same general purpose: to store data. Because of the differences in storage capacity, portability and speed, different storage devices are generally used for different reasons.
- When evaluating any storage device, there are certain things that you must take into consideration. These are:

- **function** – that determines whether you need an SSD or an HDD.
- **storage capacity** – that determines how much information you can save on the device.
- **portability** – that determines how easily it can be carried around and moved from one computer to another.
- **use** – that determines what the storage device will most likely be used for. This includes transferring files and running applications.
- **volatility** – that determines if the device will lose the data when turned off. You do not want a device that will lose all data in case of a power outage.
- **reliability and durability** – that determines how likely the device is to break down.

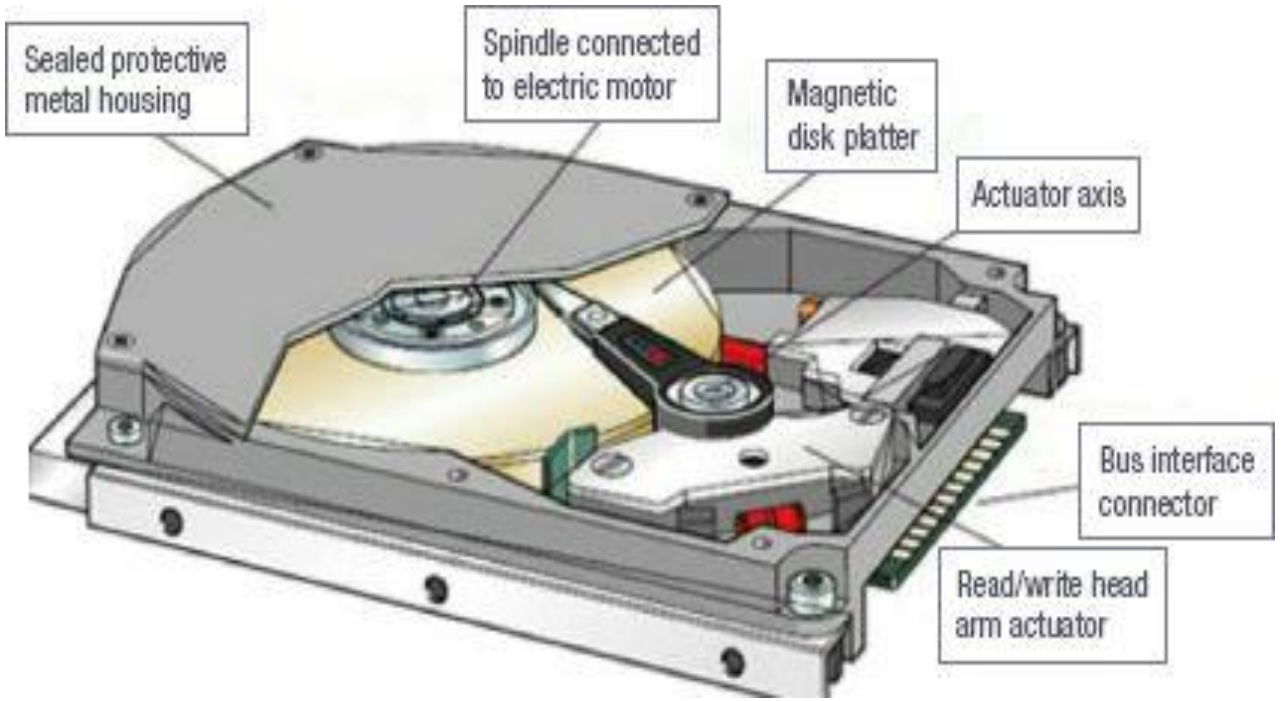
Types of Storage Devices

❖ Hard Disk Drive (HDD)

- A computer hard disk drive is a secondary storage device consisting of magnetic disks or platters that rotate at high speed.

- Its main function is to store data permanently by controlling the positioning, reading and writing of data onto the hard disk.

- Currently modern hard drives can have huge storage space and are either internal (fixed), or external (portable).



- **The Spindle**

The spindle keeps the platters in position and rotates them as required. The revolutions-per-minute rating determines how fast data can be written to and read from the hard drive.

- **Platters**

The platters are the circular discs inside the hard drive where the 1s and 0s that make up your files are stored.

- **Actuator**

The actuator or head actuator is a small motor that takes instructions from the drive's circuit board to control the movement of the read/write arm and supervise the transfer of data to and from the platters. It's responsible for ensuring the read/write heads are in exactly the right place at all times.

- **The Read/Write Arm**

The read/write arm controls the movement of the read/write heads, which do the actual reading and writing on the disk platters by converting the magnetic surface into an electric current. The arm makes sure the heads are in the right position based on the data that needs to be accessed or written

❖ Solid-State Drive (SSD)

- Solid-state drives (or SSDs) are a type of storage device that, unlike hard drives, do not have any moving parts.

- Instead, SSDs make use of special floating gate transistors to store data electronically. Solid state drives (SSDs) are generally many times faster than normal hard drives.

- Since SSDs have no moving parts, they are much quieter, more reliable and robust than HDDs. They also generate less heat, thus increasing their life span, and uses less power than an HDD, which means they are more suitable for mobile devices.

❖ Hybrid Storage Device

- A hybrid storage device is a storage device that combines an HDD with an SSD. By doing this, the hybrid storage device can take advantage of the storage capacity of the HDD as well as the speed of the SSD.

- Hybrid drives work by storing commonly used files that require high speeds (such as operating system files) on the faster SSD storage, while storing large, less commonly used files (such as media files) on the high capacity HDD.

❖External (Portable) Hard Drives

- Portable (or external) hard drives are used outside of the computer case.

- Portable hard drives are a lot easier to move around than fixed hard drives. However, thanks to USB connectors, they can quickly be connected to different computers and are ideal for transferring large amounts of data or backing up data outside of your computer. They are sensitive to rough handling.

❖Flash Drives (Disks)

- Flash drives are very small, portable storage drives that store information using a similar method to SSD.

- Flash drives connect to a USB port, which makes it easy to transfer data quickly between devices.

❖SD/Memory Cards

- SD/Memory cards (especially MicroSD cards) are tiny electronic storage devices.

- Because of their small physical size, SD cards are often used in portable devices such as smartphones, tablets and cameras to provide storage capacity.

❖ CD, DVD and Blu-Ray Drives

- CDs (compact discs), DVDs (digital versatile disc) and Blu-ray discs are popular portable forms of storage that can be read using a dedicated CD, DVD or Blu-ray drive. These discs store information optically, which means the information is stored using lights or electromagnetic waves.

- The advantage of writing data to CDs or DVDs is that the discs are affordable. These optical drives are also backwards compatible. This means that a newer optical drive (like a Blu-ray drive), can read all older optical forms (like CDs and DVDs). However, an older optical drive (like a CD drive) can only read CDs.