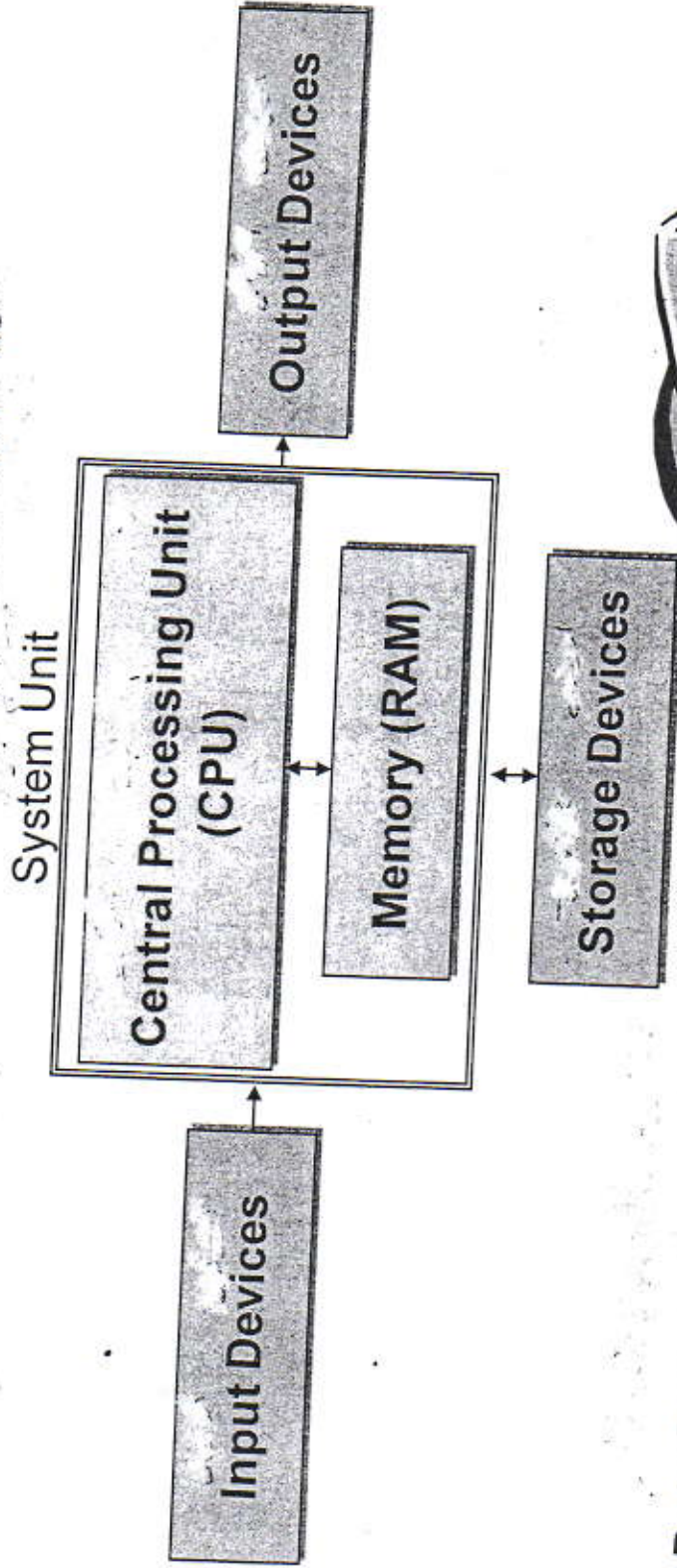


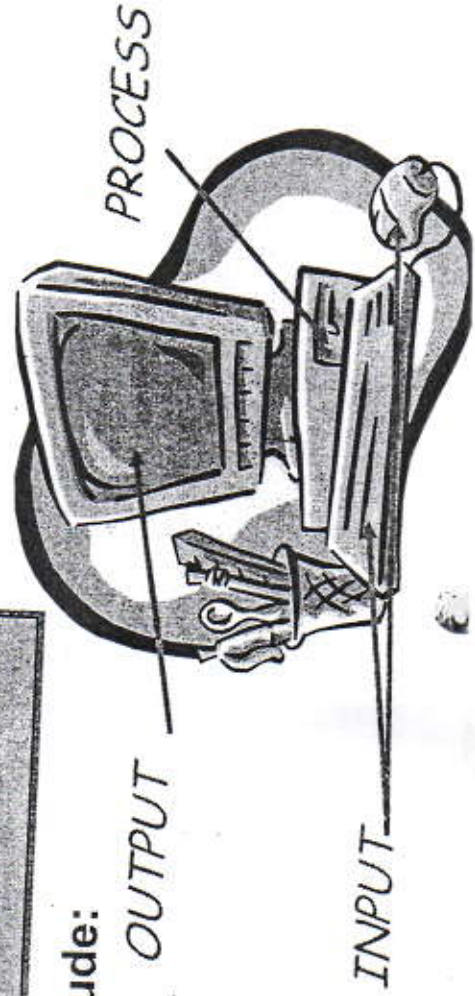
Introduction:

A **computer** is a machine that manipulates data according to a set of instructions. A computer is an *electronic machine* that can be programmed to **accept data (input)**, **process it into useful information (output)**, and **store it in a storage media** for future use



Computer Data Processing could include:

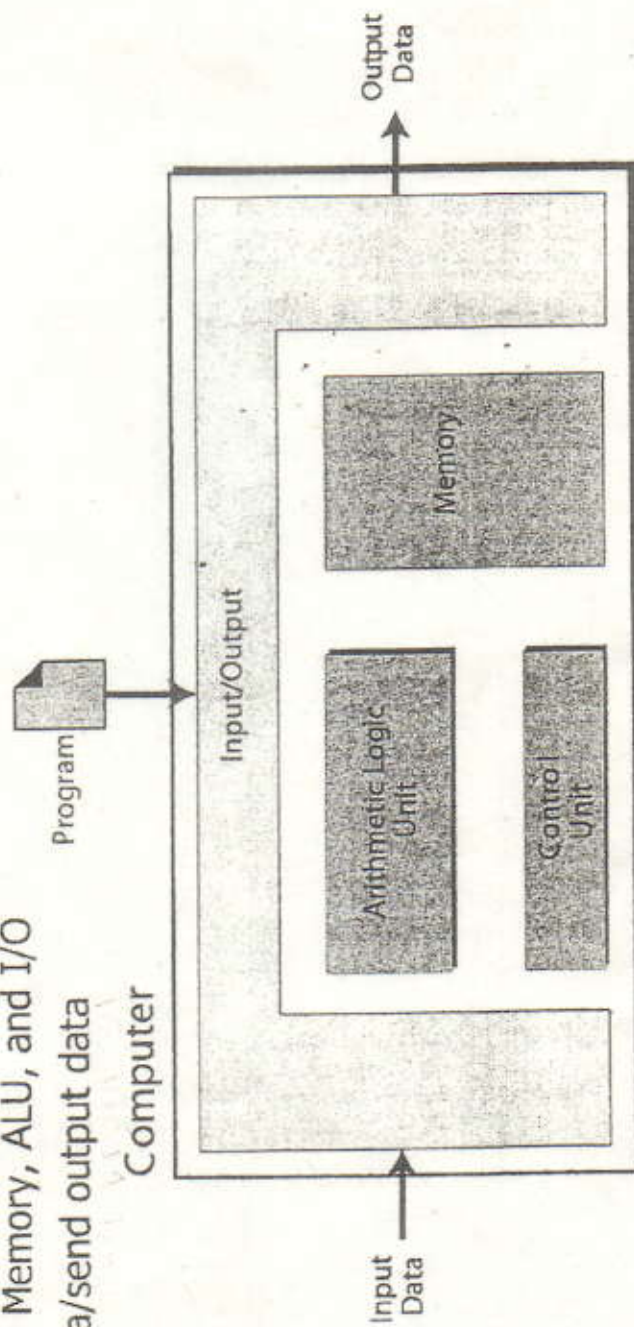
- Arithmetic Operations.
- Logical Comparison.
- Transmitting Info..
- Receiving Info.
- Storing Info.



Von Neumann Model

Every computer today is based on the von Neumann Model. It is based on 3 ideas:

- Four subsystems.
- 1. **Memory** – the storage area of programs and data.
- 2. **ALU** – arithmetic/logic operations take place
- 3. **Control Unit** – control Memory, ALU, and I/O
- 4. **I/O** – accept input data/send output data



- Stored Program Concept.
- Sequential Execution of Instructions.
One or more pieces of data are *read* from memory (one at a time), The data is processed in the CPU, The results are *written* back into memory (one at a time)

Computer Components

Hardware: Electronic devices and Mechanical parts.
Software: Instructions.

Hardware

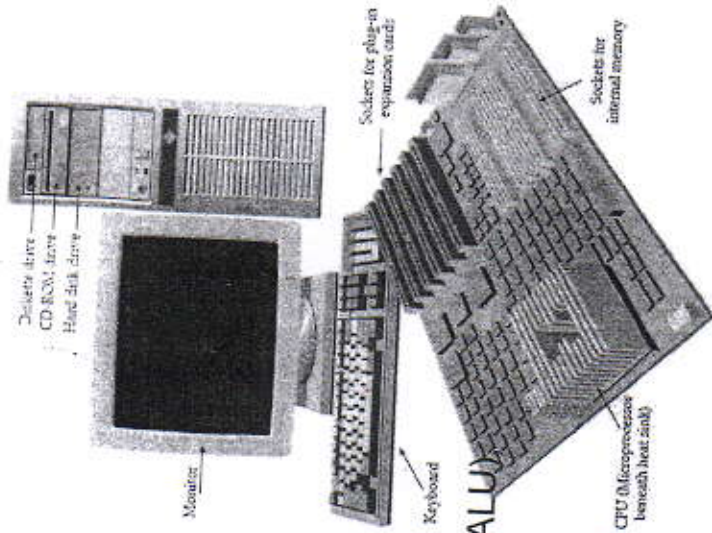
- consists of three groups according to functionalities:
- Central Processing Unit (CPU).
 - Memory Unit.
 - Input/Output Unit (I/O)

A general purpose computer has four main components: the arithmetic logic unit (ALU), the control unit, the memory, and the input and output devices (I/O). These parts are interconnected by busses, often made of groups of wires. Inside

each of these parts are thousands to trillions of small electrical circuits which can be turned **off** or **on** by means of an electronic switch. Each circuit represents a bit (binary digit) of information so that when the circuit is on it represents a "1", and when off it represents a "0" (in positive logic representation). The circuits are arranged in logic gates so that one or more of the circuits may control the state of one or more of the other circuits. The control unit, ALU, registers, and basic I/O are collectively known as a central processing unit (CPU).

Control Unit: The control unit manages the computer's various components; it reads and interprets (decodes) the program instructions, transforming them into a series of control signals which activate other parts of the computer.

Arithmetic Logic Unit: The ALU is capable of performing two classes of operations: arithmetic and logic.



Arithmetic Operations	Logical Operations
+ Add	=, ≠ equal to, not equal to
- Subtract	>, > greater than, not greater than
x Multiply	<, < less than, not less than
÷ Divide	≥, ≥ greater than or equal to, not greater than or equal to
^ Raise by a power	≤, ≤ less than or equal to, not less than or equal to

Memory Unit

The information stored in memory may represent practically anything. Letters, numbers, even computer instructions can be placed into memory with equal ease. Since the CPU does not differentiate between different types of information, it is the software's responsibility to give significance to what the memory sees as nothing but a series of numbers.

In almost all modern computers, each memory cell is set up to store binary numbers in groups of eight bits (called a byte). Each byte is able to represent 256 different numbers ($2^8 = 256$); either from 0 to 255 or -128 to +127. To store larger numbers, several consecutive bytes may be used (typically, two, four or eight). A computer can store

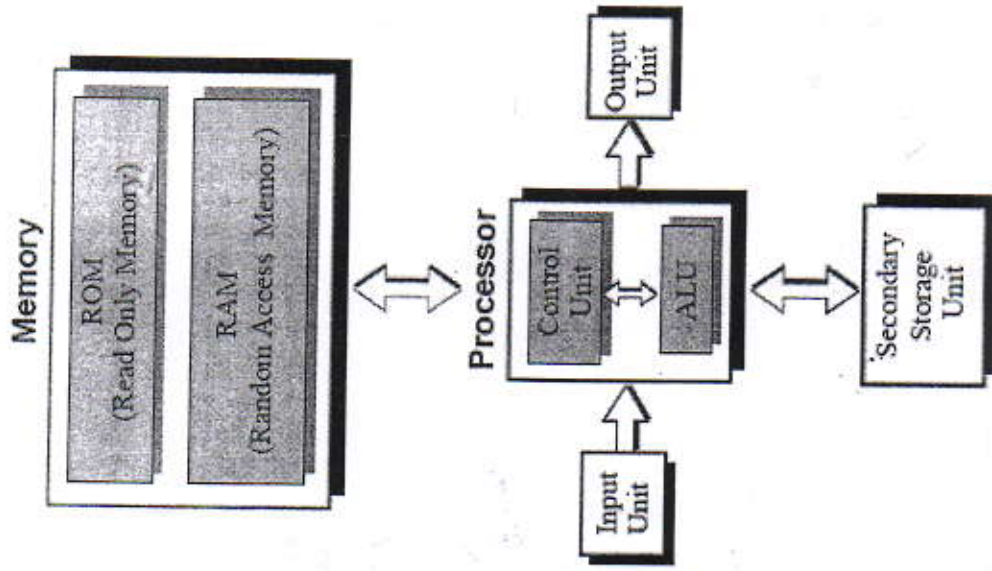
any kind of information in memory if it can be represented numerically. Modern computers have billions or even trillions of bytes of memory.

The CPU contains a special set of memory cells called registers that can be read and written to much more rapidly than the main memory area. Registers are used for the most frequently needed data items to avoid having to access main memory every time data is needed. As data is constantly being worked on, reducing the need to access main memory (which is often slow compared to the ALU and control units) greatly increases the computer's speed.

There are two types of memory:

✦ **Main memory:**

Main memory is temporary storage (e.g. current program), faster, more expensive. Two types of memory are available: RAM and ROM.



1. Random-Access Memory (RAM):

RAM provides the bulk of the memory in a computer, can be read from and written to by the user. The information (program or data) is lost after the system is powered off. The more RAM a computer has, the more capacity the computer has to hold and process large programs and files. RAM can be installed on the motherboard, either as a permanent fixture, or in the form of small chips, referred to as Single Inline Memory Modules (SIMMs) or Dual Inline Memory Modules (DIMMs).

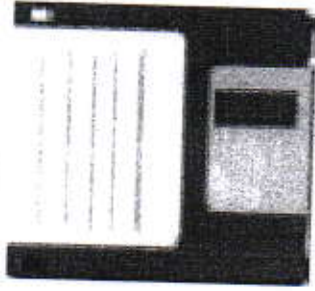
2. Read-Only Memory (ROM):

The contents of ROM come from the manufacturer; users are only allowed to read from it, but not write to it. A good example is the ROM-BIOS chip, which contains read only software. Often network cards and video cards also contain ROM chips. **ROM** is typically used to store the computer's initial start-up instructions.

In general, the contents of RAM are erased when the power to the computer is turned off, but ROM retains its data indefinitely. In a PC, the ROM contains a specialized program called the BIOS that loading the computer's Operating System from the hard disk drive into RAM whenever the computer is turned on or reset. In Embedded computers, which frequently do not have disk drives, all of the required software may be stored in ROM.

Software stored in ROM is often called Firmware, because it is notionally more like hardware than software.

Flash memory blurs the distinction between ROM and RAM, as it retains its data when turned off but is also rewritable. It is typically much slower than conventional ROM and RAM however, so its use is restricted to applications where high speed is unnecessary.

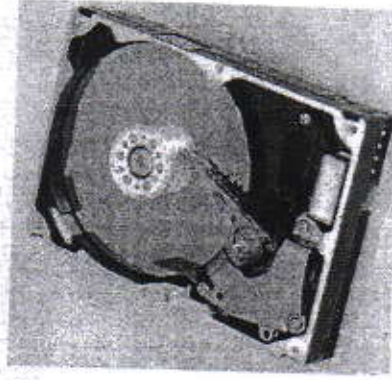


❁ Secondary memory:

Store data, slower, cheaper. Secondary memory like: Flash Memory, Floppy Disk, Hard Disk, Compact Disk (CD), Digital Video Disk (DVD). It hold data when the power is off.

Hard Disk Drive (HDD):

The HDD has a much larger storage capacity than the floppy for long-term storage. It store programs and files, as well as the operating system. Typically, the HDD is an internal drive that cannot be removed from the computer.



Input/Output Unit

□ Input devices take data into computer system like (Mouse, Keyboard, Joystick, Joystick, Scanner, Web camera, Graphics Tablet, Microphone).

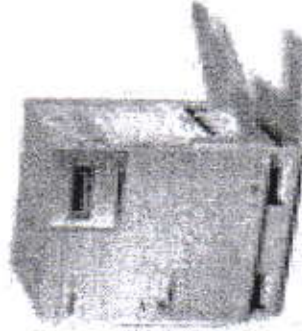
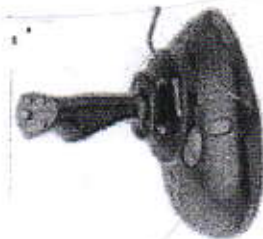
Scanner: allow to scan printed material and convert it into a file format that may be used within the PC.

Light Pens: Used to allow users to point to areas on a screen.

Touch Pads: A device that lays on the desktop and responds to pressure.

Joysticks: Many games require a joystick for the proper playing of the game.

Tracker Balls : an alternative to the traditional mouse and often used by graphic designers.



□ Output devices provide data to outside of the systems (Printer, Monitor, Plotter, Speakers).

Printers: There are many different types of printers. In large organizations laser printers are most commonly used due to the fact that they can print very fast and give a very high quality output.

Plotters: A plotter is an output device similar to a printer, but normally allows you to print larger images and maps.

Speakers: Enhances the value of educational and presentation products.

Speech synthesizers: Give the ability to not only to display text on a monitor but also to read the text to the user.