INTRODUCTION TO PC SOFTWARE

UNIT 1

What Does Computer Mean?

A computer is a machine or device that performs processes, calculations and operations based on instructions provided by a software or hardware program. It has the ability to accept data (input), process it, and then produce outputs.

Computers can also store data for later uses in appropriate storage devices, and retrieve whenever it is necessary.

Modern computers are electronic devices used for a variety of purposes ranging from browsing the web, writing documents, editing videos, creating applications, playing video games, etc.

They are designed to execute applications and provide a variety of solutions by combining integrated hardware and software components.

What is a PC?

A Personal Computer is a small multi-purpose computing device that contains a CPU (a processor).

It's designed in such a way that it's intended for individual use only – one person at a time.

I'm emphasizing the single-use nature of PCs, as it's in contrast to massive mainframe computers, which were widely used in the earlier days of computing.

A mainframe is a very large and powerful supercomputer, capable of taking up an entire room. Multiple people, even up to hundreds of them, can access and use it at a given moment.

WE use PCs in offices and homes, and each office and home can have multiple personal computers depending on how many people are working/living there.

There are different styles of PCs, and they can run on different Operating Systems.

The most popular type of PC uses the Windows OS.

A computer system is basically a machine that simplifies complicated tasks. It should maximize performance and reduce costs as well as power consumption. The different components in the Computer System Architecture are Input Unit, Output Unit, Storage Unit, Arithmetic Logic Unit, Control Unit etc.

A diagram that shows the flow of data between these units is as follows −
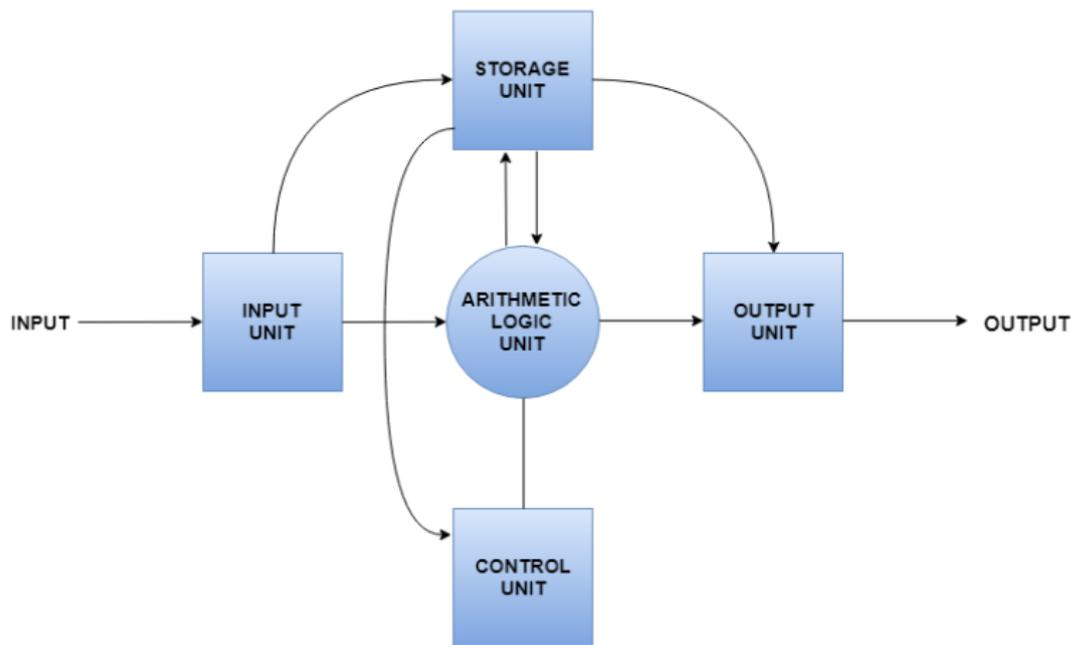
The input data travels from input unit to ALU. Similarly, the computed data travels from ALU to output unit. The data constantly moves from storage unit to ALU and back again. This is because stored data is computed on before being stored again. The control unit controls all the other units as well as their data.

Details about all the computer units are −

- **Input Unit**
  The input unit provides data to the computer system from the outside. So, basically it links the external environment with the computer. It takes data from the input devices, converts it into machine language and then loads it into the computer system. Keyboard, mouse etc. are the most commonly used input devices.

- **Output Unit**
  The output unit provides the results of computer process to the users i.e it links the computer with the external environment. Most of the output data is the form of audio or video. The different output devices are monitors, printers, speakers, headphones etc.

- **Storage Unit**
  Storage unit contains many computer components that are used to store data. It is traditionally divided into primary storage and secondary storage. Primary storage is also known as the main memory and is the memory directly accessible by the CPU. Secondary or external storage is not directly accessible by the CPU. The data from secondary storage needs to be brought into the primary storage before the CPU can use it. Secondary storage contains a large amount of data permanently.

- **Arithmetic Logic Unit**
  All the calculations related to the computer system are performed by the arithmetic logic unit. It can perform operations like addition, subtraction,

multiplication, division etc. The control unit transfers data from storage unit to arithmetic logic unit when calculations need to be performed. The arithmetic logic unit and the control unit together form the central processing unit.

- **Control Unit**
  This unit controls all the other units of the computer system and so is known as its central nervous system. It transfers data throughout the computer as required including from storage unit to central processing unit and vice versa. The control unit also dictates how the memory, input output devices, arithmetic logic unit etc. should behave.

Computer generations

Basic Terms

Vacuum tube – an electronic device that controls the flow of electrons in a vacuum. It used as a switch, amplifier, or display screen in many older model radios, televisions, computers, etc.

Transistor – an electronic component that can be used as an amplifier or as a switch. It is used to control the flow of electricity in radios, televisions, computers, etc.

Integrated circuit (IC) – a small electronic circuit printed on a chip (usually made of silicon) that contains many its own circuit elements (e.g., transistors, diodes (a semiconductor device containing used in circuits for converting alternating current to direct current, resistors, etc.).

Microprocessor – an electronic component held on an integrated circuit that contains a computer's central processing unit (CPU) and other associated circuits.

CPU (central processing unit) – It is often referred to as the brain or engine of a computer where most of the processing and operations take place (CPU is part of a microprocessor).

Magnetic drum – a cylinder coated with magnetic material, on which data and programs can be stored.

Machine language – a low-level programming language comprised of a collection of binary digits (ones and zeros) that the computer can read and understand.

Assembly language is like the machine language that a computer can understand, except that assembly language uses abbreviated words (e.g. ADD, SUB, DIV…) in place of numbers (0s and 1s).

Memory – a physical device that is used to store data, information and program in a computer. Artificial intelligence (AI) – an area of computer science that deals with the simulation and creation of intelligent machines or intelligent behave in computers (they think, learn, work, and react like humans).

Classification of generations of computers

Five Generations of Computers

Generations of computers	Generations timeline	Evolving hardware
First generation	1940s-1950s	Vacuum tube based
Second generation	1950s-1960s	Transistor based
Third generation	1960s-1970s	Integrated circuit based
Fourth generation	1970s-present	Microprocessor based
Fifth generation	The present and the future	Artificial intelligence based

The main characteristics of first generation of computers (1940s-1950s)

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- Main electronic component – vacuum tube
- Main memory – magnetic drums and magnetic tapes
- Programming language – machine language
- Power – consume a lot of electricity and generate a lot of heat.
- Speed and size – very slow and very large in size (often taking up entire room).
- Input/output devices – punched cards and paper tape.
- Examples – ENIAC, UNIVAC1, IBM 650, IBM 701, etc.
- Quantity – there were about 100 different vacuum tube computers produced between 1942 and1963.

Second Generation of Computers

The main characteristics of second generation of computers (1950s-1960s)

- Main electronic component – transistor
- Memory – magnetic core and magnetic tape / disk
- Programming language – assembly language
- Power and size – low power consumption, generated less heat, and smaller in size (in comparison with the first-generation computers).
- Speed – improvement of speed and reliability (in comparison with the first-generation computers)
- Input/output devices – punched cards and magnetic tape.
- Examples – IBM 1401, IBM 7090 and 7094, UNIVAC 1107, etc.

Third Generation of Computers

The main characteristics of third generation of computers (1960s-1970s)

- Main electronic component – integrated circuits (ICs)
- Memory – large magnetic core, magnetic tape / disk
- Programming language – high level language (FORTRAN, BASIC, Pascal, COBOL, C, etc.)
- Size – smaller, cheaper, and more efficient than second generation computers (they were called minicomputers)
- Speed – improvement of speed and reliability (in comparison with the second-generation computers)
- Input / output devices – magnetic tape, keyboard, monitor, printer, etc
- Examples – IBM 360, IBM 370, PDP-11, UNIVAC 1108, etc.

Fourth Generation of Computers

The main characteristics of fourth generation of computers (1970s-present)

- Main electronic component – very large-scale integration (VLSI) and microprocessor.
- VLSI– thousands of transistors on a single microchip
- Memory – semiconductor memory (such as RAM, ROM, etc.)
  - RAM (random-access memory) – a type of data storage (memory element) used in computers that temporary stores of programs and data (volatile: its contents are lost when the computer is turned off)

- ROM (read-only memory) – a type of data storage used in computers that permanently stores data and programs (non-volatile: its contents are retained even when the computer is turned off)

- Programming language – high level language (Python, C#, Java, JavaScript, Rust, Kotlin, etc.).
  - A mix of both third- and fourth-generation languages
- Size – smaller, cheaper and more efficient than third generation computers.
- Speed – improvement of speed, accuracy, and reliability (in comparison with the Input / output devices – keyboard, pointing devices, optical scanning, monitor, printer, etc third-generation computers).
- Network – a group of two or more computer systems linked together.
- Examples – IBM PC, STAR 1000, APPLE II, Apple Macintosh, etc.

Fifth Generation of Computers

The main characteristics of fifth generation of computers (the present and the future)

- Main electronic component: based on artificial intelligence, uses the Ultra Large-Scale Integration (ULSI) technology and parallel processing method
- **ULSI** – millions of transistors on a single microchip
- **Parallel processing method** – use two or more microprocessors to run tasks simultaneously
- Language – understand natural language (human language).
- Power – consume less power and generate less heat.
- Speed – remarkable improvement of speed, accuracy and reliability (in comparison with the fourth-generation computers).
- Size – portable and small in size, and have a huge storage capacity
- Input / output device – keyboard, monitor, mouse, trackpad (or touchpad), touchscreen, pen, speech input (recognise voice / speech), light scanner, printer, etc.
- Example – desktops, laptops, tablets, smartphones, etc.

Types of Computers
A computer is a device that transforms data into meaningful information. It processes the input according to the set of instructions provided to it by the user and gives the desired output. Computers are of various types and they can be categorized in two ways on the basis of size and on the basis of data handling capabilities.

So, on the basis of size, there are five types of computers:

1. Supercomputer
2. Mainframe computer
3. Minicomputer
4. Workstation
5. PC (Personal Computer)

And on the basis of data handling capabilities, there are three types of computers:

1. Analogue Computer
2. Digital Computer
3. Hybrid Computer

1. Supercomputer:

When we talk about speed, then the first name that comes to mind when thinking of computers is supercomputers. They are the biggest and fastest computers(in terms of speed of processing data). Supercomputers are designed such that they can process a huge amount of data, like processing trillions of instructions or data just in a second. This is because of the thousands of interconnected processors in supercomputers. It is basically used in scientific and engineering applications such as weather forecasting, scientific simulations, and nuclear energy research. It was first developed by Roger Cray in 1976.

Characteristics of supercomputers:

- Supercomputers are the computers which are the fastest and they are also very expensive.
- It can calculate up to ten trillion individual calculations per second, this is also the reason which makes it even faster.
- It is used in the stock market or big organizations for managing the online currency world such as bitcoin etc.
- It is used in scientific research areas for analysing data obtained from exploring the solar system, satellites, etc.

2. Mainframe computer:

Mainframe computers are designed in such a way that it can support hundreds or thousands of users at the same time. It also supports multiple programs simultaneously. So, they can execute different processes simultaneously. All these features make the mainframe computer ideal for big organizations like banking, telecom sectors, etc., which process a high volume of data in general.

Characteristics of mainframe computers:

- It is also an expensive or costly computer.
- It has high storage capacity and great performance.
- It can process a huge amount of data (like data involved in the banking sector) very quickly.
- It runs smoothly for a long time and has a long life.

3. Minicomputer:

Minicomputer is a medium size multiprocessing computer. In this type of computer, there are two or more processors, and it supports 4 to 200 users at one time. Minicomputers are used in places like institutes or departments for different work like billing, accounting, inventory management etc. It is smaller than a mainframe computer but larger in comparison to the microcomputer.

Characteristics of minicomputer:

- Its weight is low.
- Because of its low weight, it is easy to carry anywhere.
- less expensive than a mainframe computer.
- It is fast.

4. Workstation:

Workstation is designed for technical or scientific applications. It consists of a fast microprocessor, with a large amount of RAM and high speed graphic adapter. It is a single-user computer. It generally used to perform a specific task with great accuracy.

Characteristics of Workstation:
- It is expensive or high in cost.
- They are exclusively made for complex work purposes.
- It provides large storage capacity, with better graphics, and a more powerful CPU when compared to a PC.
- It is also used to handle animation, data analysis, CAD, audio and video creation, and editing.

5. PC (Personal Computer):

It is also known as a microcomputer. It is basically a general-purpose computer and designed for individual use. It consists of a microprocessor as a central processing unit(CPU), memory, input unit, and output unit. This kind of computer is suitable for personal work such as making an assignment, watching a movie, or at office for office work, etc. For example, Laptops and desktop computers.

Characteristics of PC (Personal Computer):
- In this limited number of software can be used.
- It is smallest in size.
- It is designed for personal use.
- It is easy to use.

6. Analogue Computer:

It is particularly designed to process analogue data. Continuous data that changes continuously and cannot have discrete values is called analogue data. So, an analogue computer is used where we don't need exact values or need approximate values such as speed, temperature, pressure etc. It can directly accept the data from the measuring device without first converting it into numbers and codes. It measures the continuous changes in physical quantity. It gives output as a reading on a dial or scale. For example speedometer, mercury thermometer, etc.

7. Digital Computer:

Digital computers are designed in such a way that it can easily perform calculations and logical operations at high speed. It takes raw data as an input and processes it with programs stored in its memory to produce the final output. It only understands the binary input 0 and 1, so the raw input data is converted to 0 and 1 by the computer and then it is processed by the computer to produce the result or final output. All modern computers, like laptops, desktops including smartphones are digital computers.

8. Hybrid Computer:

As the name suggests hybrid, which means made by combining two different things. Similarly, the hybrid computer is a combination of both analog and digital computers. Hybrid computers are fast like an analog computer and have memory, and accuracy like a digital computer. So, it has the ability to process both continuous and discrete data. For working when it accepts analog signals as input then it converts them into digital form before processing the input data. So, it is widely used in specialized applications where both analog and digital data is required to be processed. A processor which is used in petrol pumps that converts the measurements of fuel flow into quantity and price is an example of a hybrid computer.

<u>**Types of PCs**</u>

the six main types of personal computers we used today.

1. *Desktop Computers*
2. *Workstations*
3. *Notebook computers or laptops*
4. *Tablet computers*
5. *Handheld computers*
6. *Smartphones*

1. Desktop Computer

The most common type of **personal computer** is the desktop computer. It is a PC that is designed to sit on a desk or a table.
These are the system you see around you in schools, colleges, universities, homes and offices.

Today's **desktop computers** are more powerful than that of a few years ago. Personal computers are used for various types of tasks.

It is being used by everyone from pre-schoolers to nuclear physicists as well as desktop computers are indispensable for learning, working as well as playing.

2. Workstation

A **workstation** is a specialized personal computer. It is single user which has more power and features than a standard PC.
These machines are popular among scientists, engineers, and animators who need a greater speed power to perform sophisticated tasks.

Workstations often has large, high resolution monitors and accelerated graphics handling capabilities which makes them suitable for advanced architectural or engineering design, modelling, animation video editing etc.

3. Notebook computer or Laptop

Notebook computers are another type of personal computer which is getting more popularity day by day. It is very small in size and can easily fit inside a brief case.
They are also called **laptop computers** because people frequently set these devices on their lap. Notebook computer can be operated by both alternating current and direct current by battery.
It's weight is less than 8 pounds. During use, the computer's lid is raised to reveal a thin monitor and a keyboard. When not in use, the device folds up for easy storage.

It is a fully functional **microcomputer** or personal computer. People who need the power of a full-size desktop computer wherever they go outside, use notebook.
Some **notebook computers** are designed to be plugged into a docking station, which includes a large monitor, a full-size keyboard and mouse or other devices.
Docking stations also provide **additional ports** that enable the note book computer to be connected to different devices or a network in the same manner as a desktop personal computer.

4. Tablet computer

Tablet computer is the newest development in portable, full- featured personal computer.
Tablet PCs offer all the functionality of a notebook computer.
They are lighter and can accept input from a special pen called a stylus or a digital pen.
Stylus is used to tap or write directly on the screen.

Some tablet PCs also have a built-in **microphones** and special software that accepts input from the user's **voice**.
Some have a fold-out keyboard, so they can be transformed into a standard notebook computer.

Tablet PCs run specialized versions of standard programs and can be connected to a network as a personal computer.

Some models also can be connected to a keyboard and a full-size monitor.

5. Handheld computer

Handheld computers are another types of personal computer which are small enough to fit in your hand. The **Personal Digital Assistant (PDA)** is the popular types of handheld computers.

PDA is used for special applications such as taking notes, displaying telephone numbers and addresses, and keeping track of dates or agendas.

Many PDAs can be connected to larger computers to exchange data.

Many PDAs let the user access the internet through a **wireless connection** as a personal computer.
Several models offer features such as cellular telephones, cameras, music players, and GPS.

6. Smartphone

Smartphones which are the most uses personal computers now a days. There is hardly a person who has not a smartphone.

These are very small and can easily portable to your pocket.

Smartphone is the smallest types of PC now a days. Almost everyone have a smartphone today by which a man can connect to the internet.

One can get the features like web and email access, special software such as personal organizers, or special hardware such as digital cameras or music players.

It has made our life easy because we can easily take it with us and use whenever need.

Computer Hardware: Hardware refers to the physical components of a computer. Computer Hardware is any part of the computer that we can touch these parts. These are the primary electronic devices used to build up the computer. Examples of hardware in a computer are the Processor, Memory Devices, Monitor, Printer, Keyboard, Mouse, and the Central Processing Unit.
Computer Software: Software is a collection of instructions, procedures, and documentation that performs different tasks on a computer system. we can say also Computer Software is a programming code executed on a computer processor. The code can be machine-level code or the code written for an operating system. Examples of software are Ms Word, Excel, PowerPoint, Google Chrome, Photoshop, MySQL, etc.

Difference Between Hardware and Software:

Difference Between Hardware and Software:

S.No	Parameters	Hardware	Software
1.	**Basic Definition**	Hardware is a physical part of the computer that causes the processing of data.	Software is a set of instructions that tells a computer exactly what to do.
2.	**Development**	It is manufactured.	It is developed and engineered.
3.	**Dependency**	Hardware cannot perform any task without software.	The software can not be executed without hardware.
4.	**Process of creating**	Electronic and other materials are used to create hardware.	Created by utilizing a computer language to write instructions.
5.	**Tangible**	Hardware is tangible as hardware is a physical electronic device, that can be touched.	Software is intangible as we can see and also use the software but can't touch them.
6.	**Durability**	Hardware typically wears out over time.	The software does not wear out with time. However, it may contain flaws and glitches.
7.	**Types**	It has **four** main categories: input devices, output devices, storage, and internal components.	It is mainly divided into System software and Application software.

S.No	Parameters	Hardware	Software
8.	**Virus effect**	Hardware is not affected by computer viruses.	Software is affected by computer viruses.
9.	**Transfer**	It cannot be transferred from one place to another electrically through the network.	It can be transferred via a network means.
10.	**Machine-Level language**	Only machine-level language is known to be understood by hardware.	The program accepts human-readable input, interprets it in machine-level language, and sends it to hardware for additional processing.
11.	**Replacement**	If hardware is damaged, it is replaced with a new one.	If the software is damaged, its backup copy can be reinstalled.
12.	**Failures**	Dust, overheating, dust, and other factors are commonly responsible for hardware failures.	Overloading, systematic error, major-minor version error, and other factors are commonly responsible for software failures.
13.	**Examples**	Ex: Keyboard, Mouse, Monitor, Printer, CPU, Hard disk, RAM, ROM, etc.	Ex: MS Word, Excel, PowerPoint, Photoshop, MySQL, etc.

BITS AND BYTES

A bit is a binary digit, the smallest increment of data on a computer. A bit can hold only one of two values: 0 or 1, corresponding to the electrical values of off or on, respectively.

Because bits are so small, you rarely work with information one bit at a time. Bits are usually assembled into a group of eight to form a byte. A byte contains enough information to store a single ASCII character, like "h".

A kilobyte (KB) is 1,024 bytes, not one thousand bytes as might be expected, because computers use binary (base two) math, instead of a decimal (base ten) system.

BIT – a" Bit" is atomic: The smallest unit of storage (0 or1)

BYTE- Groups of 8 bits to make 1 byte

1 Byte	= Binary digit
8 Bits	= 1 Byte
1024 Bytes	= 1 kilobyte
1024 Kilobytes	= 1 Megabyte
1024 megabytes	= 1 gigabyte
1024 gigabytes	= 1 terabyte
1024 terabytes	= 1petrabyte
1024 petrabytes	= 1 exabyte