Computer Literacy

B.Ed(hons.)

What is Computer?

Computer is an electronic device that is designed to work with Information. *The term computer* is *derived from the Latin term* '**computare**', this means to calculate. **Computer cannot do anything without a Program**. It represents the decimal numbers through a string of binary digits. The Word 'Computer 'usually refers to the Centre Processor Unit plus Internal memory.

Computer is an advanced electronic device that takes raw data as input from the user and processes these data under the control of set of instructions (called program) and gives the result (output) and saves output for the future use. It can process both numerical and non-numerical (arithmetic and logical) calculations. The basic components of a modern digital computer are:

- Input Device
- Output Device
- Central Processor

Charles Babbage is called the "**Grand Father**" of the computer. The First mechanical computer designed by Charles Babbage was called Analytical Engine. It uses read-only memory in the form of punch cards.

- Four Functions about computer are:

accepts data	Input
processes data	Processing
produces output	Output
stores results	Storage

Input (Data):
Input is the raw information entered into a computer from the input devices. It is the collection of letters, numbers, images etc.
Process:
Process is the operation of data as per given instruction. It is totally internal process of the computer system.
Output:
Output is the processed data given by computer after data processing. Output is also called as Result. We can save these results in the storage devices for the future use.

The Characteristics of Computers

Much of the world runs on computers and computers profoundly changed human life mostly for better. What is the characteristics for computer:

• Speed
A computer is a very fast device. It can carry out instructions at a very high speed obediently, uncritically and without exhibiting any emotions. It can perform in a few seconds the amount of work that a human being can do in an entire year – if he work day and night and is nothing else.
Some calculation that would have taken hours and days to complete otherwise, can be competed in a few seconds using the computer. The speed of computer is calculated in MHz, that is one million instructions per second.

• Accuracy
Accuracy of a computer is consistently high and the degree of accuracy of a particular computer depends on the

instructions and the type of processor. But for a particular computer, each and every calculation is performed. For example, the computer accurately give the result of division of any number up to 10 decimal points.

• Versatility

Versatility is one of the most wonderful things about computer. Multi-processing features of computer makes it quiet versatile in nature. One moment, it is preparing the results of particular examination, the next moment it is busy preparing electricity bills, and in between it may be helping an office secretary to trace an important letter in seconds.

It can perform different types of tasks with same ease. All that is required to change its talent is to slip in a new program into it. Briefly, a computer is capable of performing almost any task provided that the task can be reduced to a series of logical steps.

• Reliability

Computer provide very high speed accompanied by an equality high level for reliability. Thus computers never make mistakes of their own accord.

• Power of Remembering

A computer can store and recall any amount of information because of its secondary storage capability. Every piece of information can be retain as long as desired by the user and it can be recalled information almost instantaneously. Even after several years, the information recalled will be as accurate as on the day when it was fed to the computer.

• No I.Q

A computer is a magical device. It can only perform tasks that a human being can. The difference is that it performs these tasks with unthinkable speed and accuracy.

It posses no intelligence of its own. Its I.Q is zero at least till today. It can only perform what is programmed to do. Hence, only the user can determine what tasks a computer will perform. Computers have no sense of meaning, cannot perceive and are only able to make simple robotic decision about the data they receive.

• Common Data Used

One item can be involved in several different procedures or accessed, update and inspected by a number of different users. This can hinder the work of those who need access to data. As the time is changing, more and more facilities are being added to the computers they can perform but in practical life many tasks are limited to these basic operations.

• Diligence

The computer is a machine, does not suffer from the human traits of tiredness. Nor does it loses concentration even after working continuously for a long time.

This characteristics is especially useful for those jobs where same tasks is done again and again. It can perform long and complex calculations with same speed and accuracy from the start till the end.
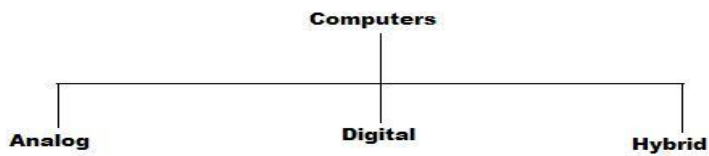
• Storage

The computers have a lot of a storage devices which can store a tremendous amount of data. Data storage is essential function of the computer. Second storage devices like floppy disk can store a large amount of data permanently.

No feeding ,automation ,

These computer types are

- Analogue Computers
- Digital Computers
- Hybrid Computers

Analogue Computers

Analogue types of Computer uses what is known as analogue signals that are represented by a continuous set of varying voltages and are used in scientific research centres?, hospitals and flight centres. With analogue types of computer no values are represented by physical measurable quantities e.g. voltages. Analogue computer types program arithmetic and logical operations by measuring physical changes i.e. temperatures or pressure.

Digital Computer type

With these types of computers operation are on electrical input that can attain two inputs, states of ON=1 and state of OFF = 0. With digital type of computers data is represented by digital of 0 and 1 or off state and on state. Digital computer type recognizes data by counting discrete signal of (0 0r 1), they are high speed programmable; they compute values and stores results. After looking at the Digital computer type and how it functions will move to the third computer type as mentioned above.

Hybrid type of Computer

Hybrid computer types are very unique, in the sense that they combined both analogue and digital features and operations. With Hybrid computers operate by using digital to analogue convertor and analogue to digital convertor. By linking the two types of computer above you come up with this new computer type called Hybrid.

Types of Computers based on Configuration(size)

There are four different types of computers when we classify them based on their performance and capacity. The four types are

- Super Computers
- Mainframe Computers
- Mini Computers
- Micro Computers
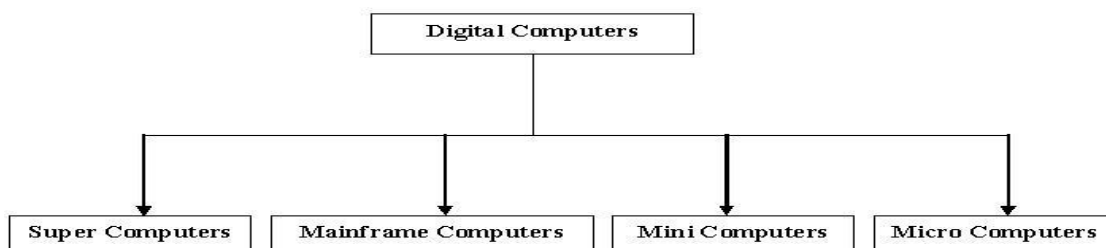
Super Computers

When we talk about types of computers, the first type that comes to our mind would be Super computers. They are the best in terms of processing capacity and also the most expensive ones. These computers can process billions of instructions per second. Normally, they will be used for applications which require intensive numerical computations such as stock analysis, weather forecasting etc. Other uses of supercomputers are scientific

simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting). Perhaps the best known super computer manufacturer is Cray Research. Some of the "traditional" companies which produce super computers are Cray, IBM and Hewlett-Packard.

Mainframe Computers

Mainframe computers can also process data at very high speeds vi.e., hundreds of million instructions per second and they are also quite expensive. Normally, they are used in banking, airlines and railways etc for their applications.

Mini Computers

Mini computers are lower to mainframe computers in terms of speed and storage capacity. They are also less expensive than mainframe computers. Some of the features of mainframes will not be available in mini computers. Hence, their performance also will be less than that of mainframes.

Micro Computers

The invention of microprocessor (single chip CPU) gave birth to the much cheaper micro computers. They are further classified into

- Desktop Computers
- Laptop Computers
- Handheld Computers(PDAs)

advantages and disadvantages of computer

The following is a list of advantages and disadvantages of the computer:

Disadvantages:
1. It can have negative effects on your social life and interactions with other people if you do not maintain the balance between time online and offline.
2. It may have a negative effect on your eyesight due to radiation.
3. It may cause pimples and wrinkles.
4. It may distract you from your studies.
5. Too much time in front of monitor may adversely affect your eyesight.
6. Sitting in front of a computer for too long without exercise can cause a weight gain.

Advantages:
1. It helps you automate various tasks that you cannot do manually.
2. It helps you organize your data and information.
3. It has much more computing and calculating power then an ordinary human.
4. It may help your work to be a lot easier.
5. It can help you communicate with friends, co-workers and other contacts.
6. It has many search engines to help you find information quickly.

Applications of computers

In Tourism, Banks, In Industry, Transportation, Education, Entertainment,

The Importance of Computers in the Modern Education:
- Assignments,
- projects,
- presentations,
- extracurricular activities

Assignments and Projects:

First of all, teachers prefer projects to be typed or in the soft copy, where computers are a must. Secondly the education system has gone out of the concept of only book reading. There are so many websites, research material available on the internet where students can not only learn about their projects but also gain extra general knowledge about the world.

Presentations:

Another great usage of computers in the education system is where students are asked to give presentations about their projects or some other topic. There are so many helpful resources online where students can get guidelines about how to make their presentation excel and get good grades. The need for computers and the internet is ever growing and parents and elders have to accept this fact and not stop their children from growing in this field.

Computer Sciences:

There is a whole field dedicated to computer studies and information technology and people actually do PhD in computer sciences. The subject of computer is taught to children as early as in grade 2 and its importance can be understood from this.

Extra-Curricular:

There are a number of different software that can help students enhance and grow in their hobbies such as music, photography, video editing and so much more. The students have a chance to explore their options and perfect themselves in their hobbies as well.

The importance of computer sciences can be understood from the concept that there is no field of education or business where computers are not being used for one thing on the other. This technology savvy world demands that we keep up with the advancements and stay in touch with the outside world.

Computer - Memory Units

Following are the main memory storage units:

Sr. No.	Unit	Description
1.	Bit (Binary Digit)	A binary digit is logical 0 & 1 representing a passive or an active state of a component in an electric circuit.
2.	Nibble	A group of 4 bits is called nibble.
3.	Byte	A group of 8 bits is called byte. A byte is the smallest unit which can represent a data item or a character.
4.	Word	A computer word like a byte, is a group of fixed number of bits processed as a unit which varies from computer but is fixed for each computer. The length of a computer word is called word-size or word length and it may be as small as 8 bits or may be as long as 96 bits. A computer stores the information in the form of the computer words.

Few higher storage units are following

Sr. No.	Unit	Description
1.	Kilobyte (KB)	1 KB = 1024 Bytes
2.	Megabyte (MB)	1 MB = 1024 KB
3.	Gigabyte (GB)	1 GB = 1024 MB
4.	Terabyte (TB)	1 TB = 1024 GB
5.	Petabyte (PB)	1 PB = 1024 TB

Examples of Hardware are following.

- **Input devices --** keyboard, mouse etc.
- **Output devices --** printer, monitor etc.
- **Secondary storage devices --** Hard disk, CD, DVD etc.
- **Internal components --** CPU, motherboard, RAM etc.

Binary Number System

Characteristics
- Uses two digits, 0 and 1.
- Also called base 2 number system
- Each position in a binary number represents a 0 power of the base (2). Example 2^0
- Last position in a binary number represents a x power of the base (2). Example 2^x where x represents the last position - 1.

Example

Binary Number: 10101_2

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	10101_2	$((1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	10101_2	$(16 + 0 + 4 + 0 + 1)_{10}$
Step 3	10101_2	21_{10}

Computer - Overview

Today's world is an information rich world and it has become a necessity for everyone to know about computers. Purpose of this tutorial is to introduce you about computer systems and its fundamentals.

Functionalities of a computer

Any digital computer carries out five functions in gross terms:
- Takes data as input.
- Stores the data/instructions in its memory and can use them when required.
- Process the data and convert it into useful information.
- Output the information.
- Control all the above four steps.
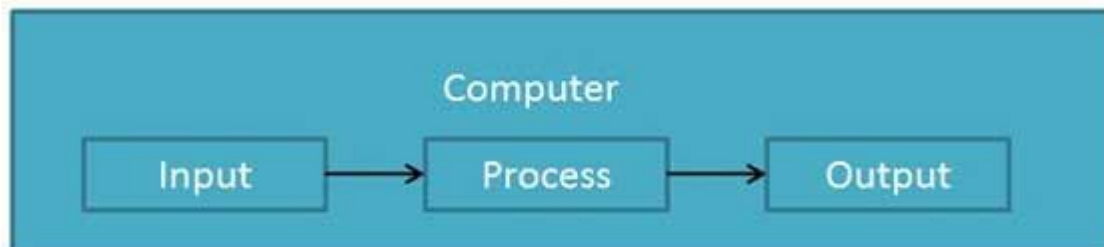
Definition

Computer System is an electronic data processing device which does the following:
- Accept and store an input data.
- Process the data input.
- And output the processed data in required format.

Advantages
Following list demonstrates the advantages of Computers in today's arena.

- Computer is a very fast device.
- In addition to being very fast, computer are very accurate.
- The computer has performed calculations 100% error free.
- Computers perform all jobs with 100% accuracy.
- The computer has much more storage capacity than human beings.
- Unlike human beings, a computer is free from monotony, tiredness and lack of concentration.
- It can work continuously without creating any error and boredom.
- It can do repeated work with same speed and accuracy.
- A computer is a very versatile machine.
- A computer is very flexible in performing the jobs to be done.
- Computer is a automatic machine.
- The use of computers for data processing in an organization leads to reduction in paper work and speeds up the process.
- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of files gets reduced.
- Though the initial investment for installing a computer is high but it substantially reduces the cost of each of its transaction.

Disadvantages
Following list demonstrates the disadvantages of Computers in today's arena.

- A computer is a machine and has no intelligence of its own to perform any task.
- Each and every instruction has to be given to computer.
- A computer cannot take any decision on its own.
- It can perform function as instructed by user. So it is fully dependent on human being.
- The operating environment of computer should be dust free and suitable to it.
- Computer has no feeling or emotions.
- It cannot make Judgement based on feeling, taste, experience and knowledge unlike a human being.

Computer - Applications

Following list demonstrates the various applications of Computers in today's arena.

Business
The computer's characteristic as high speed of calculation, diligence, accuracy, reliability, or versatility has made it an integrated part in all business organisations.

Banking
Today Banking is almost totally dependent on computer.

Insurance
Insurance companies are keeping all records up to date with the help of computer. The Insurance Companies, Finance houses and Stock broking firms are widely using computers for their concerns.

Education

The computer has provided a lot of facilities in the Education System.

Marketing

With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.

Health Care

Computers have become important part in all Medical Systems.

Engineering Design

Computers are widely used in engineering purposes.

Military

Computers are largely used in defence. Modern tanks, missiles, weapons etc. Employ computerised control systems.

Communication

Communication means to convey a message, an idea, a picture or speech that is received and understood clearly and correctly by the person for whom it is meant.

Government Applications

Computers play an important role in government applications like sales tax department, income tax department and computerization of voters lists etc.

Computer - Types

Computer can be broadly classified by their speed and computing power.

Sr. No.	Type	Specifications
1.	PC (Personal Computer)	Single user computer system. Moderately powerful microprocessor.
2.	WorkStation	Single user computer system. Similar to Personal Computer but have more powerful microprocessor.
3.	Mini Computer	Multi-user computer system. Capable of supporting hundreds of users simultaneously.
4.	Main Frame	Multi-user computer system. Capable of supporting hundreds of users simultaneously. Software technology is different from minicomputer.
5.	Supercomputer	An extremely fast computer which can perform hundreds of millions of instructions per second.

Computer - Components

All types of computer follows a same basic logical structure and perform the following five basic operations for converting raw input data into information useful to their users

Sr. No.	Operation	Description
1.	Take Input	The process of entering data and instructions into the computer system.
2.	Store Data	Saving data and instructions so that they are available for processing as and when required.
3.	Processing Data	Performing arithmetic, logical operations on data in order to convert them into useful information.
4.	Output Information	The process of producing useful information or results for the user, such as a printed report or visual display
5.	Control the workflow	Direct the manner and sequence in which all of the above operations are performed.
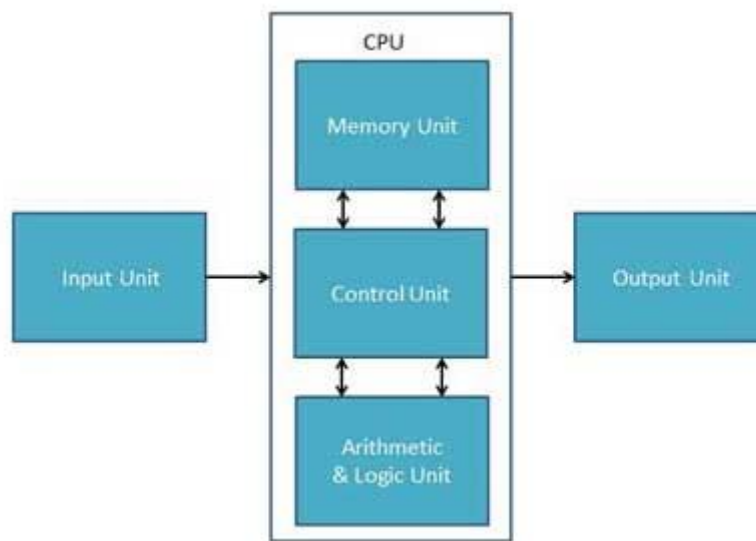
Input Unit

This unit contains devices with the help of which we enter data into computer.This unit makes link between user and computer.
The input devices translate the human being information into the form understandable by computer.

CPU (Central Processing Unit)

CPU is considered as the brain of the computer. CPU perform all types of data processing operations.It stores data , intermediate results and instructions(program).It controls the operation of all parts of computer.
CPU itself has following three components

- ALU(Arithmetic Logic Unit)
- Memory Unit
- Control Unit

Output Unit

Output unit consists of devices with the help of which we get the information from computer. This unit is a link between computer and users.
Output devices translate the computer's output into the form understandable by users.
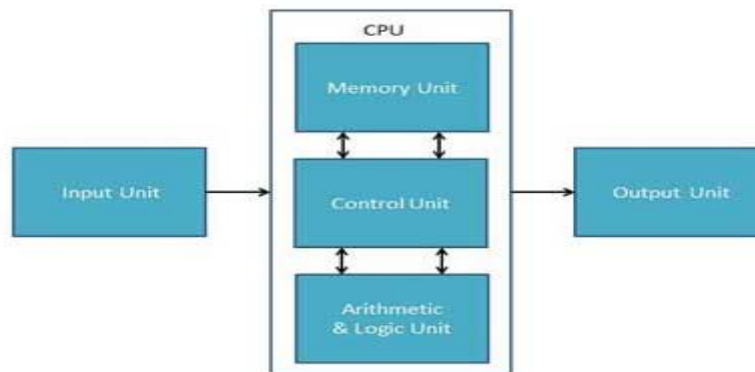
Computer - CPU

- CPU is considered as the brain of the computer.
- CPU performs all types of data processing operations.
- It stores data , intermediate result and instructions(program).
- It controls the operation of all parts of computer.

CPU itself has following three components.
- Memory Or Storage Unit:
- Control Unit
- ALU(Arithmetic Logic Unit)

Memory Or Storage Unit:
This unit can store instruction, data and intermediate results. This unit supplies information to the other units of the computer when needed .It is also known as internal storage unit or main memory or primary storage or Random access memory (RAM).

Its size affects speed, power and capability. There are primary memory and secondary memory two types of memories in the computer. Function of Memory Unit are:

- It stores all the data to be processed and the instructions required for processing.
- It stores intermediate results of processing.
- It stores final results of processing before these results are released to an output device.
- All inputs and outputs are transmitted through main memory.

Control Unit:
This unit controls the operations of all parts of computer.It does not carry out any actual data processing operations.

Functions of this unit are
- It is responsible for controlling the transfer of data and instructions among other units of a computer.
- It manages and coordinates all the units of the computer.
- It obtains the instructions from the memory, interprets them and directs the operation of the computer.

- It communicates with Input / Output devices for transfer of data or results from storage.
- It does not process or store data.

ALU(Arithmetic Logic Unit)

This unit consists of two subsection namely

- Arithmetic section
- Logic Section

Arithmetic section

Function of Arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication and division.All complex operations are done by making repetitive use of above operations.

Logic Section

Function of logic section is to perform logic operations such as comparing, selecting, matching and merging of data.

Computer - Input Devices

Following are few of the important input
devices which are used in Computer Systems

- Keyboard
- Mouse
- Joy Stick
- Light pen
- Track Ball
- Scanner
- Graphic Tablet
- Microphone
- Magnetic Ink Card Reader(MICR)
- Optical Character Reader(OCR)
- Bar Code Reader
- Optical Mark Reader

Computer - Output Devices

Following are few of the important output devices which are used in Computer Systems

- Monitors
- Graphic Plotter
- Printer

Computer - Memory

A memory is just like a human brain. It is used to store data and instruction. Computer memory is the storage space in computer where data is to be processed and instructions required for processing are stored.
The memory is divided into large number of small parts. Each part is called cell. Each location or cell has a unique address which varies from zero to memory size minus one.

For example if computer has 64k words, then this memory unit has 64 * 1024=65536 memory location. The address of these locations varies from 0 to 65535.

Memory is primarily of three types

- Cache Memory
- Primary Memory/Main Memory
- Secondary Memory

Computer - RAM

A RAM constitutes the internal memory of the CPU for storing data, program and program result. It is read/write memory. It is called random access memory (RAM).

Since access time in RAM is independent of the address to the word that is, each storage location inside the memory is as easy to reach as other location & takes the same amount of time. We can reach into the memory at random & extremely fast but can also be quite expensive.

RAM is volatile, i.e. data stored in it is lost when we switch off the computer or if there is a power failure. Hence a backup uninterruptible power system(UPS) is often used with computers. RAM is small , both in terms of its physical size and in the amount of data it can hold.

RAM is of two types

- Static RAM (SRAM)
- Dynamic RAM (DRAM)

Computer - ROM

ROM stands for Read Only Memory. The memory from which we can only read but cannot write on it. This type of memory is non-volatile. The information is stored permanently in such memories during manufacture.

A ROM, stores such instruction as are required to start computer when electricity is first turned on, this operation is referred to as bootstrap. ROM chip are not only used in the computer but also in other electronic items like washing machine and microwave oven.

Computer - Motherboard

The motherboard serves as a single platform to connect all of the parts of a computer together. A motherboard connects CPU, memory, hard drives, optical drives, video card, sound card and other ports and expansion cards directly or via cables. It can be considered as the backbone of a computer.

Features

- Motherboard varies greatly in supporting various types of components.
- Normally a motherboard supports a single type of CPU and few types of memories.
- Video Cards, Hard disks, Sound Cards have to compatible with motherboard to function properly.
- Motherboards, cases and power supplies must be compatible to work properly together.

Computer - Data & information

What is Data?

Data can be defined as a representation of facts, concepts or instruction in a formalized manner which should be suitable for communication, interpretation or processing by human or electronic machine.

Data is represented with the help of characters like alphabets (A-Z,a-z), digits (0-9) or special characters(+,-,/,*,<,>,= etc).

What is Information?

Information is organised or classified data so that it has some meaningful values to the receiver.

Information is the processed data on which decisions and actions are based.

For the decision to be meaningful, the processed data must qualify for the following characteristics

- Timely - Information should be available when required.
- Accuracy - Information should be accurate.
- Completeness - Information should be complete.

Primary Memory (Main Memory)

Primary memory holds only those data and instructions on which computer is currently working. It has limited capacity and data get lost when power is switched off.

It is generally made up of semiconductor device. These memories are not as fast as registers. The data and instruction required to be processed earlier reside in main memory. It is divided into two subcategories RAM and ROM.

Characteristic of Main Memory

- These are semiconductor memories.
- It known as main memory.
- Usually volatile memory.
- Data is lost in case power is switch off.
- It is working memory of the computer.
- Faster than secondary memories.
- A computer cannot run without primary memory.

Secondary Memory

This type of memory is also known as external memory or non-volatile. It is slower than main memory. These are used for storing Data/Information permanently.

CPU directly does not access these memories instead they are accessed via input-output routines.

Contents of secondary memories are first transferred to main memory, and then CPU can access it.For example: disk, CD-ROM,DVD etc.

Characteristic of Secondary Memory

- These are magnetic and optical memories.
- It is known as backup memory.
- It is non-volatile memory.
- Data is permanently stored even if power is switched off.
- It is used for storage of the data in the computer.
- Computer may run without secondary memory.
- Slower than primary memories.