Course outline

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INTRODUCTION TO COMPUTERS

Definition of a computer:

A Computer is an electronic machine that takes in data, processes it following a set of instructions and then produces results. All computers, regardless of their size, purpose, or type, follow this definition. Computer as a word was derived from the word compute which means to calculate.

Data are those measurable quantities, symbols or characters which a computer can process, store and transmit in the form of electrical signals.

The computer was originally regarded as a fast calculator. It could solve complex arithmetic and scientific problems at an impressive speed. Today, in addition to handling arithmetic and scientific computations, the computers can perform many other tasks such as accepting, sorting, selecting, moving, and comparing various types of information.

Classification of Computers

Computers are classified into three categories namely:
- Analog computers,
- Digital computers and
- Hybrid computers.

Analog computers
An analog computer represents data by measurable quantities such as voltages, temperature etc. in order to solve a problem. They perform calculations with the help of measures. They are used to process analog data.

Digital Computers
Digital computers are programmable, they can perform processing such as mathematical calculations, sorting, comparison etc. Digital computers accept input and produces output as signals representing high(on) or low(off) voltage state of electricity. Symbols, numbers and alphabets are all represented as a series of 1s and 0s. Digital computers are classified further as General Purpose Digital Computer (GPDC) and Special Purpose Digital Computer (SPDC). General Purpose computers can be used for any applications like accounts, payroll, data processing etc. While Special purpose computers are used for a specific jobs like those used in automobiles, microwaves etc. Another classification of digital computers is done on the basis of their capacity to access memory and their size

and they are; Microcomputers, Minicomputers, Mainframe computers and supercomputers.

Hybrid Computers
Hybrid Computers are a combination of Analog and Digital computers. They combine the speed of analog computers and accuracy of digital computers. They are mostly used in specialized applications where the input data is in an analog form i.e. measurement. This is converted into digital form for further processing. The computers accept data from sensors and produce output using conventional input/output devices.

Classification of digital computers

Microcomputers
Microcomputers are the most widely used and the smallest of digital computers. They are generally referred to as Personal Computers (PC). They are used in homes because of the affordable price. The Microcomputer consists of the CPU, Keyboard, Monitor, the disk drive printers etc.

- **Note Book and Laptop Computers**

These types of digital computers are battery operated. Their storage devices are CDs, SD cards etc. and output devices like printers can be connected to these computers. Notebook computers are smaller in physical size than laptop computers. However, both have powerful processors, support graphics, and can accept mouse driven input.

- **Hand Held Computers**

These types of computers are mainly used in applications like collection of field data. They are even smaller than the note book computers.

Mini Computers
These category of computers are more powerful than microcomputers, they are designed specifically for the multi-user environment i.e. several person can use the machine at the same time. Mini Computers have a very high speed and more storage capacity, they are mostly used in process control systems and have applications in payrolls, financial accounting, computer aided design etc.

Mainframe Computers
These are very large computers; they can process data at a very high speed of several million instructions per second. Mainframe computers are large general purpose computers that can serve more than 100 remote terminals. They can be

linked into a network with smaller computers, microcomputers and with other types of computers. Mainframe computers are typically used in large organization, government departments etc.

Super Computers

These are the fastest, most expensive and most powerful computers. Operate at speeds measured in nanoseconds and even in picoseconds. They are used for complex tasks that requires a lot of computational power. With multiple processors embedded in them, they can process multiple instructions at the same time. This is known as parallel processing. Super computers are widely used in advance applications such as processing geological data, weather forecasting etc.

THE COMPUTER SYSTEM

A system is defined as a group of well integrated parts that are designed to achieve a common goal. The word system implies that there is more than one element or part and each part is related and controlled in a way that they achieve the purpose of the system. The two main parts of a computer system are the hardware and software. Other components fall under these two as seen in the diagram below:
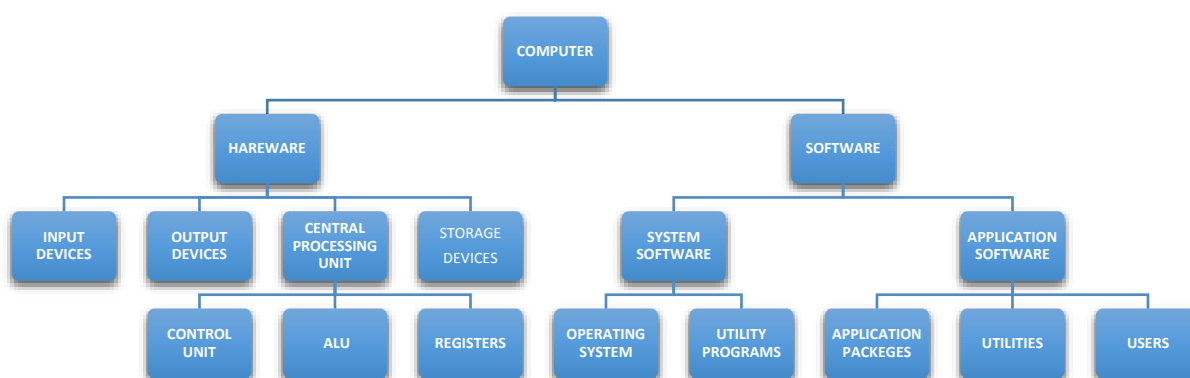
The Hardware

The hardware are part of the computer that can be touched, it includes all physical parts or devices associated with the computer system examples include the electronic integrated circuits (ICs), memory cards, and other mechanical devices like input devices, output devices etc. All these various hardware are linked together in such a way that makes the computer function as a single unit as we learnt earlier. Computer hardware has evolved from the use of vacuum tubes of the first generation computers to the use of microprocessors of this present generation of computers. The basic parts of computer hardware are:
- Input Unit
- Output Unit
- The Central Processing Unit
- The storage or memory devices and media

1. **The Input Unit:**

Input devices are hardware devices which help the computer users to interact with, communicate with and control the computer. The interaction or communication is made possible by a cable connection between the devices and the computer or by a wireless transmission to the computer. Types of input devices Input devices may be grouped into keyboard and non-keyboard devices. The non-keyboard

devices include pointing devices, pen devices, touch interactive devices, sound or voice control devices, scanning devices etc. The choice of particular input device (s) depends on the task to be accomplished.

- **The Keyboard**

As the name implies, the keyboard consists of a set of keys mounted on a board. It is basically a text based device that allows the user to input alphabets and finite sets of symbols. Most keyboards have similar layouts. The individual keys for letters, numbers and special characters are collectively called the character keys.

The keys on the keyboard are grouped as follows:

S/N	KEY	DESCRIPTION
1.	Alphanumeric keys	These keys include the letter keys A-Z, numeric keys 0-9 and special characters like mathematical operation symbols +, -, *, () etc.
2.	Function keys	There are twelve function keys labeled F1, F2, F3... F12. The keys are arranged in a row at the top of the keyboard. Each function key has unique meaning and is used for some specific purpose.
3.	Control keys	These are the keys which move a cursor. Control keys include the four directional arrow keys, Home, End, Insert, Delete, Page up, Page down, Ctrl, Alternate (Alt), Escape key (ESC).
4.	Special- function keys	These keys have special functions assigned to them and can be used only for those specific purposes. Functions of some of the important keys are stated below.

		i) ENTER: it is used to execute a command or program. ii) BACKSPACE: This key is used to move the cursor or position to the left and also delete the character in that position, i.e., it deletes character from the back (leftwards). iii) DELETE: it is used to delete the character at the cursor position. iv) SPACEBAR: it is used to create space at the current cursor location. v) INSERT: insert key is used to toggle between insert and overwrite mode during data entry. vi) SHIFT: this key is used to type capital letters when pressed along with an alphabet key. Also used to type the special characters located on the upper side of a key that has two characters defined on the same key. vii) CAPS LOCK: it is used to type capital letters only. viii) TAB: tab is used to move the cursor to the next tab position defined in the document. It is also used to add indentations in the document. ix) ESC: The escape key is used to negate a command. Also it is used to cancel or abort executing/running programs.

POINTING DEVICES

Pointing devices enable the user to move or control the position of the cursor and items such as texts, diagrams etc. They also help to select items on the screen. The pointing devices include the mouse, touch screen, touchpad, joystick, trackball etc.

- **The Mouse**

The mouse is one of the commonest and most important pointing device. The mouse is a small device used to point to a particular place on the screen at times to select in order to perform an action. The most available or commonest kind of mouse has two buttons on top; left button and right button with a wheel between

them. The mouse is a very famous cursor-control device which follows its movement and sends corresponding signals to the central processing unit when the mouse buttons are pressed. Mouse can be used to control the position of cursor on screen, but it cannot be used to enter text into the computer.

The Mouse

Mouse actions

Left click: used to select an item

Double click: used to start a program or open a file.

Right click: used to display a set of commands.

Drag and Drop: used to select and move an item from one position to another.

- **The Joystick**

- **Touch screen**

- **Touch Pad**

- **Trackball**

PEN DEVICES

- **Light Pen**

- **Digitizer**

SOUND OR VOICE CONTROL DEVICE

- Microphone

SCANNING DEVICES

- Image Scanner

- **Magnetic Ink Character Recognition (MICR)**

This input device is used to verify the authenticity or originality of paper documents, especially cheques. The bank code number and cheque number are printed on the cheque with a type of ink that contains magnetic material which can be read by the machine. Banks use the magnetic ink character recognition to check the validity and enhance the security of signed cheques, while some airlines use the magnetic ink character recognition reader to validate flight tickets. A magnetic ink character recognition reader or scanner magnetizes the character before it decodes the complete text. The characters are then run through an **MICR** read head; a device that converts the characters to wave form, which are then identified by the system. This reading process by the machine saves a lot of time and reduces to the barest minimum the chances of error and forgery.

- **Optical Card Reader (OCR)**

Optical card reader or optical character reader is used to read printed text. It scans texts and converts them into a machine readable code. It is commonly used as a form of data entry from printed works like passport, documents, bank statements, utility bills, etc.

- **Barcode reader**

Barcodes are data in form of thin and thick vertical dark lines seen on most goods or products in market, food companies etc. Normally the price of items are set in the computer system or database, when the barcode is scanned, the price appears for the sale agent and customer to see. Barcode reader scans a barcode image, converts it into alphanumeric value which is then fed to the computer to which it is connected.

- **Optical Mark Reader (OMR)**

Optical mark recognition involves the use of an electronic device to extract intended data from marked fields such as checkboxes and fill-in fields on printed forms. The optical mark reader "reads" pencil marks on compatible scan forms such as surveys or test answer forms. The optical mark reader can also read pen marks made in predefined positions on paper forms as responses to questions or tick list prompts. The OMR card by itself is not considered as an input device however the OMR reader that reads the card is sending data (input) to the computer, which is why it is considered as an input device.

2. The output unit

The computer communicates with a user through output. The CPU processes facts or data that is in machine understandable form after which it gives output in a form which can be sensed by a human either through sight using the eyes or sound using the ears. Output may come in various forms as seen below:

- Audio: speech, music, sound
- Text: letters, numbers, punctuation marks, other symbols (what you are reading at the moment is in text form)
- Video: a sequence of images that forms a moving picture
- Graphics: digitally represented non-text information such as graphs, charts, pictures, animations etc.
- Tactile: also known as haptic output, employs the sense of touch to give output. Tactile output can be in form of protruding lines in a printed material which aids blind individuals to recognise the contents of printed materials by touching and following the protruding lines with their hands. Tactile output can also be in form of motions or vibrations to the user as seen in some handheld devices like game pads.

Output devices are hardware through which the computer gives out information to the user. Output media are materials through which these output devices present information to the user, such as printing papers, plastic films etc. A computer can still work without an output device. However, there may be no way for a user to determine what the computer is doing. For instance, a monitor can be disconnected from the computer and the computer will still function. There are several output devices, below are some of them.

- **Printer:** A printer is an output device responsible for taking electronic data stored on a computer or computing device and generating a hard copy of that data. Printers are commonly used to print textual and graphical output.

Printers can be classified as follows;

Based on Operating principle:

Impact Printer: In Impact Printers, printing is performed by means of a ribbon loaded with ink; there is mechanical contact between the printing assembly, inked ribbon, and paper. The advantage of this printer is that they allow printing of several copies simultaneously, but its disadvantage is that they are relatively slow and are noisy and are becoming obsolete.

Examples are selected character, daisy wheel and Dot matrix printers amongst others.

Non-impact: In Non-impact Printers, there is no mechanical contact between the printing assembly and paper. In some printers, the image to be printed is first formed on an intermediary support, and then it is transferred onto the paper. The advantages of these printers are their high speed, high quality of the printed text or image, and low level of noise. Their disadvantage is that they cannot create several copies simultaneously. Examples are Inkjet, LaserJet and thermal printers amongst others.

Based on printing speed:

Serial printers: They print the characters one by one. Their speed is expressed in characters per second, and they reach up to a few hundreds of characters per second.

Line printers: They print all the characters in a line simultaneously. Their speed is expressed in lines per minute, and it can reach several thousands of lines per minute for non-impact printers.

Page printers: Printing is performed by storing the image to be printed for an entire page in memory, after which the paper is advanced continuously during printing. Their speed may reach 50,000 lines per minute. LaserJet printers are examples of page printers.

Multi-Function Printer (MFP): This is a device made up of multiple functionalities, including printing, copying and scanning.

3D Printer: These are new generation printers that are able to produce different kinds of 3 dimensional objects with different materials, all from the same printer. This is how it works- the whole magic starts from making a virtual design of the object to be created as a Computer Aided Design using a 3D modelling application. After the virtual design has been created, printing is done layer by layer with each layer joint to the next to produce a whole 3 dimensional object. There is a long list of objects that can be produced by 3d printers such as, toys, ceramics, car parts, machine parts, ammunitions etc.

- **Monitor:** The computer monitor or the VDU (Visual Display Unit) is the main output device of a computer. It has dual functionality; serves as both an input and output device. The monitor presents information to the user in graphical, textile and video forms. There are two popular types of monitors which have certain features and properties common to them. The two popular types of monitors are;
  - Cathode Ray Tube (CRT): It is the oldest technology used by monitors and is no longer popular. It is based on the cathode ray tube technology that was developed for televisions.

A CRT monitor

  - **Liquid Crystal Display (LCD):** This is the most common type of monitor which has replaced the CRT monitors. LCD monitors are lighter in weight than CRT monitors and display through a flat panel. They also work as touch screens in tablet computers, mobile phones, and other handheld technologies. There is an advance form of LCD monitors called LED (Light Emitting Diode) monitors which are less expensive and more reliable than the LCD monitors.

LCD Monitor

- **Digital Projectors:** A digital projector is an output device which can be connected to a computer or other devices in order to cast the video output from the device unto a screen or wall. Projectors vary in size and type and may be placed on a stand or fixed to an elevated position such as a ceiling. Projectors are helpful in making presentations, simulations, education, entertainment etc.

A Digital projector

- **Speakers and Headphones:** Speakers are output devices that produce audio output in the form of sound waves. The production of the sound that comes from the speaker is created by a Sound card. While some speakers come inbuilt with the computer, others are peripheral. Laptop computers come with integrated speakers which usually produce low-quality sound because of the restricted space.
  Headphones serve a similar function as speakers, although they are designed to deliver audio signals to a single user (in the user's ears). Headphones may be wired to a signal source such as an audio amplifier, CD player, portable media player, mobile phone, electronic musical instrument, or wirelessly.

- **Braille Embossers/Printers:** A braille embosser is an impact printer that prints text using the braille writing system for users who are blind or visually impaired. Dots are embossed (pressed down) onto a piece of paper or a similar material so that the user of the braille system could read by using their fingers to recognise the dots. Before printing, a software is needed to translate the electronic text from the computer into Braille and then printing is done. The working of a braille printer is

similar to that of an inkjet printer except that protruding dots are impressed on the paper rather than ink.

The braille writing system matched with the English alphabets.

Although braille printers appear quite useful to the blind and visually impaired, they are expensive. Consequently, cheaper technologies such as screen readers are more popular.

Part of a printed braille text

3. The Central Processing Unit:

The central processing unit can likened to the work done by the human brain which is to process information. This is where logical and arithmetic tasks are carried out. The central processing unit or CPU is made up of three parts, namely;

i. The control unit,
ii. the arithmetic logic unit and
iii. the registers

The Control Unit:

The Control Unit manages and coordinates the activity of the computer system. The computer system operations are all controlled by the control unit. It does this by retrieving instructions from the programs stored within the storage unit and interprets the instructions then directs other units to carry out the instruction.

The Arithmetic Logic Unit:

The Arithmetic Logic Unit (ALU) actually executes the instructions and performs all the calculations and decisions. The data is held in the primary storage unit and transferred to the ALU whenever needed. Data can be moved from the primary storage to the arithmetic logic unit a number of times before the entire processing is complete. After the completion, the results are sent to the output storage section and the output devices.


The Registers:

The register stores information within the computer system for high speed access, it is a temporal storage which serves as a store of intermediate results coming from the activities of the Arithmetic and logic Unit (ALU).

4. **The storage or memory devices and media.**

For a computer to make use of data, the data has to be stored in some sort of repository. Those locations are referred to as Computer storage or memory. Computer storage can be defined as devices and storage media where information is stored for subsequent use. The processor which does the computing collects all information including instructions from the various storage devices and supplies the output when needed.

Types of Storage

All forms of computer storage are used to store files and instructions but they are accessed in different ways by the computer's CPU. Some are accessed directly by the CPU while others are not. The figure below shows the computer memory hierarchy indicating the two main types of computer memory and their examples.
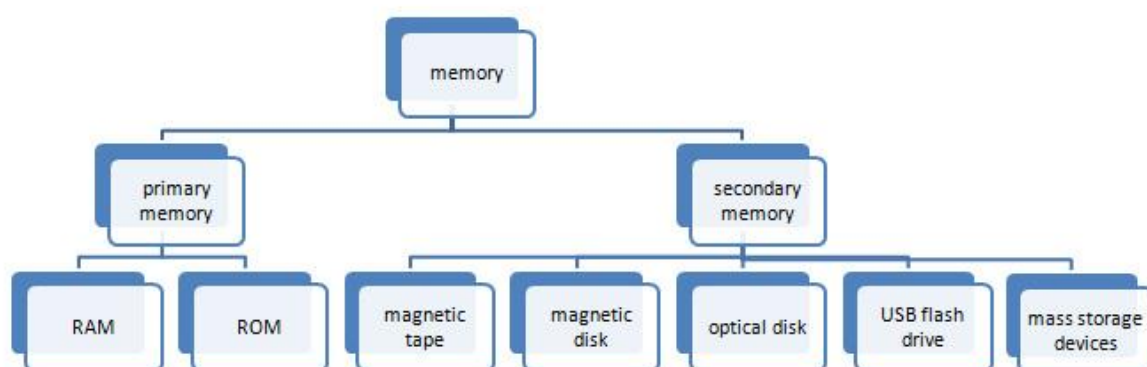
There are two types of memory:
- Primary storage and
- Secondary storage devices

Primary Memory
The Primary memory is also referred to as main memory or internal memory. It is that memory which is accessed directly by the CPU. All instructions to be carried out by the CPU are stored in the main memory during active execution. Main memory comes in form of chips (connected to the motherboard with the CPU). Basically, there are two forms of primary memory:

- **RAM**

RAM is a short form for Random Access Memory. This is the memory often referred to when 'main memory' is mentioned. This is because it is the working

memory which the CPU uses while executing instructions. The RAM is called 'Random Access' because information can be read from and written to a RAM at any given time (Read/Write). The contents of a RAM chip are frequently refreshed in order to accommodate new information because it stores only current information during the execution of a program or instruction. The RAM is referred to as Volatile memory because it retains its content only as long as power is supplied to it, that is, information in the RAM is lost when the power is turned off (this explains why you have to save your work into a more permanent storage such as a secondary storage). The speed at which a computer executes its instructions strongly depends on the capacity of its RAM. Therefore, the higher the capacity of the RAM in a computer, the faster its speed of instruction execution.

A RAM chip on the motherboard

- ROM

ROM is a short form for Read Only Memory. A ROM chip is non-volatile meaning that it retains its content even when there is loss of power (permanent storage). The content of a ROM chip is usually factory-programmed at the time of manufacture and maybe reprogrammed in one way or the other. The most prominent use of the ROM is seen in the storage of instructions that the computer needs to execute during booting. For example, there is a set of instructions called the Basic Input/Output System (BIOS) which the computer uses to start up the operating system which enables communication between the components of a computer system. The BIOS is stored in a ROM chip containing continuous values such as system date and time and some authentication information such as passwords and other access codes. The CPU can only read information from the content of a ROM, hence the name 'Read Only'.

A typical ROM chip

Secondary Memory

Secondary memory is also referred to as External/Back-up/auxiliary memory. Unlike primary memory, secondary memory is not directly accessible by the CPU. Secondary memory is non-volatile in that it retains its content even after power is lost. Therefore, it can store information on a permanent basis such that information can be retrieved when needed by the user. In modern computers, a kind of secondary memory called hard disks are used in the computer together with the **RAM** to store information. In other words, the CPU has access to the hard disk and other secondary memory through input/output channels and then transfers the desired information to the **RAM** for processing. A very significant difference between the main memory and secondary memory is the access time. It takes longer to access the content of a hard disk than it does for a **RAM**. As an advantage in addition to permanence, secondary memory is more cost efficient than main memory.

There are different forms in which secondary memory devices come. They are as follows:

- **Magnetic Storage**

Magnetic storage devices store information in a magnetized medium. It is the most common and one of the oldest forms of secondary storage. A device known as a Hard disk is the main secondary storage for a typical computer. A device known as Hard Disk Drive (HDD) reads data from a hard disk and also writes to it.

Other magnetic storage devices include, magnetic tapes and floppy disks (almost obsolete).

Interior view of a hard disk drive   **An internal hard disk drive while detached from the PC.**   **An external hard disk drive with USB**

Magnetic tapes

- Optical storage

Optical storage devices facilitate reading and writing of data through the use of laser beams. A laser scans a spinning reflective disk (usually made of aluminium) in which the presence or absence of non-reflective pits in the disk indicates 0s or 1s respectively. Data can be read from any part of the disk (random access). An optical disk drive is a device in a computer that can read data from an optical disk and write to it. Optical disks are mostly used to store music, videos and data for

PCs or programs. The optical discs available include Blu-ray, HD DVD, DVD, CD, CD-R (Compact disk-Recordable), CD-RW (Compact Disk-ReWritable), DVD-RW (Digital Versatile Disk-ReWritable), DVD-RAM (Digital Versatile Disk-Random Access Memory) and DVD-R (Digital Versatile Disk-Recordable).

Optical disk drive in a laptop

An optical disk with Protective casing

External optical disk drive with an optical disk in it

- **Flash Memory**

Flash memory is a type of non-volatile memory which stores data electronically instead of magnetically and optically. It erases data in units called blocks instead of bit by bit. It is also referred to as solid state storage because it is made from silicon microchips. A block stored on a flash memory chip must be erased before data can be programmed to the microchip. Flash memory has the advantages of compactness and low power consumption. Another advantage is that is that it contains no mechanical parts, allowing data transfer to and from storage media to take place at a much higher speed.

Applications of flash memory can be found in personal computers, Personal Digital Assistants (PDAs), digital audio players, digital cameras, smart mobile phones, synthesizers, video games, robotics, and medical electronics.

Below are some examples of devices that use flash memory.

- USB drives (Universal Serial Bus drives alternatively called pen drives, flash drives or memory sticks)
- Memory cards
- SSD (Solid State Drives)

Memory cards

Interior view of a USB drive

A memory stick slotted into a laptop

Most solid state disks can be attached to a USB port, however, some disks need to be inserted into a special drive or card reader.

Storage capacity and file size

As established, a bit is the smallest unit of information representation which may have the value of 0 or 1. The value of a bit is too small to be used as a unit of measuring the amount of data in memory therefore, the byte which is a group of 8 bits is the fundamental unit for information representation. A byte can store 2^8, i.e, 256 different values to represent characters, such as letters, numbers and symbols. Consequently, other units of information representation in memory are derived from specific combination of bytes.

Most files contain thousands of bytes, therefore, file sizes are often measured in kilobytes ('kilo' is greek word for thousand). A kilobyte should be enough to store around 200 different characters since a character is equivalent to 1 byte. Larger files such as images, videos, and audio files contain millions of bytes and therefore are measured in megabytes ('mega' precisely means a million). Modern storage devices can store thousands of these files, which is why storage capacity is typically measured in gigabytes or terabytes ('Giga' refers to billions and 'tera' refers to trillions). Larger units of measurement are usually reserved for measuring the aggregate of multiple storage devices or the capacity of large data storage networks.

The table below shows the standard units of information representation in storage devices from fundamental to largest in use currently.

UNIT	VALUE	SIZE	EQUIVALENT
1 Kilobyte (KB)	2^{10}	1,024 bytes	1,024 bytes
1 Megabyte (MB)	2^{20}	1,048,576 bytes	1,024 kilobytes
1 Gigabyte (GB)	2^{30}	1,073,741,824 bytes	1,024 megabytes
1 Terabyte (TB)	2^{40}	1,099,511,627,776 bytes	1,024 gigabytes
1 Petabyte (PB)	2^{50}	1,125,899,906,842,624 bytes	1,024 terabytes

Standard units of information representation in storage devices

The units in the table below shows units larger than 1Petabyte. There are no storage devices currently capable to hold that much quantity of information. Therefore, they are used to represent aggregates of the lower units.

UNIT	VALUE	EQUIVALENT
1 Exabyte (EB)	2^{60}	1,024 petabytes
1 Zettabyte (ZB)	2^{70}	1,024 exabytes
1 Yottabyte (YB)	2^{80}	1,024 zettabytes
1 Brontobyte (BT)	2^{90}	1,024 yottabytes

Units of information representation greater than 1Petabyte

The Software

Without the computer software, the hardware will not be able to do anything on its own. The computer has to be given instructions on how to perform a particular task. Computer software controls the processing activities of the computer, thus, the computer cannot do what it is not programed to do. The software of a computer consists of programs, procedures and other documentation used to operate a computer system. There are two general categories of software:

- System software and
- Application software.

Most computer programs clearly fit into one of these two categories.

1. System software

The system software is the chief piece of software that controls all other software in a computer system.

- Operating Systems

An operating system is the most fundamental set of programs in a computer. The operating system controls the internal operations of the computer's hardware, manages all of the devices connected to the computer, allows data to be saved to and retrieved from storage devices, and allows other programs to run on the computer.

- Utility Programs

A utility program performs a specialized task that enhances the computer's operation or safeguards data. Examples of utility programs are virus scanners, file compression programs, and data backup programs.

- Software Development Tools or Language Translator

Software development tools are the programs that programmers use to create, modify, and test software. Assemblers, compilers, and interpreters are examples of programs that fall into this category.

2. Application Software

Application software include programs useful for a user's day to day task. They are designed for the user to make full use of their computer system. Examples of application software are Adobe PDF reader, Microsoft Word, Computer games, spreadsheet Applications etc.

APPLICATION OF COMPUTERS

Computers have a widespread application; listening to music, chatting with friends and families, watching videos, learning new skills, making research, taking pictures, storing important data on social medias etc. Some of the major application areas include:

Scientific, Engineering and Research
This is the major area where computers find vast applications. They are used in areas which require lot of experiments, mathematical calculations, weather forecasting, and complex mathematical and engineering applications. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) help in designing robotics, automobile manufacturing, automatic process control devices etc.

Business:
In business, computers are used in great extent, some applications include, keeping record, invoicing, reports, accounting, marketing etc. Database management used in banking and websites where large amount of data need to be uploaded, sorted and searched are possible because of computers.

Medicine:
In the field of medicine, computerized systems are used in monitoring patient's blood pressure, pulse rate etc. this has made diagnoses of patient accurate and faster. Computed tomography (CT) scan and Magnetic Resonance Imaging (MRI) are examples of computer that are used to diagnose and cure many diseases.

Education:
With the help of computer systems, students can develop a habit of thinking logically and are able to formulate solutions to problems. Students now have access to online training, encyclopedias, dictionaries and books in digital form.

Games and Entertainment:
The computer is nowadays used in advertising, sports, movies etc. Computer has also make analyzing and watching sports easier, they are used to edit videos, complete research, update relevant data etc. computer games are common computer application enjoyed by both children and adults.