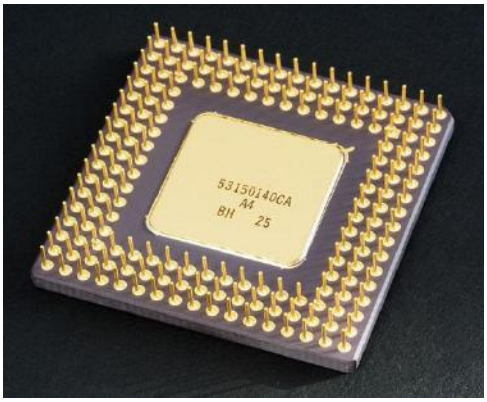
UNIT-1

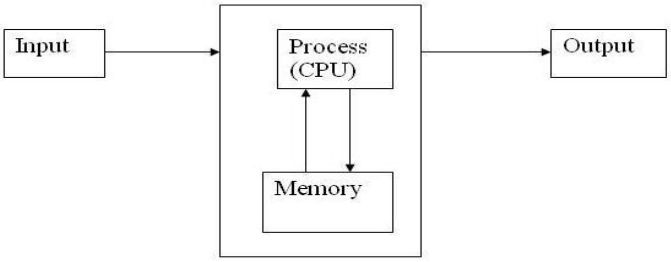
HARDWARE CONCEPTS

BASIC COMPUTER OPERATIONS

The central processing unit (CPU, occasionally central processor unit) is the hardware within a computer system which carries out the instructions of a computer program by performing the basic arithmetical, logical, and input/output operations of the system. The term has been in use in the computer industry at least since the early 1960s. The form, design, and implementation of CPUs have changed over the course of their history, but their fundamental operation remains much the same.



A computer as shown below performs basically five major operations or functions irrespective of their size and make. These are 1) it accepts data or instructions by way of input, 2) it stores data, 3) it can process data as required by the user, 4) it gives results in the form of output, and 5) it controls all operations inside a computer. We discuss below each of these operations.



1. Input: In computing, an **input device** is any peripheral (piece of computer hardware equipment) used to provide data and control signals to an information processing system such as a computer or other information appliance.

2. Storage: Storage Devices are the data storage devices that are used in the computers to store the data. The computer has many types of data storage devices. Some of them can be classified as the removable data Storage Devices and the others as the non removable data Storage Devices.

The memory is of **two types**; one is the **primary memory** and the other one is the **secondary memory**.

The primary memory is the volatile memory and the secondary memory is the non volatile memory. The volatile memory is the kind of the memory that is erasable and the non volatile memory is the one where in the contents cannot be erased. Basically when we talk about the data storage devices it is generally assumed to be the secondary memory.

The secondary memory is used to store the data permanently in the computer. The secondary storage devices are usually as follows: hard disk drives – this is the most common type of storage device that is used in almost all the computer systems. The other ones include the floppy disk drives, the CD ROM, and the DVD ROM. The flash memory, the USB data card etc.

The storage unit performs the following major functions: All data and instructions are stored here before and after processing. Intermediate results of processing are also stored here.

3. Processing: The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit.

4. Output: This is the process of producing results from the data for getting useful information. Similarly the output produced by the computer after processing must also be kept somewhere inside the computer before being given to you in human readable form. Again the output is also stored inside the computer for further processing.

5. Control: The manner how instructions are executed and the above operations are performed. Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.

Arithmetic Logical Unit (ALU)

In computing, an **arithmetic and logic unit** (*ALU*) is a digital circuit that performs arithmetic and logical operations. The ALU is a fundamental building block of the central processing unit of a computer, and even the simplest microprocessors contain one for purposes such as maintaining timers

Control Unit (CU)

The control unit coordinates the components of a computer system. It fetches the code of all of the instructions in the program. It directs the operation of the other units by providing timing and control signals. All computer resources are managed by the CU. It directs the flow of data between the Central Processing Unit (CPU) and the other devices

Central Processing Unit (CPU)

The ALU and the CU of a computer system are jointly known as the central processing unit. You may call CPU as the brain of any computer system. It is just like brain that takes all major decisions, makes all sorts of calculations and directs different parts of the computer functions by activating and controlling the operations.

HARDWARE

SOFTWARE

Personal Computer Configuration

Now let us identify the physical components that make the computer work. These are

1. Central Processing Unit (CPU) 2. Computer Memory (RAM and ROM) 3. Data bus 4. Ports 5.

Motherboard 6. Hard disk 7. Output Devices 8. Input Devices

All these components are inter-connected for the personal computer to work.

Memory

There are two kinds of computer memory: **primary and secondary**. Primary memory is accessible directly by the processing unit. RAM is an example of primary memory. As soon as the computer is switched off the contents of the primary memory is lost. You can store and retrieve data much faster with primary memory compared to secondary memory. Secondary memory such as floppy disks, magnetic disk, etc., is located outside the computer. Primary memory is more expensive than secondary memory. Because ofthis the size of primary memory is less than that of secondary memory.

Random Access Memory (RAM): It is a form of computer data storage. A random-access device allows stored data to be accessed in very nearly the same amount of time for any storage location, so data can be accessed quickly in any random order. In contrast, other data storage media such as hard disks, CDs, DVDs and magnetic tape read and write data only in a predetermined order, consecutively, because of mechanical design limitations. Therefore the time to access a given data location varies significantly depending on its physical location. This memory is a volatile memory. The two main forms of modern RAM are static RAM (SRAM) and dynamic RAM (DRAM).

Read Only Memory (ROM): **Read-only memory** (**ROM**) is a class of storage medium used in computers and other electronic devices. Data stored in ROM cannot be modified, or can be modified only slowly or with difficulty, so it is mainly used to distribute firmware (software that is very closely tied to specific hardware, and unlikely to need frequent updates). . The memories, which do not loose their content on failure of power supply.

INPUT DEVICES

Input devices are necessary to convert our information or data in to a form which can be understood by the computer. A good input device should provide timely, accurate and useful data to the main memory of the computer for processing followings are the most useful input devices.

A 'keyboard' is a human interface device which is represented as a layout of buttons. Each button, or key, can be used to either input a linguistic character to a computer, or to call upon a particular function of the computer. Traditional keyboards use spring-based buttons, though newer variations employ virtual keys, or even projected keyboards. On the basis of KEYS-LAYOUT they are of two types

a) QWERTY Keyboard
b) Dvorak Keyboard

Mouse: - A **pointing device** is any human interface device that allows a user to input spatial data to a computer. In the case of mice and touch screens, this is usually achieved by detecting movement across a physical surface. Analog devices, such as 3D mice, joysticks, or pointing sticks, function by reporting their angle of deflection. Movements of the pointing device are echoed on the screen by movements of the pointer, creating a simple, intuitive way to navigate a computer's GUI. There are Four types of mouse

a) Mechanical Mouse
b) Opto-Mechanical Mouse
c) Optical Mouse
d) Wireless Mouse

Light Pen: A **light pen**, also called a **selector pen**, is a computer input device in the form of a light-sensitive wand used in conjunction with a computer's CRT display. It allows the user to point to displayed objects or draw on the screen in a similar way to a touchscreen but with greater positional accuracy

Scanner: In computing, an **image scanner**—often abbreviated to just **scanner**—is a device that optically scans images, printed text, handwriting, or an object, and converts it to a digital image. Common examples found in offices are variations of the *desktop (or flatbed) scanner* where the document is placed on a glass window for scanning. *Hand-held scanners*, where the device is moved by hand, have evolved from text scanning "wands" to 3D scanners used for industrial design, reverse engineering, test and measurement, orthotics, gaming and other applications. Mechanically driven scanners that move the document are typically used for large-format documents, where a flatbed design would be impractical.

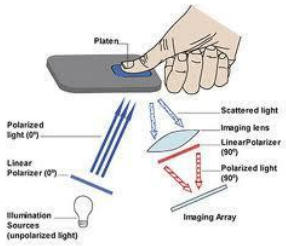
a) Hand held scanner
b) Flat Bed Scanner

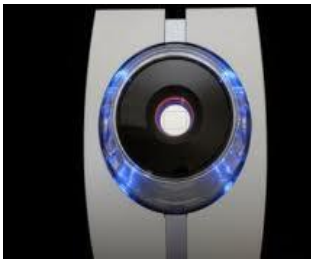
Optical Character Recognition (OCR**): - Optical character recognition**, usually abbreviated to **OCR**, is the mechanical or electronic conversion of scanned images of handwritten, typewritten or printed text into machine-encoded text. It is widely used as a form of data entry from some sort of original paper data source, whether documents, sales receipts, mail, or any number of printed records

Smart Card Reader: A **smart card**, **chip card**, or **integrated circuit card** (**ICC**) is any pocket-sized card with embedded integrated circuits. It is a common method of digitizing printed texts so that they can be electronically searched, stored more compactly, displayed on-line, and used in machine processes such as machine translation

Barcode Reader: A **barcode reader** (or **barcode scanner**) is an electronic device for reading printed barcodes. Like a flatbed scanner, it consists of a light source, a lens and a light sensor translating optical impulses into electrical ones. Additionally, nearly all barcode readers contain *decoder* circuitry analyzing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.There are five basic kinds of barcode readers -- pen wands, slot scanners, Charge-Couple Device (CCD) scanners, image scanners, and laser scanners.

Biometric Sensor: Biometrics (or **biometric authentication**) refers to the identification of humans by their characteristics or traits. Biometrics is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Many physical characteristics may be scanned by a biometric sensor including eyes, fingerprints, or DNA. Sensors contain an analog to digital converter enabling it to digitize the image and store the digital information in memory so that it can verify the user next time he or she needs to authenticate their identity.





Web Camera:- A **webcam** is a video camera that feeds its images in real time to a computer or computer network, often via USB, ethernet, or Wi-Fi.

Their most popular use is the establishment of video links, permitting computers to act as videophones or videoconference stations. The common use as a video camera for the World Wide Web gave the webcam its name.

OUTPUT DEVICES

Visual Display Unit: A **monitor** or **display** (also called **screen** or **visual display unit**) is an electronic visual display for computers. The monitor comprises the display device, circuitry, and an enclosure. The display device in modern monitors is typically a thin film transistor liquid crystal display (TFT-LCD) thin panel, while older monitors use a cathode ray tube (CRT) about as deep as the screen size.

Terminals: It is a very popular interactive input-output unit. It can be divided into two types: hard copy terminals and soft copy terminals. A hard copy terminal provides a printout on paper whereas soft copy terminals provide visual copy on monitor. A terminal when connected to a CPU sends instructions directly to the computer. Terminals are also classified as dumb terminals or intelligent terminals depending upon the work situation.

Printer: In computing, a **printer** is a peripheral which produces a representation of an electronic document on physical media such as paper or transparency film. Many printers are local peripherals connected directly to a nearby personal computer. *Network printers* have built-in network interfaces can serve any user on the network. Individual printers are often designed to support both local and network connected users at the same time. Some printers can print documents stored on memory cards or from digital cameras and scanners. Multifunction printers **(MFPs**) include a scanner and can copy paper documents or send a fax; these are also called multi-function devices (MFD), or **all-in-one (AIO)** printers. Most MFPs include printing, scanning, and copying among their many features.

Depending on their speed and approach of printing, printers are classified as impact and non-impact printers.

Impact printers: use the familiar typewriter approach of hammering a typeface against the paper and inked ribbon. Dot-matrix printers are of this type.

Non-impact printers: do not hit or impact a ribbon to print. They use electro-static chemicals and ink-jet technologies. Laser printers and Ink-jet printers are of this type. This type of printers can produce color printing and elaborate graphics.

Ink-jet (bubble-jets) printers: Ink-jets(bubble-jets) printers spray ionized tiny drops of ink onto a page to create an image. This is achieved by using magnetized plates which direct the ink's path onto the paper in the desired pattern. Almost all ink-jets offer a color option as standard, in varying degrees of resolution.

Laser Printers: Laser printers operate by shining a laser beam to produce an image on a drum. The drum is then rolled through a pool, or reservoir, or toner, and the electrically charged portions of the drum pick up ink. Finally, using a combination of heat and pressure, the ink on the drum is transferred onto the page. Laser printers print very fast, and the

supply cartridges work a long time. Color laser printers use the same toner-based printing process as black and white (B/W) laser printers, except that they combine four different toner colors.

Plotters: Plotters are large-scale printers that are very accurate at reproducing line drawings. They are commonly used for technical drawings such as engineering drawings or architectural blueprints. The two basic types of plotters are called flatbed plotters and drum plotters. Flatbed plotters are horizontally aligned with a flat surface to which a piece of paper is attached. The paper remains stationary and the printer moves pens across the paper to draw the image. Drum plotters, also called upright plotters, are vertically positioned. They have a drum that the paper rolls on. Drum plotters usually make more noise and are more compact than flatbed plotters.

Secondary Storage Device: Alternatively referred to as external memory and auxiliary storage, secondary storage is a storage medium that holds information until it is deleted or overwritten regardless if the computer has power. For example, a floppy disk drive and hard disk drive are both good examples of secondary storage devices.

Magnetic Tapes: The Magnetic Tapes is the Type of Secondary Storage Device and this Device is used for taking back up of data and this Tape contains some magnetic fields and the Magnetic Tapes are used Accessing the data into the Sequential Form and the Tape Also Contains a Ribbon which is coated on the Single Side of the Tape and also contains a head which reads the data which is Recorded on to the Tape. And when we are reading the information from the disk then we can also read backward information means we can also back the Tape for Reading the Previous information. And For inserting the Tape into the System we also Requires Some Tape Drives Which Contains Tape and which is Responsible for Reading the contents from the Tapes. They can Store huge Amount of data into the Tape Drive , But the Main Limitation of the Tape Drive is that we cant Access the Data from the Disks directly means if we wants to 100th Record from the Tape then we must have to move all the Previous i.e. 99th Records first. And the Tapes are also easily damaged due to the Human Errors.

Magnetic Disks : - This is also called as the hard disk and this is made from the thin metal platter which is coated on the both sides of the magnetic Disks. And the there are Many Plates or Platters into a single hard disk and all the Plates are Made from the Magnetic Materials and all the Disks are Rotate from the 700 to 3600 rpm means Rotation per Minute and the hard disk also Contains a head which is used for both Reading and Writing the Data from the Hard Disks.

The Plate of Disk is Divided into the Tracks and sectors and the collection of Tracks makes a Cylinder means all the Tracks of the Disk which a Consecutive Areas makes a Cylinder.

Floppy Diskette: A **floppy disk**, or **diskette**, is a disk storage medium composed of a disk of thin and flexible magnetic storage medium, sealed in a rectangular plastic carrier lined with fabric that removes dust particles. They are read and written by a **floppy disk drive** (FDD). Floppy disks, initially as 8-inch media and later in 5.25-inch and 3.5-inch sizes.

The Floppy Disk is also called as Reusable Disk means the Floppy Disk Provides us the Facility to Read and Writes the Data into disk as and When Necessary and Also Many Times. We can Read and Write the data from the Disk.

DVD: DVD stands for Digital Versatile/Video Disc, **DVD** is an optical disc storage format, invented and developed by Philips, Sony, Toshiba, and Panasonic in 1995. DVDs offer higher storage capacity than Compact Discs while having the same dimensions.

Pre-recorded DVDs are mass-produced using molding machines that physically stamp data onto the DVD. Such discs are known as DVD-ROM, because data can only be read and not written nor erased. Blank recordable DVD discs (DVD-R and DVD+R) can be recorded once using a DVD recorder and then function as a DVD-ROM. Rewritable DVDs (DVD-RW, DVD+RW, and DVD-RAM) can be recorded and erased multiple times.

USB Drives: A **USB flash drive** is a data storage device that includes flash memory with an integrated Universal Serial Bus (USB) interface. USB flash drives are typically removable and rewritable, and physically much smaller than a floppy disk.USB drives are currently available in USB 2.0 with USB 3.0 hitting the market now. These small plug-and-play drives are removable, re-writable, and great for storing personal and professional data, as many are hardware-encrypted devices for ultimate security.

Memory Card: A **memory card** or **flash card** is an electronic flash memory data storage device used for storing digital information. They are commonly used in many electronic devices, including digital cameras, mobile phones, laptop computers, MP3 players and video game consoles. They are small, re-recordable, and able to retain data without power.

There are a number of memory cards on the market, including the SD card (secure digital card), the CF card (Compact Flash card), the Smart Media card, the Memory Stick, and the Multimedia Card.

Quantities of bytes						
Common prefix				Binary prefix		
Name	Symbol	Decimal SI	Binary JEDEC	Name	Symbol	Binary IEC
kilobyte	KB/kB	10^3	2^{10}	kibibyte	KiB	2^{10}
megabyte	MB	10^6	2^{20}	mebibyte	MiB	2^{20}
gigabyte	GB	10^9	2^{30}	gibibyte	GiB	2^{30}
terabyte	TB	10^{12}	2^{40}	tebibyte	TiB	2^{40}
petabyte	PB	10^{15}	2^{50}	pebibyte	PiB	2^{50}
exabyte	EB	10^{18}	2^{60}	exbibyte	EiB	2^{60}
zettabyte	ZB	10^{21}	2^{70}	zebibyte	ZiB	2^{70}
yottabyte	YB	10^{24}	2^{80}	yobibyte	YiB	2^{80}

Flash Drives:

Also known as thumb drives because of their size or as USB drives because that's the port they connect to, flash drives are an extremely popular way to store data in a compact and portable fashion. Flash drives range in data capacity up to a whopping one terabyte (1,000GB) as of February 2012.

External Hard Drives:

External hard drives are exactly like the hard drive on any computer except they are outside of your computer. They usually connect through a USB port (similar to flash drives), are designed either for desktops or laptops and have a storage capacity of up to 2TB or more. Large companies or other individuals who need secure storage often use technologies that involve combined external hard drives set up in RAID or other hot-swappable, fault-tolerant configurations.

Smart Cards:

Smart cards are also known as memory cards. The usage and types of smart cards have evolved over the years from primary usage in laptops to cell phones and Personal Digital Assistants (PDAs). Many printers, laptops and other computers come with slots for various types of memory cards; SD cards in particular are quite popular and for the most part top out at about 2GB.

Online Storage:

Also called "remote backup," or "cloud storage," online storage sites allow you to store information on a company's servers. SugarSync, Dropbox, IDrive and numerous other sites provide these services for free; more storage space is typically available for a fee.

Re-writable CDs and DVDs:

Rewritable CDs and DVDs look exactly like CDs and DVDs you can buy in a store with music and movies on them, except in the case of rewritables you can store information on them. They are often used to store music, text files, photos, and other data. CD rewritables can hold up to about 700MB, DVD rewritables can hold up to about 4.7GB and Blu-ray rewritables, which are starting to become popular at the time of this writing, can hold about 25GB.