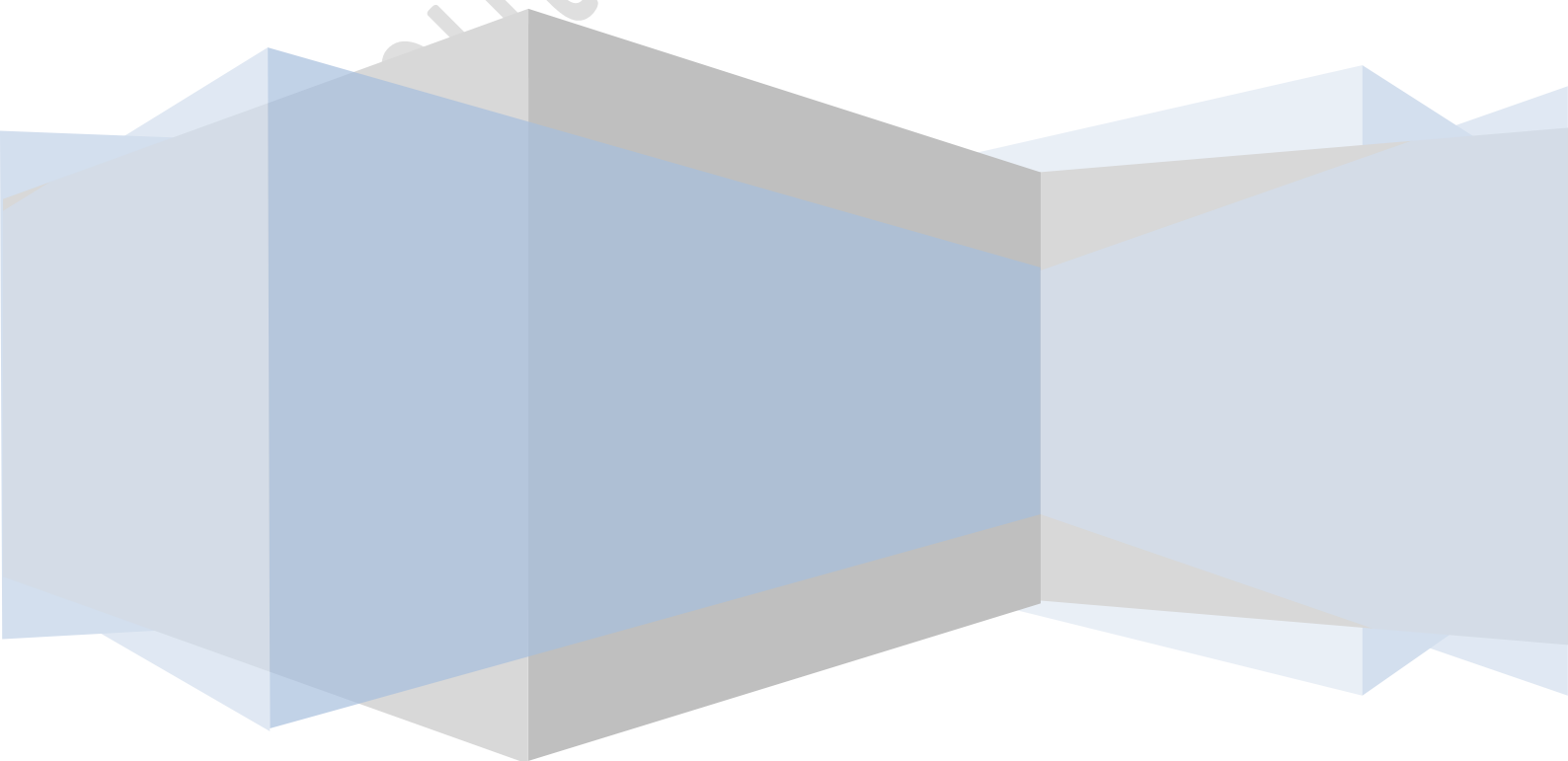# Computer Fundamentals Tutorial

This tutorial assumes no background in computers or computer programming.

Saikat

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Computer Fundamentals

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.

This Computer Fundamentals tutorial covers a foundational understanding of computer hardware, software, operating systems, peripherals etc and how to get the most value and impact from computer technology.

Audience

This tutorial has been prepared for the beginners as well as advanced learners who want to deal with computers. This tutorial is also very useful for the undergraduate students of computer science, engineering, business administration, management, science, commerce and arts where an introductory course on computers is a part of curriculum. After completing this tutorial you will find yourself at a moderate level of expertise in knowledge of Computer basics from where you can take yourself to next levels

Prerequisites

Knowledge of computers is not a prerequisite to follow the contents of this tutorial. This tutorial assumes no background in computers or computer programming.

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.
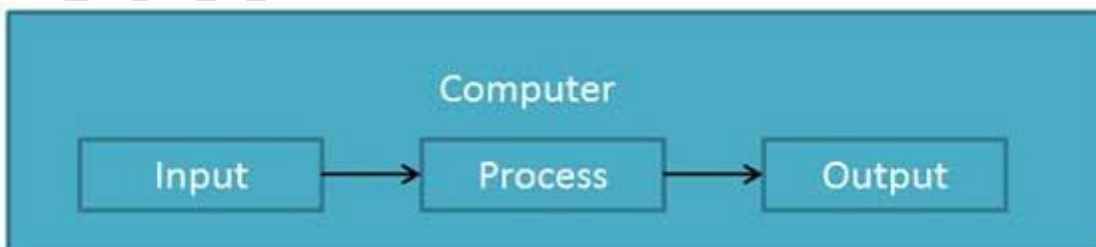
Definition

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.

High Speed

- Computer is a very fast device.
- It is capable of performing addition of very big data.
- The computer has units of speed in microsecond,nanosecond and even the picosecond.
- It can perform millions of calculations in a few seconds as compared to man who can spend many months for doing the same task.

Accuracy

- 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.

Storage Capability

- Memory is a very important characteristic of computers.
- The computer has much more storage capacity than human beings.
- It can store large amount of data.
- It can store any type of data such as images, videos, text, audio and any other type.

Diligence

- 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.

Versatility

- A computer is very versatile machine.
- A computer is very flexible in performing the jobs to be done.
- This machine can be used to solve the problems relating to various different fields.
- At one instant, it may be solving a complex scientific problem and the very next moment it may be playing a card game.

Reliability

- A computer is a reliable machine.
- Modern electronic components have failure free long lives.
- Computers are designed to make maintenance easy.

Automation

- Computer is a automatic machine.
- Automation means ability to perform the task automatically.

- Once a program is given to computer i.e stored in computer memory, the program and instruction can control the program execution without human interaction.

Reduction in Paper Work

- 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.

Reduction in Cost

- 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.

No I.Q

- 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 can not take any decision on its own.

Dependency

- It can perform function as instructed by user.So it is fully dependent on human being.

Environment

- The operating environment of computer should be dust free and suitable to it.

No Feeling

- 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 integerated part in all business organisations.

Computer used in business organisation for:

- Payroll Calculations

- Budgeting
- Sales Analysis
- Financial forcasting
- Managing employees database
- Maintenance of stocks etc.

Banking

Today Banking is almost totally dependent on computer.

Banks provide following facilities:

- Banks on-line accounting facility, which include current balances, deposits, overdrafts, interest charges, shares and trustee records.
- ATM machines are making it even easier for customers to deal with banks.

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.

Insurance Companies are maintaining a database of all clients with information showing

- how to continue with policies
- starting date of the policies
- next due installment of a policy
- maturity date
- interests due
- survival benefits
- bonus

Education

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

- The uses of computer provide a tool in the Education system is known as CBE (Computer Based Education).
- CBE involves Control, Delivery and Evaluation of learning.
- The computer education is very familiar and rapidly increasing the graph of computer students.
- There are number of methods in which educational institutions can use computer to educate the students.
- It is used for prepare a database about student performance and analysis are carried out.

Marketing

In Marketing uses of computer are following:

- **Advertising:** With computers, advertising professionals create art and graphics, write and revise copy, and print and disseminate ads with the goal of selling more products.
- **At Home Shopping:** At home shopping has been made possible through use of computerised catalogues that provide access to product information and permit direct entry of orders to be filled by the customers.

Health Care

Computers have become important part in all Medical Systems.

The computers are being used in hospitals to keep the record of patients and medicines. It is also used in scanning and diagnosing different diseases. ECG, EEG, Ultrasounds and CT Scans etc. are also done by computerised machines.

Some of major fields of health care in which computer are used:

- **Diagnostic System:** Computers are used to collect data and identify cause of illness.
- **Lab-diagnostic System:** All tests can be done and reports are prepared by computer.
- **Patient Monitoring System:** These are used to check patient's signs for abnormality such as in Cardiac Arrest, ECG etc.
- **Pharma Information System:** Computer checks Drug-Labels, Expiry dates, harmful drug side effects etc.
- Nowadays, computers are also used in performing surgery.

Engineering Design

Computers are widely used in Engineering purposes.

One of major areas is CAD(Computer aided design).CAD provides creation,edition, and modification of image. Some fields are:

- **Structural Engineering:** Requires stress and strain analysis required for design of Ships, Buildings, Budgets, Airplanes etc.
- **Industrial Engineering:** Computers deals with design, implementation and improvement of Integrated systems of people, materials and equipments.
- **Architectural Engineering:** Computers help in planning towns, designing buildings, determining a range of buildings on a site using both 2D and 3D drawings.
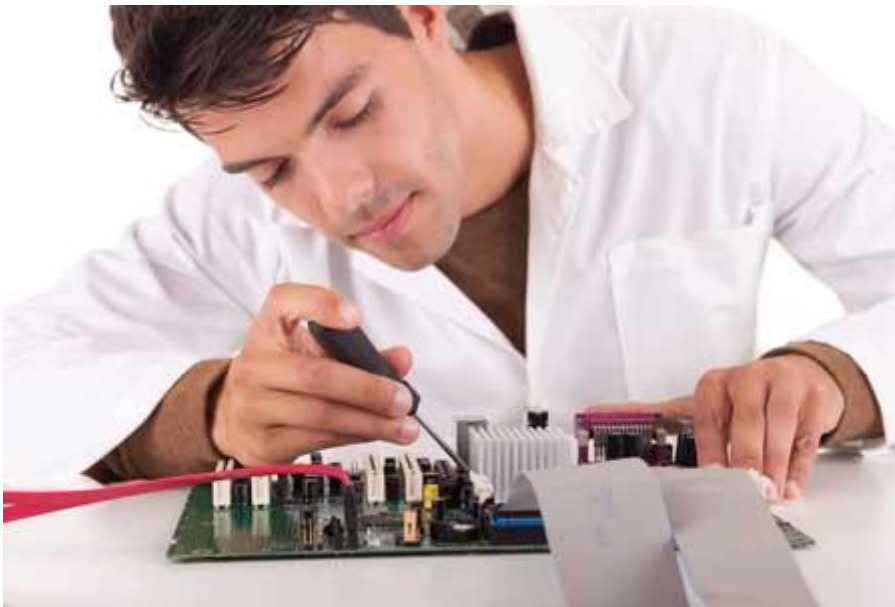
Military

Computers are largely used in defence.Modern tanks, missiles, weapons etc.employ computerised control systems.Some military areas where a computer has been used are:

- Missile Control
- Military Communication
- Military operation and planning
- Smart Weapons

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.Some main areas in this category are:

- E-mail
- Chatting

- Usenet
- FTP
- Telnet
- Video-conferencing

Government Applications

Computers play an important role in government applications.Some major fields in this category are:

- Budgets
- Sales tax department
- Income tax department
- Male/Female ratio
- Computerization of voters lists
- Computerization of Driving Licensing system
- Computerization of PAN card
- Weather Forecasting.

Computer - Generations

Computer Generations

Generation in computer terminology is a change in technology a computer is/was being used. Initially, the generation term was used to distinguish between varying hardware technologies. But nowadays, generation includes both hardware and software, which together make up an entire computer system.

There are totally five computer generations known till date. Each generation has been discussedin detail along with their time period, characteristics. We've used approximate dates against each generations which are normally accepted.

Following are the main five *generations* of computers

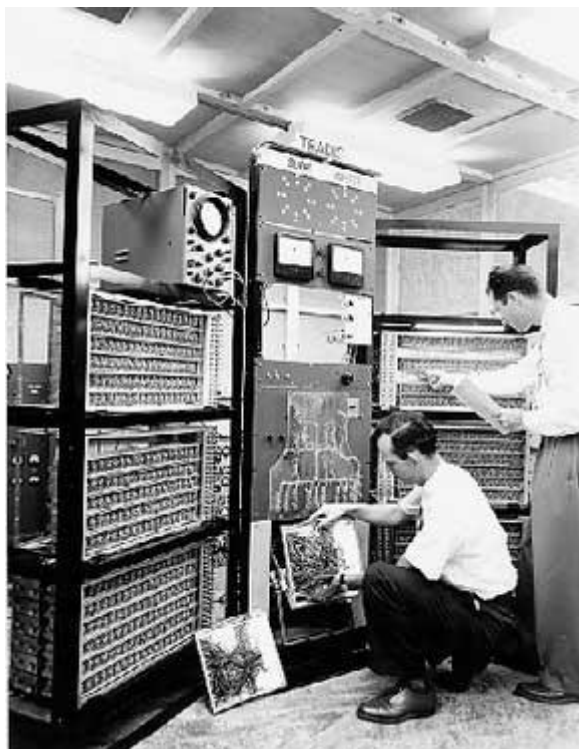| S.N.	Generation & Description
1	**First Generation**
	The period of first generation : 1946-1959. Vaccum tube based.
2	**Second Generation**
	The period of second generation : 1959-1965. Transistor based.
3	**Third Generation**
	The period of third generation : 1965-1971. Integrated Circuit based.
4	**Fourth Generation**
	The period of fourth generation : 1971-1980. VLSI microprocessor based.
5	**Fifth Generation**
	The period of fifth generation : 1980-onwards.ULSI microprocessor based

First Generation

The period of first generation was 1946-1959.

First generation of computer started with using vacuum tubes as the basic components for memory and circuitry for CPU(Central Processing Unit). These tubes like electric bulbs produced a lot of heat and were prone to frequent fusing of the installations, therefore, were very expensive and could be afforded only by very large organisations.

In this generation mainly batch processing operating system were used. In this generation Punched cards, Paper tape, Magnetic tape Input & Output device were used.

There were Machine code and electric wired board languages used.

The main features of First Generation are:

- Vacuum tube technology
- Unreliable
- Supported Machine language only
- Very costly
- Generate lot of heat
- Slow Input/Output device
- Huge size
- Need of A.C.
- Non portable
- Consumed lot of electricity

Some computer of this generation were:

- ENIAC
- EDVAC
- UNIVAC
- IBM-701
- IBM-650

Second Generation

The period of second generation was 1959-1965.

This generation using the transistor were cheaper, consumed less power, more compact in size, more reliable and faster than the first generation machines made of vaccum tubes.In this generation, magnetic cores were used as primary memory and magnetic tape and magnetic disks as secondary storage devices.

In this generation assembly language and high level programming language like FORTRAN, COBOL were used.

There were Batch processing and Multiprogramming Operating system used.

The main features of Second Generation are:

- Use of transistors
- Reliable as compared to First generation computers
- Smaller size as compared to First generation computers
- Generate less heat as compared to First generation computers
- Consumed less electricity as compared to First generation computers
- Faster than first generation computers
- Still very costly
- A.C. needed
- Support machine and assmebly languages

Some computer of this generation were:

- IBM 1620
- IBM 7094
- CDC 1604
- CDC 3600
- UNIVAC 1108

Third Generation

The period of third generation was 1965-1971.

The third generation of computer is marked by the use of Integrated Circuits (IC's) in place of transistors.A single I.C has many transistors, resistors and capacitors along with the associated circuitry.The I.C was invented by Jack Kilby. This development made computers smaller in size, reliable and efficient.

In this generation Remote processing, Time-sharing, Real-time, Multi-programming Operating System were used.

High level language (FORTRAN-II TO IV, COBOL, PASCAL PL/1, BASIC, ALGOL-68 etc.) were used during this generation.

The main features of Third Generation are:

- IC used
- More reliable
- Smaller size
- Generate less heat
- Faster
- Lesser maintenance
- Still costly
- A.C needed
- Consumed lesser electricity
- Support high level language

Some computer of this generation were:

- IBM-360 series
- Honeywell-6000 series
- PDP(Personal Data Processor)
- IBM-370/168
- TDC-316

Fourth Generation

The period of Fourth Generation was 1971-1980.

The fourth generation of computers is marked by the use of Very Large Scale Integrated (VLSI) circuits.VLSI circuits having about 5000 transistors and other circuit elements and their associated circuits on a single chip made it possible to have microcomputers of fourth generation. Fourth Generation computers became more powerful, compact, reliable, and affordable. As a result, it gave rise to personal computer (PC) revolution.

In this generation Time sharing, Real time, Networks, Distributed Operating System were used.

All the Higher level languages like C and C++, DBASE etc. were used in this generation.

The main features of Fourth Generation are:

- VLSI technology used
- Very cheap
- Portable and reliable
- Use of PC's
- Very small size
- Pipeline processing
- No A.C. needed
- Concept of internet was introduced
- Great developments in the fields of networks
- Computers became easily available

Some computer of this generation were:

- DEC 10
- STAR 1000
- PDP 11
- CRAY-1(Super Computer)
- CRAY-X-MP(Super Computer)

Fifth Generation

The period of Fifth Generation is 1980-till date.

In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components.

This generation is based on parallel processing hardware and AI (Artificial Intelligence) software.

AI is an emerging branch in computer science, which interprets means and method of making computers think like human beings.

All the Higher level languages like C and C++, Java, .Net etc. are used in this generation.

AI includes:

- Robotics
- Neural networks
- Game Playing
- Development of expert systems to make decisions in real life situations.
- Natural language understanding and generation.

The main features of Fifth Generation are:

- ULSI technology
- Development of true artificial intelligence
- Development of Natural language processing
- Advancement in Parallel Processing
- Advancement in Superconductor technology
- More user friendly interfaces with multimedia features
- Availability of very powerful and compact computers at cheaper rates

Some computer types of this generation are:

- Desktop
- Laptop
- NoteBook
- UltraBook
- ChromeBook

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 simulaneously.
4	Main Frame	Multi-user computer system. Capable of supporting hundreds of users simulaneously.Software technology is different from minicomputer.
5	Supercomputer	An extremely fast computer which can perform hundreds of millions of instructions per second.

PC (Personal Computer)

A PC can be defined as a small, relatively inexpensive computer designed for an individual user. PCs are based on the microprocessor technology that enables manufacturers to put an entire CPU on one chip. Businesses use personal computers for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications. At home, the most popular use for personal computers is for playing games and surfing the Internet.

Although personal computers are designed as single-user systems, these systems are normally linked together to form a network. In terms of power, now-a-days High-end models of the Macintosh and PC offer the same computing power and graphics capability as low-end workstations by Sun Microsystems, Hewlett-Packard, and DELL.

WorkStation

Workstation is a computer used for engineering applications (CAD/CAM), desktop publishing, software development, and other such types of applications which require a moderate amount of computing power and relatively high quality graphics capabilities.

Workstations generally come with a large, high-resolution graphics screen, large amount of RAM, inbuilt network support, and a graphical user interface. Most workstations also have a mass storage device such as a disk drive, but a special type of workstation, called a diskless workstation, comes without a disk drive.

Common operating systems for workstations are UNIX and Windows NT. Like PC, Workstations are also single-user computers. However, workstations are typically linked together to form a local-area network, although they can also be used as stand-alone systems.

Minicomputer

It is a midsize computer. A minicomputer is a multi-processing system capable of supporting from up to 250 users simultaneously.

Mainframe

Mainframe is a very large in size and is an expensive computer capable of supporting hundreds, or even thousands, of users simultaneously. Mainframe executes many programs concurrently. Mainframes support many simultaneous programs execution.

Supercomputer

Supercomputers are one of the fastest computers currently available. Supercomputers are very expensive and are employed for specialized applications that require immense amounts of mathematical calculations (number crunching). For example, weather forecasting , scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting).

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.
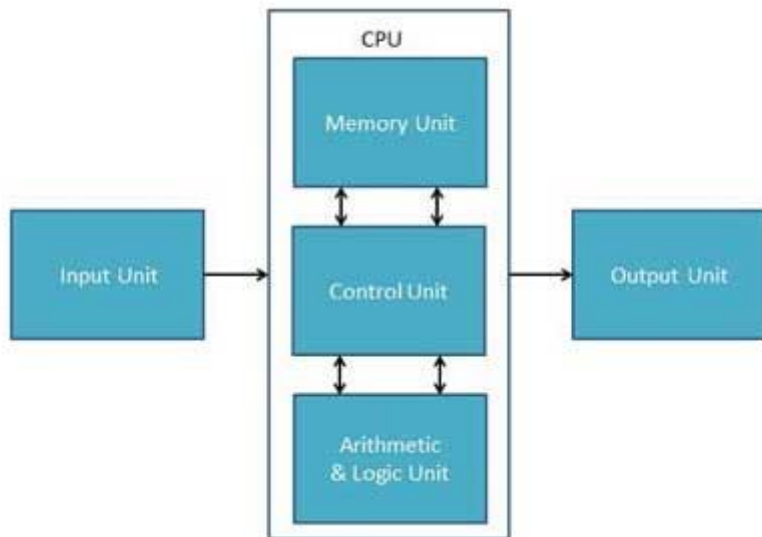
Input Unit

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.
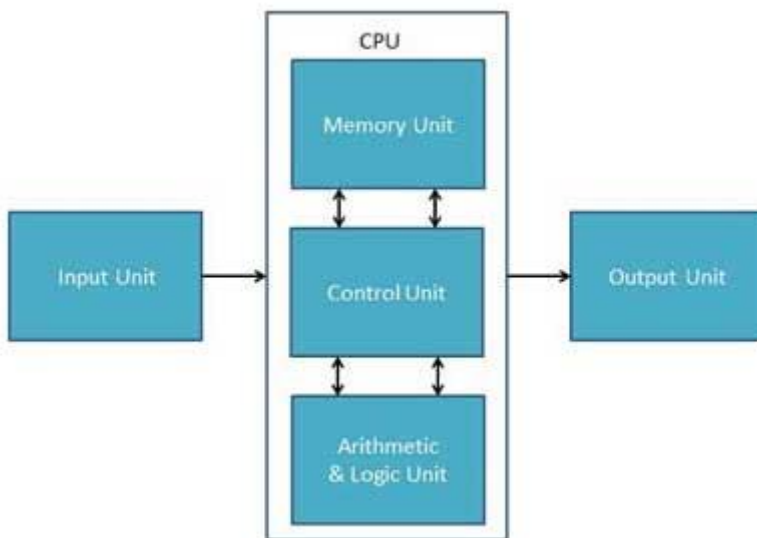
Computer - CPU

- CPU is considered as the brain of the computer.
- CPU performs all types of data processing operations.
- It stores data , intermediate resulta 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

Keyboard

Most common and very popular input device is keyboard. The keyboard helps in inputting the data to the computer.The layout of the keyboard is like that of traditional typewriter, although there are some additional keys provided for performing some additional functions.

Keyboard are of two sizes 84 keys or 101/102 keys, but now 104 keys or 108 keys keyboard is also available for Windows and Internet.

The keys are following

Sr. No.	Keys	Description
1	Typing Keys	These keys include the letter keys (A-Z) and digits keys (0-9) which are generally give same layout as that of typewriters.
2	Numeric Keypad	It is used to enter numeric data or cursor movement. Generally, it consists of a set of 17 keys that are laid out in the same configuration used by most adding machine and calculators.
3	Function Keys	The twelve functions keys are present on the keyboard. These are arranged in a row along the top of the keyboard.Each function key has unique meaning and is used for some specific purpose.
4	Control keys	These keys provides cursor and screen control. It includes four directional arrow key.Control keys also include Home, End,Insert, Delete, Page Up, Page Down, Control(Ctrl), Alternate(Alt), Escape(Esc).
5	Special Purpose Keys	Keyboard also contains some special purpose keys such as Enter, Shift, Caps Lock, Num Lock, Space bar, Tab, and Print Screen.

Mouse

Mouse is most popular Pointing device. It is a very famous cursor-control device. It is a small palm size box with a round ball at its base which senses the movement of mouse and sends corresponding signals to CPU on pressing the buttons.

Generally it has two buttons called left and right button and scroll bar is present at the mid. Mouse can be used to control the position of cursor on screen, but it cannot be used to enter text into the computer.

Advantages

- Easy to use
- Not very expensive
- Moves the cursor faster than the arrow keys of keyboard.

Joystick

Joystick is also a pointing device which is used to move cursor position on a monitor screen. It is a stick having a spherical ball at its both lower and upper ends. The lower spherical ball moves in a socket.TheJoystic can be moved in all four directions.

The function of joystic is similar to that of a mouse. It is mainly used in Computer Aided Designing(CAD) and playing computer games.

Light Pen

Light pen is a pointing device which is similar to a pen. It is used to select a displayed menu item or draw pictures on the monitor screen.It consists of a photocell and an optical system placed in a small tube.

When light pen's tip is moved over the monitor screen and pen button is pressed, its photocell sensing element detects the screen location and sends the corresponding signal to the CPU.

Track Ball

Track ball is an input device that is mostly used in notebook or laptop computer, instead of a mouse. This is a ball which is half inserted and by moving fingers on ball, pointer can be moved.

Since the whole device is not moved, a track ball requires less space than a mouse. A track ball comes in various shapes like a ball, a button and a square.

Scanner

Scanner is an input device which works more like a photocopy machine. It is used when some information is available on a paper and it is to be transferred to the hard disc of the computer for further manipulation.

Scanner captures images from the source which are then converted into the digital form that can be stored on the disc.These images can be edited before they are printed.

Digitizer

Digitizer is an input device which converts analog information into a digital form. Digitizer can convert a signal from the television camera into a series of numbers that could be stored in a computer. They can be used by the computer to create a picture of whatever the camera had been pointed at.

Digitizer is also known as Tablet or Graphics Tablet because it converts graphics and pictorial data into binary inputs. A graphic tablet as digitizer is used for doing fine works of drawing and images manipulation applications.

Microphone

Microphone is an input device to input sound that is then stored in digital form. The microphone is used for various applications like adding sound to a multimedia presentation or for mixing music.

Magnetic Ink Card Reader(MICR)

MICR input device is generally used in banks because of a large number of cheques to be processed every day. The bank's code number and cheque number are printed on the cheques with a special type of ink that contains particles of magnetic material that are machine readable.

This reading process is called Magnetic Ink Character Recognition(MICR). The main advantages of MICR is that it is fast and less error prone.

Optical Character Reader(OCR)

OCR is an input device used to read a printed text. OCR scans text optically character by character, converts them into a machine readable code and stores the text on the system memory.

Bar Code Readers

Bar Code Reader is a device used for reading bar coded data (data in form of light and dark lines). Bar coded data is generally used in labelling goods, numbering the books etc. It may be a hand held scanner or may be embedded in a stationary scanner.

Bar Code Reader scans a bar code image, converts it into an alphanumeric value which is then fed to the computer to which bar code reader is connected.

Optical Mark Reader(OMR)

OMR is a special type of optical scanner used to recognize the type of mark made by pen or pencil. It is used where one out of a few alternatives is to be selected and marked. It is specially used for checking the answer sheets of examinations having multiple choice questions.

Computer - Output Devices

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

- Monitors
- Graphic Plotter
- Printer

Monitors

Monitor commonly called as Visual Display Unit (VDU) is the main output device of a computer. It forms images from tiny dots, called pixels, that are arranged in a rectangular form. The sharpness of the image depends upon the no. of the pixels.

There are two kinds of viewing screen used for monitors.

- Cathode-Ray Tube (CRT)
- Flat- Panel Display

Cathode-Ray Tube (CRT) Monitor

In the CRT display is made up of small picture elements called pixels for short.The smaller the pixels, the better the image clarity, or resolution.It takes more than one illuminated pixel to form whole character, such as the letter e in the word help.

A finite number of character can be displayed on a screen at once.The screen can be divided into a series of character boxes - fixed location on the screen where a standard character can be placed.

The most screens are capable of displaying 80 characters of data horizontally and 25 lines vertically. There are some disadvantage of CRT

- Large in Size
- High Power consumption

Flat-Panel Display Monitor

The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement compare to the CRT. You can hang them on walls or wear them on your wrists. Current uses for flat-panel displays include calculators, videogames, monitors, laptop computer, graphics display.

The flat-panel display are divided into two categories

- **Emissive Displays** - The emissive displays are devices that convert electrical energy into light. Example are plasma panel and LED(Light-Emitting Diodes).
- **Non-Emissive Displays** - The Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns.Example is LCD(Liquid-Crystal Device)

Printers

Printer is the most important output device, which is used to print information on paper.

There are two types of printers

- Impact Printers
- Non-Impact Printers

Impact Printers

The printers that print the characters by striking against the ribbon and onto the paper, are called impact printers.

Characteristics of Impact Printers are following

- Very low consumable costs
- Impact printers are very noisy
- Useful for bulk printing due to low cost
- There is physical contact with the paper to produce an image

These printers are of two types

- Character printers
- Line printers

Character Printers:

Character Printers are printers which print one character at a time.

These are of further two types

- Dot Matrix Printer(DMP)
- Daisy Wheel

Dot Matrix Printer

In the market one of the most popular printer is Dot Matrix Printer because of their ease of printing features and economical price. Each character printed is in form of pattern of Dot's and head consists of a Matrix of Pins of size(5*7, 7*9, 9*7 or 9*9) which comes out to form a character that is why it is called Dot Matrix Printer.

Advantages

- Inexpensive
- Widely Used
- Other language characters can be printed

Disadvantages

- Slow Speed
- Poor Quality

Daisy Wheel

Head is lying on a wheel and Pins corresponding to characters are like petals of Daisy(flower name) that is why it is called Daisy Wheel Printer. These printers are generally used for word-processing in offices which require a few letters to be send here and there with very nice quality representation.

Advantages

- More reliable than DMP's
- Better quality
- The fonts of character can be easily changed.

Disadvantages

- Slower than DMP's
- Noisy
- More expensive than DMP's

Line Printers

Line printers are printers which print one line at a time.

These are of further two types

- Drum Printer
- Chain Printer

Drum Printer

This printer is like a drum in shape so it called drum printer. The surface of drum is divided into number of tracks. Total tracks are equal to size of paper i.e for a paper width of 132 characters, Drum will have 132 tracks. A character set is embossed on track. The different characters sets are available in market 48 character set, 64 and 96 characters set.One rotation of drum prints one line. Drum Printers are fast in speed and speed in between 300 to 2000 lines per minute.

Advantages

- Very high speed

Disadvantages

- Very expensive
- Characters fonts can not be changed

Chain Printer

In this printer chain of character sets are used so it called Chain Printers.A standard character set may have 48, 64, 96 characters.

Advantages

- Character fonts can easily be changed.
- Different languages can be used with the same printer.

Disadvantages

- Noisy
- Do not have the ability to print any shape of characters.

Non-impact Printers

The printers that print the characters without striking against the ribbon and onto the paper, are called Non-impact Printers. These printers print a complete page at a time, also called as Page Printers.

These printers are of two types

- Laser Printers
- Inkjet Printers

Characteristics of Non-impact Printers

- Faster than impact printers.
- They are not noisy.
- High quality.
- Support many fonts and different character size.

Laser Printers

These are non-impact page printers. They use laser lights to produces the dots needed to form the characters to be printed on a page.

Advantages

- Very high speed.
- Very high quality output.
- Give good graphics quality.
- Support many fonts and different character size.

Disadvantage

- Expensive.
- Cannot be used to produce multiple copies of a document in a single printing.

Inkjet Printers

Inkjet printers are non-impact character printers based on a relatively new technology. They print characters by spraying small drops of ink onto paper. Inkjet printers produce high quality output with presentable features.

They make less noise because no hammering is done and these have many styles of printing modes available. Colour printing is also possible. Some models of Inkjet printers can produce multiple copies of printing also.

Advantages

- High quality printing
- More reliable

Disadvantages

- Expensive as cost per page is high
- Slow as compare to laser 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

Cache Memory

Cache memory is a very high speed semiconductor memory which can speed up CPU. It acts as a buffer between the CPU and main memory.

It is used to hold those parts of data and program which are most frequently used by CPU. The parts of data and programs are transferred from disk to cache memory by operating system, from where CPU can access them.

Advantage

- Cache memory is faster than main memory.
- It consumes less access time as compared to main memory.
- It stores the program that can be executed within a short period of time.
- It stores data for temporary use.

Disadvantage:

- Cache memory has limited capacity.
- It is very expensive.

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.

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)

Static RAM (SRAM)

The word **static** indicates that the memory retains its contents as long as power remains applied. However, data is lost when the power gets down due to volatile nature. SRAM chips use a matrix of 6-transistors and no capacitors. Transistors do not require power to prevent leakage, so SRAM need not have to be refreshed on a regular basis.

Because of the extra space in the matrix, SRAM uses more chips than DRAM for the same amount of storage space, thus making the manufacturing costs higher.

Static RAM is used as cache memory needs to be very fast and small.

Characteristic of the Static RAM

- It has long data lifetime
- There is no need to refresh
- Faster
- Used as cache memory
- Large size
- Expensive
- High power consumption

Dynamic RAM (DRAM)

DRAM, unlike SRAM, must be continually **refreshed** in order for it to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second. DRAM is used for most system memory because it is cheap and small. All DRAMs are made up of memory cells. These cells are composed of one capacitor and one transistor.

Characteristic of the Dynamic RAM

- It has short data lifetime
- Need to refresh continuously
- Slower as compared to SRAM
- Used as RAM
- lesser in size
- Less expensive
- Less power consumption

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.
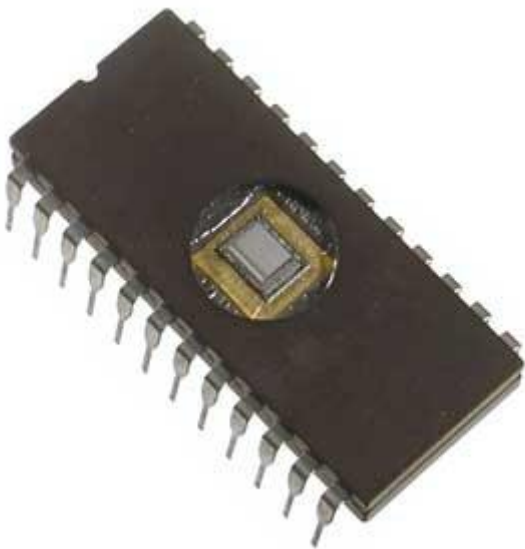
Following are the varioys types of ROM

MROM (Masked ROM)

The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kind of ROMs are known as masked ROMs. It is inexpensive ROM.

PROM (Programmable Read only Memory)

PROM is read-only memory that can be modified only once by a user. The user buys a blank PROM and enters the desired contents using a PROM programmer.Inside the PROM chip there are small fuses which are burnt open during programming. It can be programmed only once and is not erasable.

EPROM(Erasable and Programmable Read Only Memory)

The EPROM can be erased by exposing it to ultra-violet light for a duration of upto 40 minutes. Usually, a EPROM eraser achieves this function. During programming an electrical charge is trapped in an insulated gate region. The charge is retained for more than ten years because the charge has no leakage path. For erasing this

charge, ultra-violet light is passed through a quartz crystal window(lid). This exposure to ultra-violet light dissipates the charge. During normal use the quartz lid is sealed with a sticker.

EEPROM(Electrically Erasable and Programmable Read Only Memory)

The EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (milli second). In EEPROM, any location can be selectively erased and programmed. EEPROMs can be erased one byte at a time, rather than erasing the entire chip. Hence, the process of re-programming is flexible but slow.

Advantages of ROM

- Non-volatile in nature
- These can not be accidentally changed
- Cheaper than RAMs
- Easy to test
- More Reliable than RAMs
- These are static and do not require refreshing
- Its contents are always known and can be verified

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.

Popular Manufacturers

- Intel
- ASUS
- AOpen
- ABIT
- Biostar
- Gigabyte
- MSI

Description:

The motherboard is mounted inside the case and is securely attached via small screws through pre-drilled holes.

Motherboard contains ports to connect all of the internal components. It provides a single socket for CPU. For memory, normally one or more slots are available. Motherboards provide ports to attach floppy drive, hard drive and optical drives via ribbon cables. Mother board carries fans and a special port designed for power supply.

There a peripher card slots on front of the motherboard using which video cards, sound cards and other expansion cards can be connected to motherboard.

On left side, motherboards carries a number of ports. These ports connect monitor, printer, mouse, keyboard, speaker, network cables and all to the motherboard. Motherboards also provide USB ports which allows compatible devices to be connected in plug-in/plug-out fashion. For example, pen drive, digital cameras etc.

Computer - Memory Units

- It is the amount of data that can be stored in the storage unit.
- The storage capacity are expressed in terms of Bytes.

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
1	Megabyte (MB)	1 MB = 1024 KB
1	GigaByte (GB)	1 GB = 1024 MB
1	TeraByte (TB	1 TB = 1024 GB
1	PetaByte (PB)	1 PB = 1024 TB

Computer - Ports

What is a Port?

- A computer port is a physical docking point using which an extenal device can be connected to the computer.
- A computer port can also be programmatic docking point through which information flows from a program to computer or over the internet.

Characteristics

- External devices are connected to a computer using cables and ports.
- Ports are slots on the motherboard into which a cable of external device is plugged in.
- Examples of external devices attached via ports are mouse, keyboard, monitor, microphone , speakers etc.
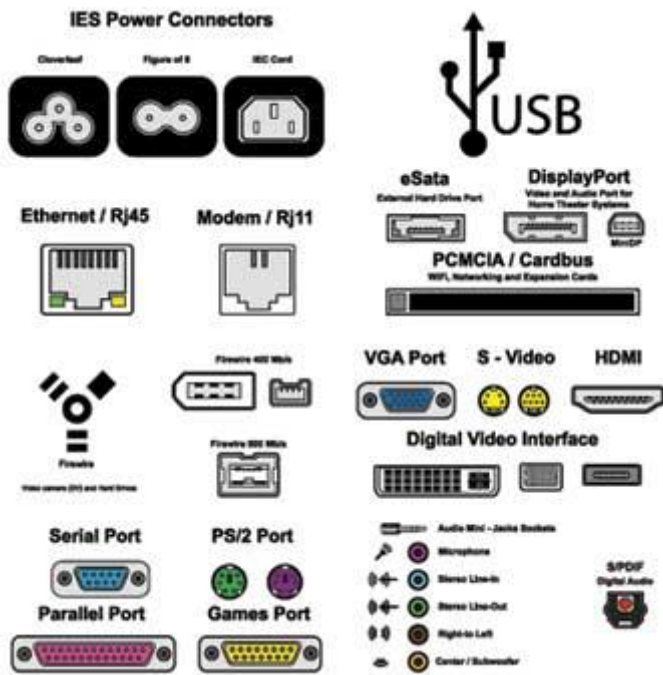
Following are few important types of ports

Serial Port

- Used for external modems and older computer mouse.
- Two versions: 9 pin, 25 pin model.
- Data travels at 115 kilobits per second.

Parallel Port

- Used for scanners and printers
- Also called printer port.
- 25 pin model.
- Also known as IEEE 1284-compliant Centronics port.

PS/2 Port

- Used for old computer keyboard and mouse
- Also called mouse port.
- Most of the old computers provide two PS/2 port, each for mouse and keyboard.
- Also known as IEEE 1284-compliant Centronics port.

Universal Serial Bus (or USB) Port

- Can connect all kind of external USB devices such as external hard disk, printer, scanner, mouse, keyboard etc.
- Introduced in 1997.
- Most of the computers provide two USB port as minimum.
- Data travels at 12 megabits per seconds
- USB compliant devices can get power from a USB port

VGA Port

- Connects monitor to a computer's video card.
- Has 15 holes.
- Similar to serial port connector but serial port connector has pins, it has holes.

Power Connector

- Three-pronged plug
- Connects to the computer's power cable that plugs into a power bar or wall socket.

Firewire Port

- Transfer large amounts of data at very fast speed.
- Connects camcorders and video equipments to the computer
- Data travels at 400 to 800 megabits per seconds
- Invented by Apple
- Three variants: 4-Pin FireWire 400 connector, 6-Pin FireWire 400 connector and 9-Pin FireWire 800 connector

Modem

- Connects a PC's modem to the telephone network.

Ethernet Port

- Connects to a network and high speed Internet
- Connect network cable to a computer.
- This port resides on an Eternet Card.
- Data travels at 10 megabits to 1000 megabits per seconds depending upon the network bandwidth.

Game Port

- Connect a PC to a joystick
- Now replaced by USB.

Digital Video Interface , DVI port

- Connect a Flat panel LCD monitors to the computer's high end video graphic cards.
- Very popular among video card manufacturers.

Sockets

- Connect microphone, speakers to sound card of the computer

Computer - Hardware

Hardware represents the physical and tangible components of the computer i.e. the components that can be seen and touched.

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.

Relationship between Hardware and Software

- Mutually dependent.Both of them must work together to make computer produce a useful output.
- Software cannot be utilized without supporting hardware.
- Hardware without set of programs to operate upon cannot be utilized and is useless.
- To get a particular job done on the computer, relevant software should be loaded into the hardware
- Hardware is a one time expense.
- software development is very expensive and is a continuing expense.
- Different software can be loaded on a hardware to run different jobs.
- A software acts as an interface between the user and the hardware.
- If hardware is the 'heart' of a computer system, then software is its 'soul'.Both are complimentary to each other.

Computer - Software

Software is a set of programs, which is designed to perform a well defined function. A program is a sequence of instructions written to solve a particular problem.

There are two types of software

- System Software
- Application Software

System Software

The system software is collection of programs designed to operate, control and extend the processing capabilities of the computer itself. System software are generally prepared by computer manufactures.

These softwares comprise of programs written in low level languages which interact with the hardware at a very basic level. System software serves as the interface between hardware and the end users.

Some examples of system software are Operating System, Compilers, Interpreter, Assemblers etc.

Features of System Software are following

- Close to system.
- Fast in speed.
- Difficult to design.
- Difficult to understand.
- Less interactive.
- Smaller in size.
- Difficult to manipulate.
- Generally written in low level language.

Application Software

Application software are the software that are designed to satisfy a particular need of a particular environment. All software prepared by us in the computer lab can come under the category of Application software.

Application software may consists of a single program, such as a Microsoft's notepad for writing and editing simple text. It may also consists of a collection of programs, often called a software package, which work together to accomplish a task, such as a spreadsheet package.

Examples of Application software are following

- Payroll Software
- Student Record Software
- Inventory Management Software
- Income Tax Software
- Railways Reservation Software
- Microsoft Office Suite Software
- Microsoft Word
- Microsoft Excel
- Microsoft Powerpoint

Features of Application Software are following

- It is close to user.
- It is easy to design.
- More interactive.
- Slow in speed.
- Generally written in high level language.
- Easy to understand.
- Easy to manipulate and use.
- Bigger in size and requires large storage space.

Computer - Number System

When we type some letters or words, the computer translates them in numbers as computers can understand only numbers.

A computer can understand positional number system where there are only a few symbols called digits and these symbols represent different values depending on the position they occupy in the number.

A value of each digit in a number can be determined using

- The digit
- The position of the digit in the number
- The base of the number system (where base is defined as the total number of digits available in the number system).

Decimal Number System

The number system that we use in our day-to-day life is the decimal number system. Decimal number system has base 10 as it uses 10 digits from 0 to 9. In decimal number system, the successive positions to the left of the decimal point represent units, tens, hundreds, thousands and so on.

Each position represents a specific power of the base (10). For example, the decimal number 1234 consists of the digit 4 in the units position, 3 in the tens position, 2 in the hundreds position, and 1 in the thousands position, and its value can be written as

$(1 \times 1000) + (2 \times 100) + (3 \times 10) + (4 \times l)$

$(1 \times 10^3) + (2 \times 10^2) + (3 \times 10^1) + (4 \times l0^0)$

$1000 + 200 + 30 + 1$

1234

As a computer programmer or an IT professional, you should understand the following number systems which are frequently used in computers.

S.N.	Number System & Description
1	**Binary Number System** Base 2. Digits used: 0, 1
2	**Octal Number System** Base 8. Digits used: 0 to 7
4	**Hexa Decimal Number System** Base 16. Digits used: 0 to 9, Letters used: A- F

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}

Note: 10101_2 is normally written as 10101.

Octal Number System

Characteristics

- Uses eight digits, 0,1,2,3,4,5,6,7.
- Also called base 8 number system
- Each position in a octal number represents a 0 power of the base (8). Example 8^0
- Last position in a octal number represents a x power of the base (8). Example 8^x where x represents the last position - 1.

Example

Octal Number: 12570_8

Calculating Decimal Equivalent:

Step	Octal Number	Decimal Number
Step 1	12570_8	$((1 \times 8^4) + (2 \times 8^3) + (5 \times 8^2) + (7 \times 8^1) + (0 \times 8^0))_{10}$
Step 2	12570_8	$(4096 + 1024 + 320 + 56 + 0)_{10}$
Step 3	12570_8	5496_{10}

Note: 12570_8 is normally written as 12570.

Hexadecimal Number System

Characteristics

- Uses 10 digits and 6 letters, 0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F.
- Letters represents numbers starting from 10. A = 10. B = 11, C = 12, D = 13, E = 14, F = 15.
- Also called base 16 number system
- Each position in a hexadecimal number represents a 0 power of the base (16). Example 16^0
- Last position in a hexadecimal number represents a x power of the base (16). Example 16^x where x represents the last position - 1.

Example

Hexadecimal Number: $19FDE_{16}$

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (F \times 16^2) + (D \times 16^1) + (E \times 16^0))_{10}$
Step 2	$19FDE_{16}$	$((1 \times 16^4) + (9 \times 16^3) + (15 \times 16^2) + (13 \times 16^1) + (14 \times 16^0))_{10}$
Step 3	$19FDE_{16}$	$(65536 + 36864 + 3840 + 208 + 14)_{10}$
Step 4	$19FDE_{16}$	106462_{10}

Note: $19FDE_{16}$ is normally written as 19FDE.

Computer - Number Conversion

There are many methods or techniques which can be used to convert numbers from one base to another. We'll demonstrate here the following

- Decimal to Other Base System
- Other Base System to Decimal
- Other Base System to Non-Decimal
- Shortcut method - Binary to Octal
- Shortcut method - Octal to Binary
- Shortcut method - Binary to Hexadecimal
- Shortcut method - Hexadecimal to Binary

Decimal to Other Base System

Steps

- **Step 1** - Divide the decimal number to be converted by the value of the new base.
- **Step 2** - Get the remainder from Step 1 as the rightmost digit (least significant digit) of new base number.
- **Step 3** - Divide the quotient of the previous divide by the new base.
- **Step 4** - Record the remainder from Step 3 as the next digit (to the left) of the new base number.

Repeat Steps 3 and 4, getting remainders from right to left, until the quotient becomes zero in Step 3.

The last remainder thus obtained will be the most significant digit (MSD) of the new base number.

Example

Decimal Number: 29_{10}

Calculating Binary Equivalent:

Step	Operation	Result	Remainder
Step 1	29 / 2	14	1
Step 2	14 / 2	7	0
Step 3	7 / 2	3	1
Step 4	3 / 2	1	1
Step 5	1 / 2	0	1

As mentioned in Steps 2 and 4, the remainders have to be arranged in the reverse order so that the first remainder becomes the least significant digit (LSD) and the last remainder becomes the most significant digit (MSD).

Decimal Number: 29_{10} = Binary Number: 11101_2.

Other base system to Decimal System

Steps

- **Step 1** - Determine the column (positional) value of each digit (this depends on the position of the digit and the base of the number system).
- **Step 2** - Multiply the obtained column values (in Step 1) by the digits in the corresponding columns.
- **Step 3** - Sum the products calculated in Step 2. The total is the equivalent value in decimal.

Example

Binary Number: 11101_2

Calculating Decimal Equivalent:

Step	Binary Number	Decimal Number
Step 1	11101_2	$((1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0))_{10}$
Step 2	11101_2	$(16 + 8 + 4 + 0 + 1)_{10}$
Step 3	11101_2	29_{10}

Binary Number: 11101_2 = Decimal Number: 29_{10}

Other Base System to Non-Decimal System

Steps

- **Step 1** - Convert the original number to a decimal number (base 10).
- **Step 2** - Convert the decimal number so obtained to the new base number.

Example

Octal Number: 25_8

Calculating Binary Equivalent:

Step	Octal Number	Decimal Number
Step 1	27_8	$((2 \times 8^1) + (5 \times 8^0))_{10}$
Step 2	27_8	$(16 + 5)_{10}$
Step 3	27_8	21_{10}

Octal Number: 25_8 = Decimal Number: 21_{10}

Step 2: Convert Decimal to Binary

Step	Operation	Result	Remainder
Step 1	21 / 2	10	1
Step 2	10 / 2	5	0
Step 3	5 / 2	2	1
Step 4	2 / 2	1	0
Step 5	1 / 2	0	1

Decimal Number: 21_{10} = Binary Number: 10101_2

Octal Number: 25_8 = Binary Number: 10101_2

Shortcut method - Binary to Octal

Steps

- **Step 1** - Divide the binary digits into groups of three (starting from the right).
- **Step 2** - Convert each group of three binary digits to one octal digit.

Example

Binary Number: 10101_2

Calculating Octal Equivalent:

Step	Binary Number	Octal Number
Step 1	10101_2	010 101
Step 2	10101_2	2_8 5_8 3_8
Step 3	10101_2	25_8

Binary Number: 10101_2 = Octal Number: 25_8

Shortcut method - Octal to Binary

Steps

- **Step 1** - Convert each octal digit to a 3 digit binary number (the octal digits may be treated as decimal for this conversion).
- **Step 2** - Combine all the resulting binary groups (of 3 digits each) into a single binary number.

Example

Octal Number: 25_8

Calculating Binary Equivalent:

Step	Octal Number	Binary Number
Step 1	25_8	$2_{10}\ 5_{10}$
Step 2	25_8	$010_2\ 101_2$
Step 3	25_8	010101_2

Octal Number: 25_8 = Binary Number: 10101_2

Shortcut method - Binary to Hexadecimal

Steps

- **Step 1** - Divide the binary digits into groups of four (starting from the right).
- **Step 2** - Convert each group of four binary digits to one hexadecimal symbol.

Example

Binary Number: 10101_2

Calculating hexadecimal Equivalent:

Step	Binary Number	Hexadecimal Number
Step 1	10101_2	0001 0101
Step 2	10101_2	$1_{10}\ 5_{10}$
Step 3	10101_2	15_{10}
Step 5	10101_2	F_{16}

Binary Number: 10101_2 = Hexadecimal Number: F_{16}

Shortcut method - Hexadecimal to Binary

Steps

- **Step 1** - Convert each hexadecimal digit to a 4 digit binary number (the hexadecimal digits may be treated as decimal for this conversion).
- **Step 2** - Combine all the resulting binary groups (of 4 digits each) into a single binary number.

Example

Hexadecimal Number: F_{16}

Calculating Binary Equivalent:

Step	Hexadecimal Number	Binary Number
Step 1	F_{16}	15_{10}
Step 2	F_{16}	$1_{10}\ 5_{10}$
Step 3	F_{16}	$0001_2\ 0101_2$
Step 4	F_{16}	00010101_2

Hexadecimal Number: F_{16} = Binary Number: 10101_2

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.

Data Processing Cycle

Data processing is the re-structuring or re-ordering of data by people or machine to increase their usefulness & add values for particular purpose.

Data processing consists of basic steps input, processing and output. These three steps constitute the data processing cycle.
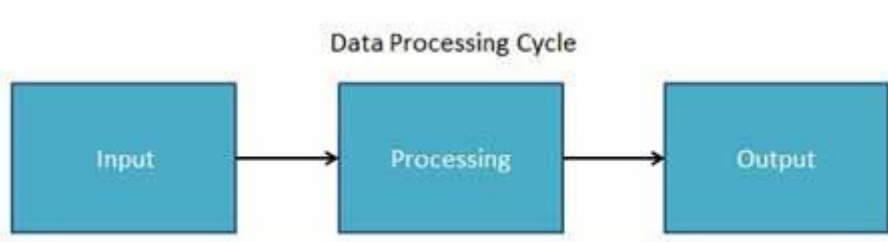
- **Input** - In this step the input data are prepared in some convenient form for processing. The form will depend on the processing machine. For example, when electronic computers are used, the input data could be recorded on any one of several types of input medium, such as magnetic disks, tapes and so on.
- **Processing** - In this step input data are changed to produce data in a more useful form. For example, pay-checks may be calculated from the time cards, or a summary of sales for the month may be calculated from the sales orders.
- **Output** -Here the result of the proceeding processing step are collected. The particular form of the output data depends on the use of the data. For example, output data may be pay-checks for employees.

Computer - Networking

What is a Computer Network?

A computer network is a system in which multiple computers are connected to each other to share information and resources.

Characteristics

- Share Resources from one computer to another
- Create files and store them in one computer, access those files from the other computer(s) connected over the network
- Connect a printer , scanner, or a fax machine to one computer within the network and let other computers of the network use the machines available over network.

Following is the list of hardwares required to setup a computer network.

- Network Cables
- Distributors
- Router
- Internal Network Cards
- External Network Cards

Network Cables

- Network cable are used to connect computers. The most commonly used cable are Category 5 cable RJ-45.

Distributors

- Each and every computer can be connected to another one via a serial port but if we need to connect many computers to produce a network, this serial connection will not work. The solution is to use a central body to which other computers, printers, scanners etc. can be connected and, and then this body will manage or distribute network traffic.

Router

- Arouter is a type of device which acts as the central point among computers and other devices that are part of a network.
- A router is equipped with holes called ports.
- computers and other devices are connected to a router using network cables.
- Now-a-days router comes in wireless modes using which computers can be connected without any physical cable.

Network Card

- Network card is a necessary component of a computer without which a computer cannot be connected over a network.
- Also known as network adapter or Network Interface Card (NIC).
- Most of branded computers have network card pre-installed.
- Network cards are of two types: Internal and External Network Cards

Internal Network Cards

- Motherboard has a slot for internal network card where it is to be inserted.
- Internal network cards are of two types.
- First type uses Peripheral Component Interconnect (PCI) connection.
- Second type uses Industry Standard Architecture (ISA).
- Network cables are required to provide network access

External Network Cards

- Comes in two flavour: Wireless and USB based.
- Wireless network card need to inserted into the motherboard but no network cable is required to connect to network.

- USB card, are easy to use and connect via USB port.

- Computer automatically detects USB card and can install the drivers required to support the USB network card automatically.
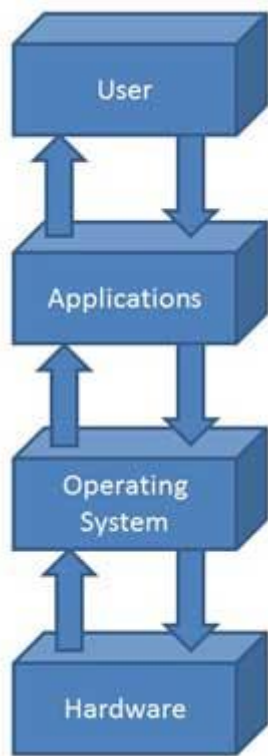
Computer - Operating System

- An operating system is a program that acts as an interface between the software and the computer hardware.
- It is an integration set of specialised programs that are used to manage overall resources and operations of the computer.
- It is specialised software that controls and monitors the execution of all other programs that reside in the computer, including application programs and other system software.

Objectives of Operating System

- Making a computer system convenient to use in an efficient manner
- To hide the details of the hardware resources from the users
- To provide users a convenient interface to use the computer system.
- To act as an intermediary between the hardware and its users and making it easier for the users to access and use other resources.
- Manage the resources of a computer system.
- keep track of who is using which resource, granting resource requests, according for resource using and mediating conflicting requests from different programs and users.
- The efficient and fair sharing of resources among users and programs

Characteristics of Operating System

- **Memory Management** -- It keeps tracks of primary memory i.e what part of it are in use by whom, what part are not in use etc.Allocates the memory when the process or program request it.
- **Processor Management** -- Allocate the processor(CPU) to a process. Deallocate processor when processor is no longer required.
- **Device Management** -- Keep tracks of all devices.This is also called I/O controller. Decides which process gets the device when and for how much time.
- **File Management** -- Allocates the resources. De-allocates the resource. Decides who gets the resources.
- **Security** -- By means of passwords & similar other techniques, preventing unauthorized access to programs & data.
- **Job accounting** -- Keeping track of time & resources used by various jobs and/or users.
- **Control over system performance** -- Recording delays between request for a service & from the system.
- **Interaction with the operators** -- The interaction may take place via the console of the computer in the form of instructions. Operating System acknowledges the same, do the corresponding action and inform the operation by a display screen.
- **Error-detecting aids** -- Production of dumps, traces, error messages and other debugging and error-detecting methods.
- **Coordination between other software and users** -- Coordination and assignment of compilers, interpreters, assemblers and other software to the various users of the computer systems.

Computer - Internet & Intranet

Internet

- Internet is a world-wide / global system of interconnected computer networks.
- Internet uses the standard Internet Protocol (TCP/IP)
- Every computer in internet is identified by a unique IP address.
- IP Address is a unique set of numbers (such as 110.22.33.114) which identifies a computer location.

- A special computer DNS (Domain Name Server) is used to give name to the IP Address so that user can locate a computer by a name.
- For Example, a DNS server will resolve a name **http://www.sbdsisaikat.com** to a particular IP address to unique identify the computer on which this website is hosted.
- Internet is accessible to every user all over the world.

Intranet

- Intranet is system in which multiple PCs are networked to be connected to each other.
- PCs in intranet are not availble to the world outside of the intranet.
- Usually each company or organizations have their own Intranet network and members/employees of that company can access the computers in their intranet.
- Each computer in Intranet is also identified by a IP Address which is unique among the computers in that Intranet.

Similarities in Internet & Intranet

- Intranet uses the internet protocols such as TCP/IP and FTP.
- Intranet sites are accessible via web browser in similar way as websites in internet. But only memebers of Intranet network can access intranet hosted sites.
- In Intranet, own instant messengers can be used as similar to yahoo messenger/ gtalk over the internet.

Differences in Internet & Intranet

- Internet is general to PCs all over the world where Intranet is specific to few PCs.
- Internet is wider access and provides a better access to websites to large populcation where as Intranet is restricted.
- Internet is not as safe as Intranet as Intranet can be safely privatized as per the need.

Computer - How to Buy?

- In this guide, we'll help you to look for when you think to buy a desktop on component by component basis.
- As Desktops are highly customizable, so it is better to learn about main parts and then go to manufacturer or retailer shop or site instead of looking at some specific model directly.
- Popular desktop brands are Dell, Lenovo, HP and Apple.
- Compare the desktops based on their specifications and base price.

Monitor

- **Size** - It is the diagonal size of the LCD screen.Larger the area, bigger the picture screen. A bigger picture is preferable for movie watching and gaming.It will increase productivity as well.
- **Resolution** - This is the number of pixels on the screen. For example, 24-inch display is 1920x1200 (width by length) and 22-inch display which is 1680x1050. High resolution provides better picture quality and a nice gaming experience.
- **Inputs** - Now-a-days monitors can accept inputs from cable as well apart from computer. They also can have USB ports.
- **Stand** - Some monitors provides adjustable stands but some may not.
- **Recommanded** - 24 Inch LCD.

Operating System

- Operating System is the main software of the computer as everything will run on it in one form or other.
- There are primarily three choices: **Windows** , **Linux**, **Apple OS X**.
- **Linux** is free but peple generally do not use it for home purpose.
- **Apple OS X** works only on Apple Desktops.
- **Windows 7** is very popular among desktop users.
- Most of the computer comes pre-equipped with Windows 7 Starter edition.
- **Windows 8** is recently introduced and is availble in market.
- **Windows 7**,**Windows 8** come under multiple versions from starter,home basic,home premium, professional, ultimate and enterprise editions.
- As edition version increases, their features list and price increases.
- **Recommanded** - Windows 7 Home Premium.

Optical Drive (CD / DVD / Blu-ray)

- Optical drive is the drive on a computer which is responsible to CD , DVD and Blu-ray discs.
- Now-a-days, DVD burners are industry standards.
- DVD Burner can burn CD, DVD and play them.
- DVD Burner are cheaper than Blu-ray drives.
- Blu-ray drives can play HD movies but are costlier component.
- **Recommanded** - DVD Burner.

Memory

- RAM is considered as Computer Memory as performance of a computer is directly proproational to its memory and processor.
- Today's software and operating system requires high memory.
- Today commonly used Ram is DDR3 which operates at 1066Mhz
- As per window 7, 1 GB is the minimum RAM required to function properly.
- **Recommanded** - 4 GB.

Hard Drive

- Hard disk is used for storage purpose. Higher the capacity, more data you can save in it.
- Now-a-day's computer are equipped with 500GB which can be extended to 2TB.
- Most hard drives in desktop operate at the standard performance speed of 7200RPM.
- **Recommanded** - 500GB.

CPU

- **Frequency (Ghz)** - This determines speed of the processor. More the speed, better the CPU.
- **Cores** - Today's CPUs come with more than one core, which is like having more than one CPU in the computer. Programs which can take advantage of multi-core environment will run faster on such machines.
- **Brand** - Intel or AMD. Both are equivalent. Intel is in lead.
- **Cache** - Higher the L1, L2 cache, better the CPU performance
- **Recommanded** - Intel Core i3 i3-3225 3.30 GHz Processor.

Computer - Available Courses

Now a days, various type of educational courses are provided by educational institutions.

Course	Name	Duration (years)	Mininum Qualification
B.C.A	Bachlor of Computer Applications	3	10+2
P.G.D.C.A	Post Graduate Diploma in Computer Applications	1	Graduation
M.C.A	Master of Computer Applications	3	Graduation
B.Sc.(CS)	Bachlor of Science (Computer Science)	3	10+2
M.Sc.(CS)	Master of Science (Computer Science)	2	Graduation
B.Tech.(CSE)	Bachlor of Technology (Computer Science and Engineering)	4	10+2
B.Tech.(IT)	Bachlor of Technology (Information Technology)	4	10+2
M.Tech.(CSE)	Master of Technology (Computer Science and Engineering)	2	B.Tech / B.E.
M.Tech.(IT)	Master of Technology (Information Technology)	2	B.Tech / B.E.
B.E.(CSE)	Bachlor of Engineering (Computer Science and Engineering)	4	10+2
B.E.(IT)	Bachlor of Engineering (Information Technology)	4	10+2

Diploma Courses

Apart from regular degree courses, now computer centers also provides short term courses (from 3 months to 1 year).

Online courses are also getting popularity for such courses.

- Computer Basics
- Programming Language Trainings
- Hardware Trainings
- Network Certifications