

UNIT - I  
COMPUTER FUNDAMENTALS AND APPLICATIONS

Computer

The term "computer" is derived from the Latin word "computare" which means to calculate. It is believed that the Analytical Engine was the first computer which was invented by Charles Babbage in 1837. Charles Babbage is also known as the father of the computer. It uses read-only memory in the form of punch cards.

A computer is an electronic device that manipulates information, or data. It has the ability to store, retrieve, and process data.

A computer is a programmable device that stores, retrieves, and processes data. The term "computer" was originally given to humans (human computers) who performed numerical calculations using mechanical calculators, such as the abacus and slide rule. The term was later given to mechanical devices as they began replacing human computers. Today's computers are electronic devices that accept data (input), process that data, produce output, and store (storage) the results (IPOS).

The Full Form of Computer is a Commonly Operated Machine Particularly used for Technical and Educational Research.

C – Commonly

O – Operated

M – Machine

P – Particularly

U – Used for

T – Technical

E – Education

R – Research

Characteristics of Computer

- Speed
- Accuracy
- Diligence
- Reliability
- Versatility
- Storage Capacity
- Automatic
- Quick Decision
- Multitasking
- No Feeling
- Power of Remembering
- No IQ

Generations of Computer

**First Generation**

Period: (1940-1956)

Main components used: Vacuum tubes

Characteristics:

- Big in size
- Consumed more power
- Malfunction due to overheat
- Machine Language was used

First Generation Computers - ENIAC , EDVAC , UNIVAC 1

**Second Generation**

Period: 1956-1964

Main components used: Transistors

Characteristics:

- Smaller compared to First Generation
- Generated Less Heat
- Consumed less power compared to first generation
- Punched cards were used
- First operating system was developed - Batch Processing and Multiprogramming operating System
- Machine language as well as Assembly language was used.

Second Generation Computers IBM 1401, IBM 1620, UNIVAC 1108

### **Third Generation**

Period: 1964-1971

Main components used: Integrated Circuits (IC)

Characteristics:

- Computers were smaller, faster and more reliable
- Consumed less power
- High Level Languages were used

Third Generation Computers IBM 360 series, Honeywell 6000 series

### **Fourth Generation**

Period: 1971-1980

Main components used: Microprocessor Very Large Scale Integrated Circuits (VLSI)

Characteristics:

- Smaller and Faster
- Microcomputer series such as IBM and APPLE were developed
- Portable Computers were introduced.

### **Fifth Generation**

Period: 1980- till date

Main components used: Ultra Large Scale Integration (ULSI)

Characteristics:

- Parallel Processing
- Super conductors
- Computers size was drastically reduced.
- Can recognize Images and Graphics
- Introduction of Artificial Intelligence and Expert Systems
- Able to solve high complex problems including decision making and logical reasoning

### **Sixth Generation**

Period: future

Characteristics:

- Parallel and Distributed computing
- Computers have become smarter, faster and smaller
- Development of robotics
- Natural Language Processing
- Development of Voice Recognition Software

In the Sixth Generation, computers could be defined as the era of intelligent computers, based on Artificial Neural Networks. One of the most dramatic changes in the sixth generation will be the explosive growth of Wide Area Networking. Natural Language Processing (NLP) is a component of Artificial Intelligence (AI). It provides the ability to develop the computer program to understand human language.

## Classification of computer

By type:

- Analog computer
- Digital computer
- Hybrid computer

By size

- Micro computer
- Mini computer
- Mainframe computer
- Super computer

By purpose

- General computer
- Specific computer

**By type:**

Analog computer

Analog computer is that computer, which is used to process continuously varying data. Everything we see and hear is changing continuously. This changeable continuous stream of data is called analog data. Analog computer can be used in scientific and industrial applications such as measure the electrical current, frequency and resistance of capacitor, etc. Analog computers are used in such areas, where we need data to be measured directly without transforming into numbers. Analog computer uses the programs for transforming of problematic equations into analog circuit. These are generally used to monitor real-world conditions like Wind, Sound, Movement, Temperature, etc.

Digital computer

Digital computer represents the digital computer's letters, numerical values, or any other special symbols. They run on electronic signs, and the binary numeral method Binary System 0 or 1 is used for calculation. Their speed is fast. It can perform arithmetic operations such as addition, subtraction, multiplication, or division and all types of logical (mathematical) operations. Today, most of the computers available in the market are digital computers. Digital computers are built to bring the solution of equations to an almost unlimited precision, but in a bit slow manner compared to analog computers. To some extent, they all have similar components for receiving, processing, sorting, and transmitting data and use a relatively small number of essential functions to perform their tasks. It uses discrete electrical signals for operation rather than continuous electrical signals as analog computers have, making them the most common form of computers today because of their versatility, speed, and power.

Hybrid Computer

Hybrid computer has features of both analogue and digital computer. It is fast like an analogue computer and has memory and accuracy like digital computers. It can process both continuous and discrete data. It accepts analogue signals and convert them into digital form before processing. So, it is widely used in specialized applications where both analogue and digital data is processed. For example, a processor is used in petrol pumps that converts the measurements of fuel flow into quantity and price. Its computing speed is very high due to the all-parallel configuration of the analogue subsystem. It produces precise and quick results that are more accurate and useful. It has the ability to solve and manage big equation in real-time. It helps in the on-line data processing. Similarly, they are used in airplanes, hospitals, and scientific applications. In a hospital intensive care unit analog devices may measure a patient's heart function, temperature etc. these measurements may then be converted into numbers and supplied to digital devices.

### Types of Computer- Based on Purpose

- General Purpose Computer
- Special Purpose Computer

#### **General Purpose Computer**

These computers can store different programs and can thus be used in countless applications. A General Purpose computer can perform any kind of jobs with equal efficiency simply by changing the application program stored in main memory.

#### **Special Purpose Computer**

A Special Purpose Computer is the one that is designed to perform only one special task. The program or instructions set is permanently stored in such a machine. It does its single task very quickly and it cannot be used for any other purpose.

These computers are often used to perform specific functions such as controlling a manufacturing process or directing communications.

### Types of Computer- Based on Size

- Micro Computer
- Mini Computer
- Mainframe Computer
- Super computer

#### **Micro Computer or personal computers**

A microcomputer is a computer whose CPU is a microprocessor. A microprocessor is a processor all of whose components are on a single integrated circuit chip.

Personal computers are a kind of micro computer. Personal computers are called so because they are designed for personal use of individual or individual small business units' office automation unit or professionals. PC can be used for a variety of applications like computer literacy, fun and games, business applications, programming etc.

Types of Micro Computer or personal computers

- Desktop Computer
- Laptop Computer
- Palmtop Computer, Digital Diary, Notebook, PDAs.

#### **Mini Computer**

It is a midsize multiprocessing computer. It consists of two or more processors and can support 4 to 200 users at one time. Minicomputers are used in institutes and departments for tasks such as billing, accounting and inventory management. A minicomputer lies between the mainframe and microcomputer as it is smaller than mainframe but larger than a microcomputer. They are smaller versions of the mainframes. Generally they offer the same computing power as bigger counterparts. The most important advantage of a mini computer over the main frame is that it is cheaper in cost, smaller in size and reliable. It does not require air conditioning and can be operated in room temperature. Main uses of these systems is in education in local government word processing etc. in business they are being used for involving stock payroll etc. it is generally used as server system on networks with personal computers as nodes.

#### **Mainframe Computer**

They are very big in size and offer the maximum computing power. A large number of peripherals can be attached to them. They are generally used in large networks of computers with the mainframe being model point of the network. They used satellites for networking.

A typical application is the airline system. It has a mainframe computer at their head office where information of all the flights is stored. Small computers are installed at the booking offices are attached to central data bank, so that up to date information of all flights is always available.

Some computers are – Univac 1100/10, Univac 1100/60, Honeywell DSP 88/860, IBM 270/168 etc.

### **Super computer**

They are most expensive of all the computers. These computers are big general purpose computers capable of executing more than 10,000 millions instruction per second and have storage capacities of millions of bits per chip. These computers are used to solve the multi-variate mathematical problems such as atomic nuclear and plasma physics seismology, aerodynamics etc.

Super computer are typically capable of handling hundreds of millions of floating point. Operations per second (MFLOPS). The speed of super computers generally measured in “FLOPS” (Floating Point Operations Per Second).

### Parts of a computer

- Monitor
- CPU
- Keyboard
- Mouse
- Storage Unit
- Memory Unit
- UPS
- Motherboard
- Power Supply Unit
- GPU
- Computer Case
- Printer
- Speaker

### **Monitor**

The monitor is the main part of a computer system. A monitor is a glass screen and the main function of a monitor to display the output result.

### **Keyboard**

A keyboard is an input device used by the user to send data or messages to the computer. It is also the main part of a computer because without a keyboard we will not be able to input any kind of textual data to the computer.

### **Mouse**

A computer mouse is a pointing device and input device in a computer system. The main function of a computer mouse is to open files, folders, applications on the monitor screen, and when done, close those files, folders, applications, and programs. The mouse is on the monitor screen as the cursor. A computer mouse can be wired or wireless.

### **Storage Unit**

Storage unit is main part of our computer system.

Our computer is incomplete without a storage unit because we will not be able to store any type of data like documents files, audio files, video files etc. in our computer.

Earlier storage units were not capable of storing much data but today's storage units are capable of storing a very large amount of data.

There are also two types of storage units.

- HDD
- SDD

### **Memory Unit**

Memory unit is also a main part of our computer without which our computer system is incomplete. It play a very important role in running our computer because without the

memory unit our computer system cannot be open. It is used by the computer system according to itself and this memory is very close to the central processing unit.

There are mainly two types of memory units.

RAM

ROM

UPS

UPS stands for uninterruptible power supply. UPS just like a battery.

This is also a main part of the computer, without which our computer is incomplete.

After the power cut, the uninterruptible power supply provides electricity to our computer so that our computer continues to run even after the power cut.

With UPS, you cannot run the computer for a long time, UPS can capable for run the computer for a few hours.

UPS keeps the computer safe and also keeps the user's work safe.

### **Motherboard**

A motherboard is also the main part of a computer because the motherboard is the main circuit of the computer, in which many main parts of the computer are connected such as - RAM, ROM, video card, network card, processor, and power supply.

The motherboard is silent to which all peripheral devices are connected. For example, keyboard, mouse, pen drive, UPS, etc. are all peripheral devices. The main function of the motherboard is communication between the devices that include, control and monitoring, administration, or management of electrical energy as well as its distribution throughout the computer.

### **Power Supply Unit**

A power supply is the main part of a computer because without a power supply our computer is not open. Power Supply Unit means - An electronic component that provides electrical energy to a computer system that runs the computer.

It controls the electrical voltage of your computer and helps your computer system to run properly without overheating. The power supply looks like a metal box with a small fan inside.

### **GPU ( Graphics Processing Unit)**

GPU is also known as a graphics card.

It is an electronic component that enhances the quality of your images and videos so that the quality of viewing the image or video is pleasing to the user.

Everything you see on a computer screen is visible to you through graphics.

Without graphics, your computer screen will not look good, due to which a user does not get a good experience of using the computer. Most of the graphics are on the gaming computer or laptop so that the user playing the game enjoys it even more.

### **Computer Case**

Computer case is also a most important part of computer system. A computer case is like a box made of iron or plastic that contains computer parts. Such as motherboard, processor, power supply, hard disk, RAM, ROM, graphics card, cooling fan and many other parts of the computer fit in this case.

If there was no computer case, then all the parts of the computer would have been scattered, but due to the computer case, the parts of the computer would fit in a box. People think of a computer case as a CPU, but the CPU is inside the computer case. There are many types of computer cases which come in different sizes.

### **Printer**

The printer is an output device. It is used to print any digital data we have like - text, photo which is on our computer. We use the printer to print any soft copy in hard copy and when the

soft copy comes out after printing as a hard copy then it is called printout. There are many types of printers available with many features.

### **Speaker**

Speaker is an output device of a computer. The job of a speaker is to take out the audio as an output so that a person can hear that audio. The speaker converts the electromagnetic waves of the computer into audio waves so that we can hear electrical signals in the form of audio.

### Input devices

Important input devices which are used in a computer:

- 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(OMR)

### **Keyboard**

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

### **Mouse**

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

Generally, it has two buttons called the left and the right button and a wheel is present between the buttons. A mouse can be used to control the position of the cursor on the screen, but it cannot be used to enter text into the computer.

### **Joystick**

Joystick is also a pointing device, which is used to move the 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. The joystick can be moved in all four directions.

### **Light Pen**

Light pen is a pointing device 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 the tip of a light pen is moved over the monitor screen and the 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 the ball, the pointer can be moved.

### **Scanner**

Scanner is an input device, which works more like a photocopy machine. It is used when some information is available on paper and it is to be transferred to the hard disk of the computer for further manipulation. Scanner captures images from the source which are then

converted into a digital form that can be stored on the disk. These images can be edited before they are printed.

### **Digitizer**

Digitizer is an input device which converts analog information into digital form. Digitizer can convert a signal from the television or 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.

### **Microphone**

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

### **Magnetic Ink Card Reader (MICR)**

MICR input device is generally used in banks as there are 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 are 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 the text optically, character by character, converts them into a machine readable code, and stores the text on the system memory.

### **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.

### Output Device

An output device is a piece of computer hardware that receives data from a computer and then translates that data into another form. That form may be audio, visual, textual, or hard copy such as a printed document.

1. Monitor
2. Printer
3. Projector

#### 1. Monitor

- CRT Monitor
- LCD Monitor
- LED Monitor
- Plasma Monitor

#### 2. Printer

1. Impact Printers
2. Non-impact printers

### Impact Printers

- Character Printers
- Line printers

### **Character Printers**

- Dot Matrix printers
- Daisy Wheel printers

### **Line printers**

- Drum printers
- Chain printers



### Non-impact printers

- Laser printer
- Inkjet printers

### 3. Projector

A projector is an output device that enables the user to project the output onto a large surface such as a big screen or wall. It can be connected to a computer and similar devices to project their output onto a screen. It uses light and lenses to produce magnified texts, images, and videos. So, it is an ideal output device to give presentations or to teach a large number of people.

Modern projects (digital projectors) come with multiple input sources such as HDMI ports for newer equipment and VGA ports that support older devices. Some projectors are designed to support Wi-Fi and Bluetooth as well. They can be fixed onto the ceiling, placed on a stand, and more and are frequently used for classroom teaching, giving presentations, home cinemas, etc.

### Processing devices

Processing devices are the components responsible for the processing of information within the computer system. This includes devices such as the CPU, memory and motherboard.

#### **CPU**

Central processing unit (CPU) is the central component of the Computer System. Sometimes it is called as microprocessor or processor. It is the brain that runs the show inside the Computer. All functions and processes that is done on a computer is performed directly or indirectly by the processor. Obviously, computer processor is one of the most important element of the Computer system. CPU is consist of transistors that receives inputs and produces output. Transistors perform logical operations which is called processing. It is also, scientifically, not only one of the most amazing devices in the world of technology.

#### Parts of CPU

- Control Unit
- Memory unit
- Arithmetic Logic Unit

**Control Unit (CU):** Decodes the program instruction. CPU chip used in a computer is partially made out of Silica. on other words silicon chip used for data processing are called Micro Processor.

**Memory unit (MU):** In this unit can store instruction, data and intermediate results by supplying information to the other units of the computer when needed. Also known as internal storage or Random access memory (RAM). Size of the memory or storage unit effects speed, power and capability.

#### *ALU (Arithmetic Logic Unit)*

This unit consists of two subsections 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 the above operations.

#### *Logic Section*

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

#### **Motherboard**

A motherboard is the main circuit board inside a computer that connects the different parts of a computer together. It has sockets for the CPU, RAM and expansion cards and it also hooks up to hard drives, disc drives and front panel ports with cables and wires.

It is also known as a mainboard, planar board or logic board, system board, mobo or MB. It allows the CPU to access and control these separate parts other than bridging internal components. The motherboard ports allows us to connect external devices to the computer. Such external devices would include the monitor, speakers, headphones, microphone, keyboard, mouse, modem and other USB devices.

Functions of the Motherboard

- The motherboard acts as the central backbone of a computer on which other modular parts are installed such as the CPU, RAM and hard disks.
- The motherboard also acts as the platform on which various expansion slots are available to install other devices / interfaces.
- The motherboard is also responsible to distribute power to the various components of the computer.
- They are also used in the coordination of the various devices in the computer and maintain an interface among them.
- Some of the Sizes in which the motherboards are available are : BTX, ATX, mini-ATX, micro-ATX, LPX, NLX etc..

Memory Devices

A memory is just like a human brain. It is used to store data and instructions. Computer memory is the storage space in the computer, where data and instructions are stored. There are two types of accessing methods to access (read or write) the memory. They are sequential access and random access. In sequential access, the memory is accessed in an orderly manner from starting to end. But, in random access, any byte of memory can be accessed directly without navigating through previous bytes. Different memory devices are arranged according to the capacity, speed and cost. Computer memory is of two basic types namely,

- Primary memory
- Secondary memory

Primary memory (RAM)

The main memory is otherwise called as Random Access Memory. This is available in computers in the form of Integrated Circuits (ICs). It is the place in a computer where the Operating System, Application Programs and the data in current use are kept temporarily so that they can be accessed by the computer's processor. The smallest unit of information that can be stored in the memory is called as a bit. The memory can be accessed by a collection of 8 bits which is called as a byte. RAM is a volatile memory, which means that the information stored in it is not permanent. As soon as the power is turned off, whatever data that resides in RAM is lost. It allows both read and write operations.

Types of RAM

RAM is of two types:

1. Static RAM (SRAM)
2. 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.

**Dynamic Ram (DRAM)**

Dynamic RAM, unlike static RAM, must be continually replaced 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. It is used for most system memory because it is cheap and small.

These two types differ in the technology they use to hold data. Dynamic RAM being a common type needs to be refreshed frequently. Static RAM needs to be refreshed less often, which makes it faster. Hence, Static RAM is more expensive than Dynamic RAM.

### Read Only Memory (ROM)

Read Only Memory refers to special memory in a computer with pre-recorded data at manufacturing time which cannot be modified. The stored programs that start the computer and perform diagnostics are available in ROMs. ROM stores critical programs such as the program that boots the computer. Once the data has been written onto a ROM chip, it cannot be modified or removed and can only be read. ROM retains its contents even when the computer is turned off. So, ROM is called as a non-volatile memory.

### **Types of ROM**

1. Programmable Read Only Memory (PROM)
2. Erasable and Programmable Read Only Memory (EPROM)
3. Electrically Erasable and Programmable Read Only Memory (EEPROM)

### **Programmable Read Only Memory (PROM)**

Programmable read only memory is also a non-volatile memory on which data can be written only once. Once a program has been written onto a PROM, it remains there forever. Unlike the main memory, PROMs retain their contents even when the computer is turned off. The PROM differs from ROM. PROM is manufactured as a blank memory, whereas a ROM is programmed during the manufacturing process itself. PROM programmer or a PROM burner is used to write data to a PROM chip. The process of programming a PROM is called burning the PROM.

### **Erasable Programmable Read Only Memory (EPROM)**

Erasable Programmable Read Only Memory is a special type of memory which serves as a PROM, but the content can be erased using ultraviolet rays. EPROM retains its contents until it is exposed to ultraviolet light. The ultraviolet light clears its contents, making it possible to reprogram the memory. An EPROM differs from a PROM, PROM can be written only once and cannot be erased. EPROMs are used widely in personal computers because they enable the manufacturer to change the contents of the PROM to replace with updated versions or erase the contents before the computer is delivered.

### **Electrically Erasable Programmable Read Only Memory (EEPROM)**

Electrically Erasable Programmable Read Only Memory is a special type of PROM that can be erased by exposing it to an electrical charge. Like other types of PROM, EEPROM retains its contents even when the power is turned off. Comparing with all other types of ROM, EEPROM is slower in performance.

### Secondary Storage Devices

A computer generally has limited amount of main memory which is expensive and volatile. To store data and programs permanently, secondary storage devices are used. Secondary storage devices serve as a supportive storage to main memory and they are non-volatile in nature, secondary storage is also called as Backup storage.

### Optical Storage Devices

It is also a secondary storage device. It is a removable storage device. Following are some optical storage devices:

CD: It is known as Compact Disc. It contains tracks and sectors on its surface to store data. It is made up of polycarbonate plastic and is circular in shape. CD can store data up to 700MB.

It is of two types:

CD-R: It stands for Compact Disc read-only. In this type of CD, once the data is written can not be erased. It is read-only.

CD-RW: It stands for Compact Disc read Write. In this type of CD, you can easily write or erase data multiple times.

**DVD:** It is known as Digital Versatile Disc or Digital Video Disc. DVDs are circular flat optical discs used to store data. It comes in two different sizes one is 4.7GB single-layer discs and another one is 8.5GB double-layer discs. DVDs look like CDs but the storage capacity of DVDs is more than as compared to CDs. It is of two types:

**DVD-R:** It stands for Digital Versatile Disc read-only. In this type of DVD, once the data is written can not be erased. It is read-only. It is generally used to write movies, etc.

**DVD-RW:** It stands for Digital Versatile Disc read Write. In this type of DVD, you can easily write or erase data multiple times.

#### **Blu-Ray Disc**

Blu-Ray Disc is a high-density optical disc similar to DVD. Blu-ray is the type of disc used for PlayStation games and for playing High-Definition (HD) movies. A double-layer Blu-Ray disc can store up to 50GB (gigabytes) of data. DVD uses a red laser to read and write data. But, Blu-ray uses a blue-violet laser to write. Hence, it is called as Blu-Ray.

#### **Magnetic Storage Devices**

**Floppy Disk:** It is also known as a floppy diskette. It is generally used on a personal computer to store data externally. A Floppy disk is made up of a plastic cartridge and secures with a protective case. Nowadays floppy disk is replaced by new and effective storage devices like USB, etc.

**Hard Disk:** It is a storage device (HDD) that stores and retrieves data using magnetic storage. It is a non-volatile storage device that can be modified or deleted n number of times without any problem. Most of the computers and laptops have HDDs as their secondary storage device. It is actually a set of stacked disks, just like phonograph records. In every hard disk, the data is recorded electromagnetically in the concentric circles or we can say track present on the hard disk, and with the help of a head just like a phonograph arm (but fixed in a position) to read the information present on the track. The read-write speed of HDDs is not so fast but decent. It ranges from a few GBs to a few and more TB.

#### **Flash memory Devices**

It is a cheaper and portable storage device. It is the most commonly used device to store data because is more reliable and efficient as compare to other storage devices. Some of the commonly used flash memory devices are:

(i) **Pen Drive:** It is also known as a USB flash drive that includes flash memory with an integrated USB interface. We can directly connect these devices to our computers and laptops and read/write data into them in a much faster and efficient way. These devices are very portable. It ranges from 1GB to 256GB generally.

(ii) **SSD:** It stands for Solid State Drive, a mass storage device like HDDs. It is more durable because it does not contain optical disks inside like hard disks. It needs less power as compared to hard disks, is lightweight, and has 10x faster read and write speed as compared to hard disks. But, these are costly as well. While SSDs serve an equivalent function as hard drives, their internal components are much different. Unlike hard drives, SSDs don't have any moving parts and thus they're called solid-state drives. Instead of storing data on magnetic platters, SSDs store data using non-volatile storage. Since SSDs haven't any moving parts, they do not need to "spin up". It ranges from 150GB to a few and more TB.

**SD Card:** It is known as a Secure Digital Card. It is generally used with electronic devices like phones, digital cameras, etc. to store larger data. It is portable and the size of the SD card is also small so that it can easily fit into electronic devices. It is available in different sizes like 2GB, 4GB, 8GB, etc.

**Memory Card:** It is generally used in digital cameras, printers, game consoles, etc. It is also used to store large amounts of data and is available in different sizes. To run a memory card on a computer you require a separate memory card reader.

Multimedia Card: It is also known as MMC. It is an integrated circuit that is generally used in-car radios, digital cameras, etc. It is an external device to store data/information.

**Computer Hardware:**

Hardware refers to the physical components of a computer. Computer Hardware is any part of the computer that we can touch these parts. These are the primary electronic devices used to build up the computer.

Examples of hardware in a computer are the Processor, Memory Devices, Monitor, Printer, Keyboard, Mouse, and the Central Processing Unit.

**Computer Software:**

Software is a collection of instructions, procedures, documentation that performs different tasks on a computer system. we can say also Computer Software is a programming code executed on a computer processor. The code can be machine-level code or the code written for an operating system.

Examples of software are Ms Word, Excel, Power Point, Google Chrome, Photoshop, etc.

Hardware	Software
Hardware is a physical component of computers that executes the instruction.	Software is a program that enables users to interact with the computer, its hardware.
It is manufactured in factories.	It is developed by software programmers or software development companies.
Storage Devices, Input Devices, Output Devices, and Internal components are the primary categories of hardware.	Operating Systems, Application Software, and Programming Software are the main categories of software.
Hardware can be seen and touch as it is a physical, electronic device.	The software can be seen but cannot be touched as it is virtual, not physical.
Computer viruses cannot affect hardware.	Computer viruses can affect software.
Hardware can be replaced with a new one if it is damaged.	The software is reinstalled if it gets damaged.
Through the network, hardware cannot be transferred electrically. Only, it can be physically transferred.	The software can be transferred easily.
Examples of hardware are RAM, ROM, Printer, Monitor, Mouse, Hard disk and more.	Examples of software are Google Chrome, MySQL, MS Word, Excel, PowerPoint, Notepad, Photoshop and more.

**Types of Software**

Software is classified into two types:

- 1) Application Software
- 2) System Software

Application Software:

Application software is a set of programs to perform specific task. For example MS-word is an application software to create text document and VLC player is familiar application software to play audio, video files and many more.

System Software:

System software is a type of computer program that is designed to run the computer's hardware and application programs. Example Operating System and Language Processor

### Operating System (OS)

An Operating System (OS) is a system software which serves as an interface between a user and a computer. This controls input, output and other peripheral devices such as disk drives, printers and electronic gadgets. The functions of an Operating System include file management, memory management, process management and device management and many more. Without an Operating System, a computer cannot effectively manage all the resources. When a computer is switched on, the operating system is loaded in to the memory automatically. Some of the popular Operating Systems used in personal computers and laptops are Windows, UNIX and Linux. The mobile devices mostly use Android and iOS as mobile OS

### **The main use of Operating System is**

- To ensure that a computer can be used to extract what the user wants it do.
- Easy interaction between the users and computers.
- Starting computer operation automatically when power is turned on (Booting).  
Controlling Input and Output Devices
- Manage the utilization of main memory.
- Providing security to user programs

### Types of Operating System

Operating System are classified into the following types depending on their processing capabilities.

- Single User Operating Systems
- Multi-user Operating Systems

### **Single User Operating Systems**

An operating system allows only a single user to perform a task at a time. It is called as a Single user and single Task operating system. MS-DOS is an example for a single user and single task Operating System.

### **Multi-user Operating Systems**

It is used in computers and laptops that allow same data and applications to be accessed by multiple users at the same time. The users can also communicate with each other. Windows, Linux and UNIX are examples for multi-user Operating System

### Window

A window is simply a rectangular unit that acts independently from other windows.

### **Windows Desktop**

The opening screen of Windows is called "Desktop". The desktop of your computer may look different because Windows allows you to change the appearance of the desktop. The desktop shows the Start button, Taskbar, Notification Area and date and time.

### **The Icons**

Icon is a graphic symbol representing the window elements like files, folders, shortcuts etc., Icons play a vital role in GUI based applications.

### *Standard Icons*

The icons which are available on desktop by default while installing Windows OS are called standard icons. The standard icons available in all Windows OS are My Computer, Documents and Recycle Bin.

### *Shortcut Icons:*

Shortcut icons can be created for any application or file or folder. By double clicking the icon, the related application or file or folder will open.

*Disk drive icons:*

The disk drive icons graphically represent five disk drive options. (i) Hard disk (ii) CD-ROM/DVD Drive (iii) Pen drive (iv) Other removable storage such as mobile, smart phone, tablet etc., (v) Network drives if your system is connected with other system.

### **The Window**

Window is a typical rectangular area in an application or a document. It is an area on the screen that displays information for a specific program.

*Application Window*

It is an area on a computer screen with defined boundaries, and within which information is displayed. Such windows can be resized, maximised, minimised, placed side by side, overlap, and so on. An Application Window contains an open application i.e. current application such as Word or Paint. When two or more windows are opened, only one of them is active and the rest are inactive.

*Document Window*

A document window is a section of the screen used to display the contents of a document.

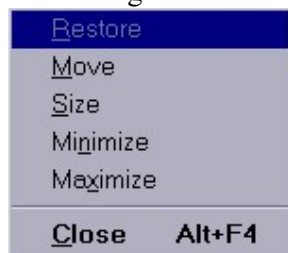
### Elements of a window

#### **Title bar**

The title bar will display the name of the application and the name of the document opened. It will also contain minimize, maximize and close button. Also, in the top-left corner of a program's window, there is an icon that shows these options when clicked.



- Press and hold the mouse button on the title bar to move the window.
- Double-click the title bar to maximize the window or set the window into window mode.
- Windows 7 introduced side-by-side windows, a feature that "snaps" windows to the side of the screen. To use side-by-side windows, click-and-drag the title bar to any edge of the screen.

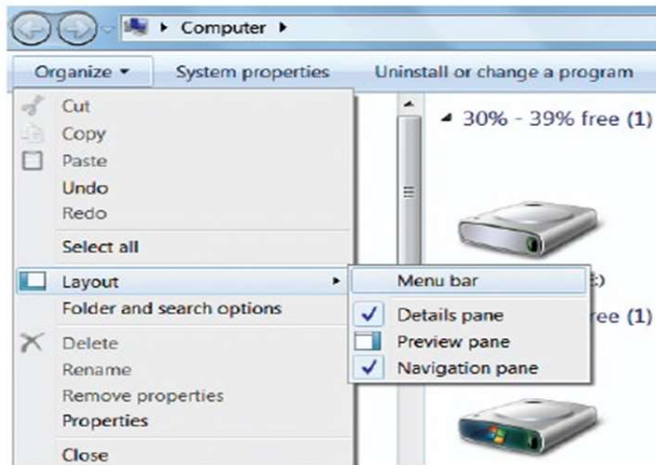


#### **Menu bar**

The menu bar is seen under the title bar. Menus in the menu bar can be accessed by pressing



Alt key and the letter that appears underlined in the menu title. Additionally, pressing Alt or F10 brings the focus on the first menu of the menu bar. In Windows 7, in the absence of the menu bar, click **Organize** and from the drop down menu, click the **Layout** option and select the desired item from that list.



### Workspace

The workspace is the area in the document window to enter or type the text of your document.

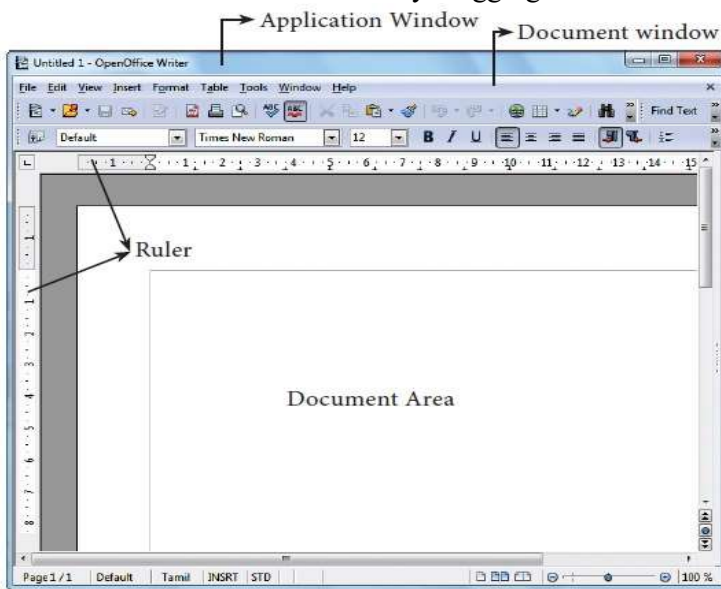
### Scroll bars

The scroll bars are used to scroll the workspace horizontally or vertically.

### Corners and borders

The corners and borders of the window helps to drag and resize the windows. The mouse pointer changes to a double headed arrow when positioned over a border or a corner.

Drag the border or corner in the direction indicated by the double headed arrow to the desired size. The window can be resized by dragging the corners diagonally across the screen.



### Control Panel

The Control Panel in Microsoft Windows enables a user to change various computer hardware and software features. Settings for the mouse, display, sound, network, and keyboard represent a few examples of what may be modified in the Control Panel.

Control Panel is the centralized configuration area in Windows. It changes nearly every aspect of the operating system, including keyboard and mouse function, passwords and users, network settings, power management, desktop backgrounds, sounds, hardware, program installation and removal, speech recognition, and parental control.

### Sections of the Windows Control Panel



There are eight main areas on the Control Panel, containing different tools designed to optimize your computer.

**System and Security** - A section to check your computer's status, backup and restore, and others.

**Network and Internet** - View network status.

**Hardware and Sound** - View which devices are on your computer and add devices.

**Programs** - Uninstall programs.

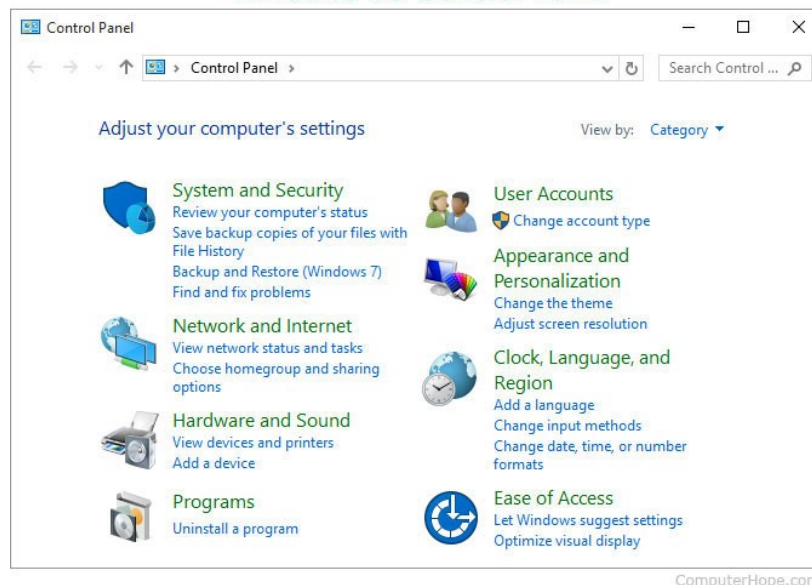
**User Accounts** - Change user accessibility.

**Appearance and Personalization** - Change desktop options, like fonts and screen readers.

**Clock and Region** - Change date and time.

**Ease of access** - Optimize your display settings.

### Windows 10 Control Panel



### Print Manager

The Windows Print Manager provides all printing functions such as scheduling, queueing and spooling. The Print Manager is not to be confused with the Windows Printing System, which provides only host-based printing to low-cost printers. Windows Print Manager is actually the "printing system," while the Windows Printing System is a function that works under the Windows Print Manager. See printing system and host-based printing.

Print Manager is the application used for job management of the printing system.

Print Manager includes three major functions.

One of the chief functions is to acquire the device information, such as the status of the machine, the consumables, and the tray information. From this information, you can confirm the status of the main body easily on your computer.

The second is to display and manage jobs. The job list of Print Manager enables the monitoring of a print job, a copy job, and a scan job, and the operation of a print job.

The third is the hot folder function used to manage and edit a hot folder.

### Clipboard

The clipboard, also known as pasteboard, is a special location on computer, phone, and tablet memory that temporarily stores cut or copied text or other data. Once something is stored in the clipboard, it can be pasted to a new location. The clipboard holds its information until you cut or copy something else, or log out of the computer.

## **How to copy or move information to the clipboard on a computer**

To copy information from a program to the clipboard, use the copy feature. For example, you could highlight the text, image, or another object you want to copy, and once highlighted, right-click it and choose the option to copy. Alternatively, you could use the copy keyboard shortcut Ctrl+C on the PC and Chromebook or Command+C on a Mac.

To move text or another object from a program to the clipboard, use the cut feature. For example, you could highlight the text, image, or another object you want to cut, and once highlighted, right-click it and choose the option to cut. Alternatively, you could use the cut keyboard shortcut Ctrl+X on the PC and Chromebook or Command+X on a Mac.

## **Paintbrush**

A paintbrush is a tool found in image editing and paint programs that allows users to digitally "paint" on an image file. This feature enables users to make edits to an image, like giving a picture a mustache or create something new on a blank page. The image shows an example of what the paintbrush icon looks like in many programs.

Paintbrush is also the name of a free, open-source raster image editing program; similar to Microsoft Paint.

## Write

When referring to data or a storage device, writing is taking information and moving it to an alternate location. For example, saving data onto a diskette is the same as writing information to a diskette.

Almost all forms of media are writable, which means any information can be written to it. However, if a disk is write protected or you don't have permission to write to the media, you will receive a write error.

## Computer virus

A computer virus is a type of malware that attaches to another program (like a document), which can replicate and spread after a person first runs it on their system. A computer virus is a program which can harm our device and files and infect them for no further use. When a virus program is executed, it replicates itself by modifying other computer programs and instead enters its own coding. This code infects a file or program and if it spreads massively, it may ultimately result in crashing of the device.

Across the world, Computer viruses are a great issue of concern as they can cause billions of dollars' worth harm to the economy each year.

## **Types of Virus**

Following are the major types of computer virus:

### Worms

This is a computer program that replicates itself at a swift pace. Unlike a computer virus, it is self-contained and hence does not need to be part of another program to propagate itself.

### Trojan Horse

A Trojan Horse is also a sort of destructive program that remains disguised in a normal software program. It is not exactly a virus, as it cannot replicate itself. However, there is possibility that virus program may remain concealed in the Trojan Horse.

### Bombs

It is similar to Trojan Horse, but Logic bombs have some specialty; these include a timing device and hence it will go off only at a particular date and time.

## **How Does Virus Affect?**

- By downloading files from the Internet.
- During the removable of media or drives.
- Through pen drive.
- Through e-mail attachments.
- Through unpatched software & services.

- Through unprotected or poor administrator passwords.

### **Impact of Virus**

- Disrupts the normal functionality of respective computer system.
- Disrupts system network use.
- Modifies configuration setting of the system.
- Destroys data.
- Disrupts computer network resources.
- Destroys of confidential data.

How does a computer virus attack?

Once a virus has successfully attached to a program, file, or document, the virus will lie dormant until circumstances cause the computer or device to execute its code. In order for a virus to infect your computer, you have to run the infected program, which in turn causes the virus code to be executed.

This means that a virus can remain dormant on your computer, without showing major signs or symptoms. However, once the virus infects your computer, the virus can infect other computers on the same network. Stealing passwords or data, logging keystrokes, corrupting files, spamming your email contacts, and even taking over your machine are just some of the devastating and irritating things a virus can do.

While some viruses can be playful in intent and effect, others can have profound and damaging effects. This includes erasing data or causing permanent damage to your hard disk. Worse yet, some viruses are designed with financial gains in mind.

### **How do computer viruses spread?**

In a constantly connected world, you can contract a computer virus in many ways, some more obvious than others. Viruses can be spread through email and text message attachments, Internet file downloads, and social media scam links. Your mobile devices and smartphones can become infected with mobile viruses through shady app downloads. Viruses can hide disguised as attachments of socially shareable content such as funny images, greeting cards, or audio and video files.

To avoid contact with a virus, it's important to exercise caution when surfing the web, downloading files, and opening links or attachments. To help stay safe, never download text or email attachments that you're not expecting, or files from websites you don't trust.

Signs of a computer virus

A computer virus attack can produce a variety of symptoms. Here are some of them:

- **Frequent pop-up windows.** Pop-ups might encourage you to visit unusual sites. Or they might prod you to download antivirus or other software programs.
- **Changes to your homepage.** Your usual homepage may change to another website, for instance. Plus, you may be unable to reset it.
- **Mass emails being sent from your email account.** A criminal may take control of your account or send emails in your name from another infected computer.
- **Frequent crashes.** A virus can inflict major damage on your hard drive. This may cause your device to freeze or crash. It may also prevent your device from coming back on.
- **Unusually slow computer performance.** A sudden change of processing speed could signal that your computer has a virus.
- **Unknown programs that start up when you turn on your computer.** You may become aware of the unfamiliar program when you start your computer. Or you might notice it by checking your computer's list of active applications.
- **Unusual activities like password changes.** This could prevent you from logging into your computer.

## **Virus Detection**

The most fundamental method of detection of virus is to check the functionality of our computer system; a virus affected computer does not take command properly. However, if there is antivirus software in your computer system, then it can easily check programs and files on a system for virus signatures.

## **Virus Preventive Measures**

A computer system can be protected from virus through the following –

- Installation of an effective antivirus software.
- Patching up the operating system.
- Patching up the client software.
- Putting highly secured Passwords.
- Use of Firewalls.

## **Most Effective Antivirus**

- McAfee Antivirus Plus
- Symantec Norton Antivirus
- Avast Pro Antivirus
- Bitdefender Antivirus Plus
- Kaspersky Anti-Virus
- Avira Antivirus
- Webroot Secure Anywhere Antivirus
- Emsisoft Anti-Malware
- Quick Heal Antivirus
- ESET NOD32 Antivirus

## ZIP files

ZIP is a common file format that's used to compress one or more files together into a single location. This reduces file size and makes it easier to transport or store. A recipient can unzip (or extract) a ZIP file after transport and use the file in the original format.

ZIP files work in much the same way as a standard folder on your computer. They contain data and files together in one place. But with zipped files, the contents are compressed, which reduces the amount of data used by your computer. Another way to describe ZIP files is as an archive. The archive contains all the compressed files in one location. So, the ZIP file format is one option to use if you need to make a single file or group of files smaller.

## **Working nature of ZIP files**

ZIP files encode information into fewer bits by removing redundant data. This “lossless data compression” ensures all the original data is intact. Let's look at a quick example to explain how this works. Imagine a file that contains the following sentences:

- The best sharing and storage solution for your business
- Your business solution for the best sharing and storage

Each word in this file appears twice. Now, if each letter and space in the sentence equals one unit of memory, then the entire file size would be 110 units. But you can create a numbered code to express the data in a different way:

- The best sharing and storage solution for your business
- 123456789

Or to put it a different way, both sentences would now read: 123456789896712345. This means that the initial file size of 110 units is reduced to 18 units, which is a massive savings. The ZIP file format uses lossless compression algorithms to do exactly that. It allows you to express the same information in a more efficient way by removing the redundant data from the file. This also means it is faster to send a ZIP file.

## UNIT - II

### INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

#### Information and Communication Technology ( ICT)

Information Technology (IT) and Information and Communication Technology (ICT) are very often interchangeably used in the context of modern technology infrastructure.

ICT is a broad and comprehensive term, which comprises information technology and communication technology.

Information technology includes radio, television, computer and Internet, teleconferencing and mobile. All these information technologies are powered by mainly two types of communication technologies.

- Satellite based communication
- Terrestrial based communication

**Satellite based communication** is the communication, which takes place between sender and receiver through a communication satellite.

**Terrestrial based communication** is the communication, which takes place through a network of transmitters spread across a geographical area, a country, or a state. This type of communication is used in the transmission of radio and television in India. However, with the launch of a series of satellites by Indian Space Research Organization (ISRO), satellite based communication is being used for telecommunication.

Communicating information effectively by making use of appropriate technology is called information and communication technology (ICT). In all, ICT is an umbrella term that includes many communication devices such as radio, television, cellular phones, computers and network, satellite systems and so on.

#### Definition of ICT

ICT is defined as a “diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information.” These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony, etc.

Information and Communication Technology (ICTs) is a broader term for Information Technology (IT), which refers to all communication technologies, including the internet, wireless networks, cell phones, computers, software, middleware, video-conferencing, social networking, and other media applications and services enabling users to access, retrieve, store, transmit, and manipulate information in a digital form.

Information and Communication Technology (ICT) in education is the mode of education that use information and communications technology to support, enhance, and optimise the delivery of information.

To summarize, enabling ICT in education, and making use of technology in education creates an easy-to-manage learning environment where the delivery of information is so much smoother and the learning easier.

Let us focus on three words behind ICT:

- Information
- Communication
- Technology

ICT is defined as the combination of informatics technology with other, related technologies, specifically communication technology.

#### Information technology

Information technology (IT) is the acquisition, processing, storage and dissemination of vocal, pictorial, textual and numerical information by a micro-electronics - based combination of computing and telecommunication. The term in its modern sense first appeared in a 1958 article published in the Harvard Business Review, in which authors Leavitt and Whisler commented that the new technology does not yet have a single

established name. We shall call it information technology. It spans a wide variety of areas that include but are not limited to things such as processes, computer software, computer hardware, Programming Languages and data constructs. In short, anything that renders data, information or perceived knowledge in any visual format whatsoever, via any multimedia distribution mechanism, is considered part of the domains space known as Information Technology.

**Meaning of Information Technology (IT):** Information Technology consists of two words Information and Technology.

The term Information refers to any communication or representation of knowledge such as facts, data or opinions in any medium or for, including textual, numerical, graphic Cartographic, narrative or audio-visual forms.

Technology is the practical form of scientific knowledge or the science of application of knowledge to practical.

Information Technology is any equipment or interconnected system or sub system of equipment that is used in the acquisition, storage manipulation, management transmission or reception of data or information

**Definition of Information Technology:**

Information Technology is a scientific, technological and engineering discipline and management technique used in handing the information, it's application and association with social, economical and cultural matters - UNSECO

Information technology is a systemic study of artifacts that can be used to give form to facts in order to provide meaning for decision making, and artifacts that can be used for organization, processing, communication and application of information- Darnton and Giacoletto

From the above definition we can conclude that information technology refers to the information processing of the software application on operating systems or hardware applications that includes computers, videos, telephones and related equipment of telecommunications, tapes, CDs etc.

**Characteristics of Information Technology:**

- Acquisition, Storage, manipulation, management, transmission or reception of data or information.
- Real time access to information.
- Easy availability of updated data
- Connecting Geographically dispersed regions
- Wider range of communication media.

Concept of Communication Technology

- Communication Technology is also comprised of two words like Communication & Technology. We have already discussed that technology is the science of the application of knowledge to practical purposes. We also know that information means any communication or representation of knowledge in any form.
- Communication is an integral part of human existence. It is communication that decides the very identity of human beings. Modern society is turning into an information society and communication is the exchange of information. It is the process & transferring information form a Sender to a receiver with the use of a medium in which the communication information is understood by both sender and receiver.
- Communication Technology implies the knowledge, skills and understanding needed to exchange information verbally or non-verbally. It is processing of information in terms of accessing information, decoding information and sending it via a medium

and changer to the receivers. Medium or channel can be written or oral or gesture form of information through speech, action or any electronic machine.

- Communication Technology is the electronic systems used for communication between individuals or groups. It facilitates communication between individuals or groups. Systems such as telephone, telex, Fax, radio, T.V. and Video are included, as well as more recent computer based technologies, including electronic data interchange and e-mail. In short, communication technology is the activity of designing and constructing and maintaining communication systems.

#### Concept of Instructional Technology

Any Subject who meets the following two norms of the characteristics is called instructional Technology. They are:

- Systematic application of scientific knowledge to the practical tasks
- the division of the practical tasks into sections and Subsections.

Instructional technology today is widely accepted as the application of systems approach in the systemic design of a learning system and as a method or approach combined with the appropriate and necessary media and material to bring about improvement in teaching - learning - evaluation process. Instructional Technology is neither technology in education nor technology of education but both and all pervasive which pervades the whole teaching learning or engineering put it should be taken as a sum total of all such aspects, which go a long way in shaping the personality of the learner in a meaningful context.

#### **Definition of Instructional Technology**

Instructional technology is just what it sounds lie, using computers, CD Roms, interactive media, modems, satellites, teleconferencing and other technological means to support learning.

#### **Aspects of Instructional technology**

- the process of designing instruction.
- the application of learning theories and
- styles to designing instruction
- the selection of materials and tools to design and implement a design.
- the evaluation of designs.
- the effective use of team work and
- the use of technology in support of the development and delivery of instruction.

#### **Nature of Instructional Technology:**

- It's basis is science
- It studies the effect of science and technology upon education.
- It is a continuous, dynamic, progressive & effect producing method.
- It develops new concepts like programmed learning, microteaching, Simulated teaching, video tape, projector and computer etc.
- It accepts school as a system.
- It cannot solve each and every problem of education. It can be used successfully in teaching and instructional system only.
- It cannot replace the teacher

#### ICT in education

##### **Definition**

"ICT implies the technology which consists of electronic devices and associated human interactive materials that enable the user to employ them for a wide range of teaching -

learning processes in addition to personal use." These technologies include computers, the Internet, broadcasting technologies (radio and television), and telephony.

"Information and communications technology (ICT) in education is the processing of information and its communications facilities and features that variously support teaching, learning and a range of activities in education."

All these definitions combine Communication technology and Information technology that have thin line between them but cannot do away without each other. When these technologies are applied in the field of education, it is termed as ICT in education. The term too can be used as the connotation to the term Educational technology because it also uses any hardware and software approaches that can enhance yield better learning outcomes.

#### Objectives of using ICT in Education

- Providing accessibility through online medium of education.
- Improving the quality of teaching, especially in remote areas.
- To increase transparency in the education system.
- To strengthen the policies, rules, and laws in the education system.
- To analyze the learning and participation of the students and measure its effectiveness.
- Measuring and evaluating students' behavior, involvement, and retention in the learning process.
- To analyze students' performance, placement, and application of knowledge.

#### Characteristics of ICT in education

- ICT in education is any hardware and software technology that contribute in the educational information processing. In the context of present era, ICT mainly comprises of Computer technology with its hardware, like, Personal computer machine, infrastructure required for setting up Internet facility and also software like, CD ROM including various programme packages, E-learning strategies etc.
- ICT in education is any Information Technology that focuses on the acquisition, storage, manipulation, management, transmission or reception of data required for the educational purpose. For example, the information about students' records, their admissions, updates of their auricular and co-curricular activities.
- ICT in education is any technology that deals with the exchange of information or in other words communication in the teaching learning process. Uses of Electronic learning technology like, Teleconferencing, power point presentations, CD ROM are Communication Technology which is the part of ICT.
- ICT in education is any educational technology that is applied in the educational process. It encompasses Hardware approach like use of machines and materials, Software approach like use of methodologies and strategies of teaching learning and Systems approach that uses the management technology that deals with the systematic organization of the hardware and the software. Different software packages for the use in different department of education. e.g. library software, administration software, software related to managing the entire teaching learning process.
- ICT in education is the support material in the hands of the human resource involved in the educational process in order to enhance the quality of education.
- ICT in education comprises of the application of science of On-line, Offline learning with the help of the computer technology.

#### Uses of ICT in education

- To broadcast material, online facility or CD-ROM can be used as sources of information in different subjects;
- To facilitate communication for pupils with special needs;



- To use electronic toys to develop spatial awareness and psycho-motor control;
- To use the online resource like, email, Chat, discussion forum to support collaborative writing and sharing of information.
- To facilitate video-conferencing or other form of Tele conferencing to involve wide range of students from distant Geographic areas.
- For Blended learning by combining conventional classroom learning with E-learning learning systems
- To process administrative and assessment data.
- To exchange and share ideas among teachers for the professional growth.
- To carry out internet based research to enhance , educational process

### Scope of ICT in Education

ICT is used to raise the efficiency of education. But with the passage of time, the system of education is facing new problems to be tackled. So, the hardware and software of ICT are ever expanding. Therefore, the application of ICT in education is much more than what it was a few decades back. Following are some of the applications of ICT in education that are worth noting.

#### **Mass education**

There has been explosion of population and knowledge. There is, therefore, a need to educate the masses. The problem is multiplied further by having a large section of illiterate people. So, ICT has a tremendous application to educate a large section of people and to impart a large amount of knowledge in a limited span of time. In this regard, the mass media, TV, radio, and other modern technologies like computers and information technology (E-mail, internet, mobile, etc.) has a lot of scope. The illiterate masses can also be made literate with the help of innovative methods and practices of teaching and learning.

#### **Historical information**

Any branch of knowledge that we deal with has a historical base. Such information is of tremendous importance for the students to understand any branch of knowledge in its totality. Such incidents when occur can be recorded with the help of CD or DVD. Such CD OR DVD becomes the source of information for learners to learn. The main advantage of such CDs is that we cannot create or repeat the history once more howsoever we try hard and place it before the learner.

#### **Costly and hazardous experiments**

In many fields of science and technology there are some experiments having great implications for effective learning which are not advisable for the teacher to conduct in the classroom because of cost and health hazards involved. Such experiments, once conducted carefully in the laboratory or elsewhere can be recorded with the help of new information and communication technology and be used by teachers and students for effective learning.

#### **Gaming and simulation**

If historical events which are either costly or hazardous which cannot be conducted, then ICT can rescue us by doing the same through simulation. Computer technology in this regard plays the main role. This can provide a lifelike picture of phenomena in three dimensions (3D). It can also show the operation of different parts of a phenomenon and the consequences. The other possibility is games. Children can learn, through play, many concepts that just cannot be taught in the formal set of the classroom. The gaming and simulation has a great scope in the training of military personnel and in the field of aviation.

#### **Distance education**

ICT has a great scope in distance education and open school programme. Today there is a great need for personnel training and education on regular basis for updating oneself in the field of work. In this regard, distance education programmes, a relatively less formal process

of education, have acquired new status. Educational technology with its innovative practices can educate the learners who cannot come to the classroom setup for their education. In this regard programmed learning materials, modules, contact programme, and counselling are some innovations which can help distance learners.

### **Collection, storing and retrieval of information**

There are digital cameras and mobiles which provide us the facility to take same photographs of events that take place in a fraction of second. There are also satellites that work for us day and night to provide us information about places which are not accessible to us. Information can be collected with the help of this new electronic technology both in audio and in video form. Such information can be stored with magnetic and electronic devices easily and can be retrieved within no time.

### **Research**

Information can be collected and stored to be used for educational purposes. Information can also be collected and stored in the same way for research. Further, for analysis and reporting, computer can be used. Not only quantitative data but also qualitative data can be analysed and there lies the role of computer and the different methods of data analysis methods and techniques. Moreover, in developmental type of research, different kinds of packages can be developed for raising the effectiveness of learning. There are many researches already conducted in this field i.e., computer assisted instruction(CAI), and computer assisted language learning packages. With the facilities of Internet, Website, and INFLIBNET, the researchers as well as a learner wanting to inquire or find out something that is happening elsewhere can have access to a large amount of information sitting at home. He can formulate his hypotheses, problems, and ideas and get them solved while at home. In this process, the research findings are not only disseminated but also the quality of research can be increased.

### Advantages of the use of ict in education

**Quick access to information:** Information can be accessed in seconds by connecting to the internet and surfing through Web pages.

**Easy availability of updated data:** Sitting at home or at any comfortable place the desired information can be accessed easily. This helps the students to learn the updated content. Teachers too can keep themselves abreast of the latest teaching learning strategies and related technologies.

**Connecting Geographically dispersed regions:** With the advancement of ICT, education does not remain restricted within four walls of the educational institutions. Students from different parts of the world can learn together by using online, offline resources. This would result in the enriching learning experience. Such collaborative learning can result in developing:

- Divergent thinking ability in students
- Global perspectives
- Respect for varied nature of human life and acculturation.
- Facilitation of learning

ICT has contributed in shifting the focus on learning than teaching. ICT helps students to explore knowledge to learn the content through self-study. Teacher can help the students by ensuring the right direction towards effective learning. Situational learning, Programmed learning, many Online learning courses are some of the example of self-learning strategies that are being utilized with the help of ICT.

**Catering to the Individual differences:** ICT can contribute in catering to individual needs of the students as per their capabilities and interest. Crowded class rooms have always been a challenge for the teacher to consider the needs of every student in the class.

**Wider range of communication media:** With the advent of ICT, different means of communication are being introduced in the teaching learning process. Offline learning, on line learning, blended learning is some of the resources that can be used in educational institutions. Collaborative learning, individualized learning strategies can enhance the quality of group as well as individual learning with the real society. This can ensure the applicability of knowledge.

**Wider learning opportunities for pupils** Application of latest ICT in education has provided many options to the learners to opt for the course of their choices. Many Online courses are available for them to select any as per their aptitude and interest. Students can evaluate their own progress through different quizzes, ready to use online tests. This can ensure fulfilment of the employment required in the job market thus minimizing the problem of unemployment. It can also provide more efficient and effective citizens to the society as per the changing needs.

#### Application of computer

The various applications of computers in today's arena:

1. Business
2. Education
3. Marketing
4. Banking
5. Insurance
6. Communication
7. Health Care
8. Military
9. Engineering Design
10. Buildings
11. Paperwork
12. Human connection

#### **Business**

A computer has high speed of calculation, diligence, accuracy, reliability, or versatility which made it an integrated part in all business organisations. Computer is used in business organisations for: Payroll calculations, Sales analysis, Budgeting, Financial forecasting, Managing employees database and Maintenance of stocks etc.

#### **Education**

Computers have its dominant use in the education field which can significantly enhance performance in learning. Even distance learning is made productive and effective through internet and video-based classes. Researchers have massive usage of these computers in their work from the starting to till the end of their scholarly work.

#### **Marketing**

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.

Home Shopping - 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.

#### **Banking**

Today banking is almost totally dependent on computer. Banks provide online accounting facility, which includes 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 computers. The insurance companies, finance houses and stock broking firms are widely using computers for their concerns.

### **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 for. Some main areas in this category are: Chatting, E-mail, Video-conferencing and Telnet.

### **Health and Medicine**

Most of the medical information can now be digitized from the prescription to reports. Computation in the field of medicine allows us to offer varied miraculous therapies to the patients. ECG's, radiotherapy wasn't possible without computers. Computers are helping immensely to monitor the extremely ill in the intensive care unit and provide cross-sectional views of the body. This eliminates the need for hired nurses to watch the patient twenty-four hours a day, which is greatly tiring and error prone. Doctors use computers to assist them in diagnosing certain diseases of the sort. This type of computer is called the Expert System, which is basically a collection of accumulated expertise in a specific area of field.

### **Military**

Computers are the main tools which help in developing missiles and other equipment in the defence system. Designing and the maintenance are possible only through computers. Computer builds the links between the soldiers and commanders through the satellite. Construction of weapons and controlling their function is not possible without the aid of computers. The list of the criminals and the records of the cops are maintained regularly in the system.

### **Engineering Design**

As per the title, computers aid in designing buildings, magazines, prints, newspapers, books and many others. The construction layouts are designed beautifully on system using different tools and software's.

### **Buildings**

Architects use computer animated graphics to experiment with possible exteriors and to give clients a visual walk-through of their proposed buildings. The computers provide architects a numerous amount of facilities to create different buildings with greater accuracy, better designing and editing tools, and work done at the fastest speed possible. Finally, a new kind of artist has emerged, one who uses computers to express his or her creativity.

### **Paperwork**

Computer systems will increasingly cut down the paperwork that is involved in millions of industries around the world. If a business is run on a manual system, then the amount of papers or registers involved is a great deal, making the administration process more tedious and error prone. If it is replaced by a computer system, then all the necessary data and information is transferred into the memory of the computer. This makes managing various tasks easier, faster and more effective than the manual system. Organisations that involve administrative tasks such as a hotel, school, hospitals, clubs, libraries etc. will become more efficient if a computer system is implemented.

### **The Human connection**

The computers have evolved in such prosperity that it is now able to assist or aid with humans who are disabled - both physically and mentally. The handicapped are now able to express their missing sense with the aid of computer technology. For example, a deaf and dumb person is able to communicate extensively with other people by using a specially designed computer system. This gives the disabled a chance to live out life and gradually catch up with the other fortunate people living on earth.

### **Government**

Among other tasks, the federal government uses computers to forecast the weather, to manage parks and historical sites, to process immigrants, to produce social security checks and to collect taxes. The most important use of the computer system in this field is perhaps the Army, the Air Force and the Navy. The computers have to be very powerful and in order to be run they have to be very accurate and precise. E.g. in the use of missiles and other likes, every nanosecond counts, which may save trillions of lives on this planet. The government also uses computers in various simulations like the spread of influenza in a particular locality.

### **The Home**

People having a computer in the home justifies the fact that it is not only useful and efficient, but it is also well-regarded as a learning system. Personal computers are being used for innumerable tasks nowadays, for example, to keep records, write letters and memos, prepare budgets, produce presentations, draw pictures, publish newsletters and most importantly - connect with other in the rest of planet earth.

### **Crime investigation**

High-end devices have ensured that justice is more effective. CCTV cameras and other security systems have reduced the amount of crime. There are many ways to track down the criminal in no time. Forensic science uses it for many of its operations related to investigations.

### ICT in Learning

Earlier it was considered that learning can be achieved through teachers and all the teaching learning activities go round the teacher but the scenario has changed. Now learning can be achieved in the absence of teachers and without classrooms. It has become possible only due to information and communication technologies. A person can achieve learning according to his own convenience any time anywhere through it. A lot of ICT tools are available for this. Uses of ICT for learning may be explained with the help of these points:-

**Group learning:** Information and Communication Technology tools help a student to come in contact with other students, teacher's experts of the subjects for better learning. He can also participate in online discussions with persons concerned and enables himself to enrich his knowledge.

**Individual learning:** ICT has widened the scope of individual learning. With the help of ICT a student can achieve learning according to his own will without the barriers of time and space.

**Professional learning:** ICT has made the students enable to get various professional courses and skills for their development according to their convenience. Different languages learning courses and skill development programmes are available on internet which can be accessed easily through ICT tools.

**Distance learning:** ICT is the back bone of distance learning all the processes of modern distance learning courses depends on the use of ICT. Providing assignments and their collection, delivery of materials counselling and other works are done with the help of ICT tools. (v) Various e-books, e-journals, e-magazines and useful sites are freely available on internet, which are helpful in providing better learning situations for students.

**Collaborative learning:** Now days it has become easier to study in groups or in clusters with the help of ICT. Students can be united for better learning with ICT facilities. Modern ICT tools are helpful in delivery of educational content. Mobiles, telephone, computers radio, television and internet have proved better tools for learning. It has also proved helpful in developing various modes of learning and training. Some of the modes are:-

- (a) Multimedia Learning
- (b) Technology enhanced Learning (TEL)
- (c) Computer based Instruction (CBI)
- (d) Computer Assisted Instruction (CAI)
- (e) Internet based Training (IBT)
- (f) Web based Training (WBT)
- (g) Online Education
- (h) Virtual Education
- (i) Mobile Learning
- (j) Language Lab
- (k) Virtual Learning Environment (VLE)
- (l) Multiuser Virtual Environment (MUVE)
- (m) Mobile Assisted Language Learning (MALL)
- (n) Computer Supported Collaborative Learning (CSCL)

**Learning for special Children:** Information and Communication Technology is also helpful in learning, teaching, training and skill development of the children with special needs according to their convenience. It also helps in designing and preparation of teaching learning materials for special children. Braille script, hearing aids, talking books and computer programmes are also developed with the help of ICT. Due to this a lot of disabled children have become enable to admit in educational institutions.

### **UNIT - III**

#### **ICT ENRICHED LEARNING EXPERIENCES IN CLASSROOM**

##### **Objectives ICT**

- To establish and enabling environment to promote the usage of ICT especially in Higher secondary and secondary govt./aided schools in rural areas.
- Enrichment of existing curriculum and pedagogy by employing ICT tools for teaching and learning.
- To enable students to acquire skills needed for the digital world for higher studies and gainful employment.
- To provide an effective learning environment for children with special needs through ICT tools.
- To promote critical thinking and analytical skills by developing self-learning. This shall transform the classroom environment from teacher centric to student centric learning.
- To promote use of ICT tools in distance education including use of audio visual medium and satellite based devices.

##### **Need of ICT in Teacher Education**

The central aim of introducing technology in teacher education is to develop and promote openness for new thinking in an atmosphere of innovation through introduction of methods that are interactive, non-threatening and self-paced and move away from mechanical text-based, chalk and talk methods. Integrating ICT into teacher education is also necessary for bridging the digital divide between Government and private teachers, rich-poor, urban-rural,

by providing opportunities to effectively use technology to further educational objectives. This will entail hardware support, namely provisioning for satellite transmission facilities in the DIETs. It will also entail provisioning for software support for developing content and orientation of teacher educators and teachers.

Since the adoption of ICTs in education is essentially an educational issue, rather than a technological one, pre-service teacher education policy and program need to be anchored in sound educational perspectives. Curriculum is the primary process of directing teaching towards fulfilling educational aims and digital learning resources (content) and digital learning tools/ processes (software applications) which constitute curricular resources, need to comply with curricular principles. An important principle of education is that curricular resources need to be publicly owned, so that they are freely available to teacher educators, teachers and students without restrictions.

### **Means for ICT-Enabled Teacher Education**

In the field of teacher education ICT-based applications and their integration with content, method and pedagogy are potential catalysts for meaningful learning of students. Professionals associated with teacher education institutions should equip them to design their educational system and prepare teachers for the future of the society. Some of the important strategies to make ICT-enabled teacher education programme a real success are:

- Teachers must update their knowledge and skills to use the digital technology in classroom for teaching learning process.
- Teacher education institutions should be equipped with ICT-based resources with provision of training and orientation of teacher educator for better integration of technology with content and pedagogy.
- Professional competencies to integrate ICTs into teaching and learning process are a continuous process to ensure meaningful participation and integration of students.
- Educational administrators and policy makers should work more closely with schools and colleges to determine the training needs of teachers and extend their support to organize appropriate training programmes with better exposure at all levels.
- In-service and pre-service training should involve use of ICTs in Trends and Challenges in ICT Integrated Teacher Education in pedagogical analysis, presentation of content with new techniques of evaluation.
- Teachers at all levels of education need to be supported in meeting the challenges of effective integration of ICTs for improving classroom practices. All the classrooms should also be equipped with basic ICT - based infrastructure like computers, projector and internet facility.
- Teacher in education institution should have well equipped ICT Lab with computer, satellite communication, high-speed internet facility and other electronic media to supplement the learning of children in this digital world.
- Discipline-wise (e.g., mathematics, language, science, EVS) shortterm ICT-based programme should be designed for teacher educators and teachers as a part of their professional development.
- Motivation of teachers leading to their active participation is very important for result-oriented initiatives and their implementation. Incentives like certification, professional advancement, formal and informal recognition at the institution and community levels are some of the means to sustain motivation of the teachers and teacher educators.
- Curriculum and course content should be designed with an approach to ensure better implementation of ICTs and should be supported by technology-mediated Learning Management System (LMS). The curriculum and content of teacher education should

enable the students to compete globally. This is possible by developing a pool of world-class content and designing the content with socially relevant examples and illustrations through technology-mediated interventions for students.

- Teacher education institutions across the country must provide the leadership for pre and in-service teachers and model the new pedagogies and tools for learning with active collaboration from national and international agencies. With mutual collaboration from all around it would be easy and convenient to design and develop culturally responsive digital content for teachers and students.

### **Issues in Implementation of Technology-Mediated Teacher Education Initiatives**

Creating a cadre of teacher educators at different levels who are able to appreciate the initiatives of technology-mediated learning is very important through research and development in the field of teacher education in all the Asian countries. They must appreciate blended learning and paced learning to develop a motivation for effective integration of technology with content of teacher education curriculum. It is imperative to consider the global standard and set a benchmark to correlate their performance with the performance of global standards. Some of the common issues in integration of ICTs in the field of teacher education are as follows:

- A well designed technology-mediated teacher education curriculum with appropriate mechanism of assessing and monitoring quality of education should be in place for ensuring better implementation of integrated teacher education programmes.
- Availabilities of technical capabilities are one of the issues in making course design and its production for technology-mediated learning.
- Policy planning is very important to have outcome-oriented plans, programmes and interventions for the effective use of ICTs in teacher education programme. It is found that there is a lack of coherence in planning and leadership which consequently affects the implementation aspect.
- It is essential to bridge the gap between the mind set-up of new-age students and old classroom teachers through advocacy and in-service training and capacity-building activities from time to time. Availability and accessibility of technology should be made cost-effective for users at all levels.

### **The Challenges in ICT-Integrated Teacher Education**

The teacher education institutions should understand the tremendous potential of digital technologies and how best it can be harnessed in teaching\_ learning process to enable the students to learn meaningfully. With this teacher education institutions can really serve different segments of the society and meet the expectations of the new generation learners. Making teachers familiar with emerging technologies is also very important.

- Teacher education institutions find it difficult to collaborate on the development and implementation of ICT courses for pre-service and in-service teachers with agencies within their reach.
- Teachers face major challenges when they are in schools due to number of demands and expectations
- The effective integration of ICTs for meaningful learning need to be constantly updated to make them current, relevant and pedagogically sound.
- The course content must be constantly revised and updated as the technology is moving fast from time to time. It is essential to make the content in line with new trends in learning with technology. For example, Mobile can be used as a learning device in view of its accessibility, cost-effectiveness and ease of operation.



- Teacher education institutions should aim to capture the potentials and opportunities available to enable students to access their course materials and work collaboratively. The future of using technology for teaching and learning is always challenging. Therefore, it is imperative for teacher educators to update themselves with recurrent training and orientation through refresher courses and orientation programmes.
- A major challenge is lack of initiative on the part of formulation of appropriate policy to encourage teachers and teacher educators to incorporate the use of technology in teaching.
- Content-wise identification of activities is one of the significant challenges in the development of the courseware for effective integration. Real challenge is in providing guidance to student teachers and in following up their work from time to time.

### **Roles of teacher in the classrooms**

With the emergence of technology in the field of teacher education, the role of teacher is not just confined to teaching alone. Teacher is expected to be a facilitator and moderator in the whole teaching learning process. The key features with reference to changing roles of teacher in the classrooms are as follows:

- Learners have access to networked resources on which teacher is presenting information; as a result the use of overhead projectors and chalkboard becomes obsolete.
- With the use of online tests some of the traditional assessment methods become redundant.
- It is important for the teacher to encourage critical thinking skills of students, promote information literacy and nurture collaborative practices not just to impart content knowledge.
- Teacher is expected to identify quality information from misinformation. Therefore, the new role of teacher is identification, classification, and authentication of electronic information sources. Recurrent training and professional development of teacher is important to ensure optimal use of technology and its effective and efficient use in classrooms.
- Teacher needs to transform the classroom to a place of dynamic student centered learning environment in which student interact with peers in their own classroom and with virtual classes around the world.

### **Integrating ICTs into subject teaching-learning**

ICT is a very broad domain, and affects all aspects of life, the socio-cultural, the political and the economic. Since education is concerned with preparing learners to become responsible citizens, there is a great need for student-teachers to acquire a basic understanding of ICTs, including the Internet. Hitherto, focus has been on basic proprietary softwares; however, we need to expose student-teachers to a larger gamut of ICTs, so that they have basic understanding and can develop skills in areas that interest them. The course curriculum should hence cover the following:

- (a) Basic hardware knowledge - Computers – laptops, net-books, tablets, radio and audio recorders, camera, Printer/peripherals; Cell phones
- (b) Basic software knowledge - Public operating systems (e.g. GNU/Linux) - virus free, free of cost/free to share which support most languages, and basic software applications that are also free to share, modify and use for office automation, web browsing etc.
- (c) Basic knowledge of Internet and web based tools and resources including of cyber security – avoiding dangers and risks as well as basic website and web tools use.
- (d) Larger socio-cultural, political and economic implications of the emerging network society, an effect of ICTs.

The goal in ICT literacy must be to expose teachers to a wide variety of ICT resources – hardware, software as well as digital learning resources . This requires an emphasis on using available free / public digital resources. Teachers must not treat ICTs as a black box – they should be taught to install even the operating system, open up hardware to study components. Programs that have done this have seen enormous confidence developed in teachers. Learning to install software and freely installing it on multiple computers (without such act being a violation of law) serves as a significant inhibition destroying process and encourages teachers to begin a journey of learning in the digital world. Teachers become learners and teachers instead of being consumers/users who have no idea and no right to study, share or customise resources. Inexpensive computers / devices that support access and participation in the digital space, need to be promoted on large scale.

### **Integrating ICTs into subject teaching-learning**

The biggest drawback so far in ICTs has been to treat it as a stand-alone subject. However, ICT it is a new and powerful method for mediating teaching-learning and hence needs to be integrated into different subjects. To integrate, the steps of accessing, reviewing, creating and sharing resources are to be structured into formal curricular experiences.

Existing digital resource repositories from governments and NGOs including audio resources (EDC), video resources, animation movies etc. should be made widely accessible. It is important to make the resources available in district repositories linked to state repository. Student-teachers also need to learn how to access the world wide web for resources, including principles governing quality, authenticity of resources, rules of fair use etc. Student-teachers need to integrate ICTs into their subject teachinglearning, using varied digital methods to create learning resources, using public educational software applications, such as

- (i) Maths – Geogebra, Bruch, K Turtle, carMetal
- (ii) Languages - SCIM (multi-language typing), K Hangman etc. (language), K Anagram, K Letters
- (iii) Science – K Stars, Stellariumetc (astronomy), Kalzium, STEP, PHET etc
- (iv) Social Science - Marble (geography), KGeography, OpenMaps
- (v) other subjects - Freemind (creative thinking) for creating concept maps
- (vi) web tools like wiki, blogs
- (vii) digital tools like video camera and video/photo/audio software applications including recordmydesktop, Kdenlive, Audacity etc. as well as CBTs such as spoken tutorials

### Individualized instruction

Individualized instruction focuses on the needs of the individual student. Teaching is specific and targets one need at a time. It is where students’ personal needs are placed at the forefront of an instructor’s teaching practices. Here, technology, content and pace of learning depend on the abilities of individual students in a class. Five steps to individualization in the classroom include:

- Set clear and specific goals
- Make goals challenging and realistic
- Make goals dynamic and review regularly
- Let students own their progress
- Involve parents or academic advisors when necessary

### **Meaning**

**Individualized instruction** refers to educators using specific strategies, resources and assessments that cater to the needs of learners in their class. This process ensures that

students are given guidance and flexibility in their learning process, enhancing their academic growth along the way.

Among the alternative approaches there is a focus on a more individualized approach to instruction, where the traits of the individual learner are given more consideration. Each approach to individualizing instruction is different, but they all seek to manipulate the three following fundamental variables:

Pace: the amount of time given to a student to learn the content

Method: the way that the instruction is structured and managed

Content: the material to be learned

### **Pace**

There are two basic extremes when the pace of instruction is considered. The first is when someone other than student, usually a teacher or instructor, controls the amount of time spent learning the material. In this case specific due dates are defined before instruction begins. This is currently the predominant model in most educational systems. The opposite extreme would be if the learner had exclusive control over the pace of instruction, without a time limit. Between these two extremes are situations where control of the pace of instruction is shared or negotiated, not necessarily equally, by the teacher and learner.

### **Method**

As theories of learning and instruction develop and mature, more and more consideration is given to the way in which learning occurs. In an attempt to account for the way that students learn, instructors may apply a combination of theories and principles in preparing instruction. This can influence whether instruction is designed for one homogenous group, or is flexible, in anticipation of individual differences among learners. In the majority of cases, instruction is designed for the average learner, and is customized ad-hoc by the teacher or instructor as needed once instruction begins. This type of instruction, although it does give some consideration to individual differences among learners during instruction, does not fall into the typically accepted definition of individualized instruction. For instruction to be considered individualized, the instruction is usually designed to account for specific learner characteristics. This could include alternative instructional methods for students with different backgrounds and learning styles.

### **Content**

Perhaps the least frequently modified component is the actual learning content. However, it is possible to vary the content taught to different learners or groups of learners. Both "tracking" and "enrichment" are examples of customizing instructional content. A renewed movement toward learner-centered principles in education has given this component more consideration in the 1990s. It has become possible to find examples of instructional settings in which students define their own content, and pursue learning based on their own interests. In most cases, however, this opportunity is limited to high-achieving students. In terms of extremes, content can be uniform for everyone, or unique to each individual. Between these extremes lie cases where the content can be varied, but only within a predefined range. The range of activities available to the learner is an indicator of how individualized the content is in an instructional setting.

### **Examples of Individualized Instruction**

There are many examples of instructional approaches that have modified some or all of these three components. In all of these examples, the goal was to improve the instructional experience for the individual learner. Some of the most historically notable approaches are discussed below. Within each example both the benefits and criticisms of each approach are discussed.

## Personalized System of Instruction (PSI)

Introduced in 1964 by Fred Keller, the Personalized System of Instruction, or the Keller Plan, is perhaps one of the first comprehensive systems of individualized instruction. PSI was originally designed as a classroom-based method of instruction with the intention of improving student achievement and, at the same time, replacing the long tradition of punishment in education with the use of positive consequences for learning. PSI has five defining features:

### **Stress on the Written Word**

In a PSI course, the instructional content is presented in written form rather than via lectures. PSI teachers normally prepare a written study guide that is designed to assist students with learning. The study guide contains study objectives and questions that focus students' attention on important material to be learned, and provide a clear indication of what students are expected to do. The study guide may also include instructor comments used to elucidate difficult points, exercises and practice problems to prepare students for the unit quiz, thought questions to stimulate students' interest in the exploring the subject matter further, and a supplementary reading list. In addition to the study guide, PSI instructors also prepare a course policy statement or student manual containing an overview of the course, policies for such matters as essay expectations, deadline dates for exams, and instructor tips for good performance.

### **Unit Mastery Requirement**

In a PSI course, content is separated into portions called units. To advance from one unit to the next, students must demonstrate that they have learned the unit's material. In many PSI courses, students demonstrate unit mastery by taking a quiz that requires a minimum score of, for example, 80 percent or 90 percent. Students who fail the first attempt at the quiz are typically given at least two additional attempts to pass the unit by taking a different form of the unit quiz. When the course objectives require some kind of evaluation, other than a paper-and-pencil quiz such as an essay or demonstration of a physical skill, students are also given multiple opportunities to demonstrate mastery. Providing remedial opportunities for students to learn substantially removes the stigma of failure. Remedial opportunities also transform the purpose of grades: grades are not used to rank students relative to each other, but are instead used as incentives to promote achievement.

### **Student Self-Pacing**

A system of individualized student pacing follows from PSI's use of a unit mastery requirement. Because some students take more time to master individual units, students will thus progress through a PSI course at different rates. Some students finish a PSI course relatively quickly, while others require the total allotted time (e.g., a semester) to finish the course. As such, once a PSI course has begun, students enrolled in the same course, will work on different units of the same course depending on their rate of progress. Unlike the lock-step model of traditional instruction, a self-paced model recognizes and accounts for differences among students in the rate at which they learn the course material and avoids grade penalties for students who require more time to learn.

### **Use of Proctors**

PSI courses make use of course staff called proctors or tutors to help students learn the material, administer unit quizzes, provide feedback regarding unit quiz performance, and conduct certain administrative tasks such as maintaining student records. PSI proctors can be external or internal proctors. External proctors are former students who receive academic credit for proctoring a course. Internal proctors are students enrolled in the course, who have passed early units in the course, and are now assisting students with the units they have already mastered.

### **Lectures and Demonstrations as Motivational Devices**

With PSI's emphasis on the written word, lectures tend to be de-emphasized. However, the founders of PSI also felt there was a place for lectures in order to stimulate the students' interest in the subject matter, so occasional lectures were initially included as a feature of a PSI course. Unlike the other components of PSI, lectures have not been demonstrated to be effective in boosting student academic performance, and should be considered as an optional feature of the method, at best, that might be reserved for those rare spellbinding lecturers. Keller based his system on ten accepted educational principles:

- Active responding
- Positive conditions and consequences
- Specification of objectives
- Organization of material
- Mastery before advancement
- Evaluation/objectives congruence
- Frequent evaluation
- Immediate feedback
- Self-pacing
- Personalization

#### Audio-Tutorial

Audio-Tutorial is a method of individualized instruction developed by Samuel N. Postlethwait in 1961 at Purdue University. His goal was to find an improved method of teaching botany to a larger number of college students and to effectively assist the students who possessed only limited backgrounds in the subject. The development of an Audio-Tutorial program requires a significant amount of planning and time by the instructor. Although there is some room for modification for each specific program, the general principles remain the same. Students have access to a taped presentation of a specifically designed program that directs their activities one at a time. The basic principles of Audio-Tutorial are:

- repetition;
- concentration;
- association;
- unit steps;
- use of the communication vehicle appropriate to the objective;
- use of multiplicity of approaches;
- use of an integrated experience approach

The major benefits of Audio-Tutorial are that "students can adopt the study pace to their ability to assimilate the information. Exposure to difficult subjects is repeated as often as necessary for any particular student". In addition to taking more time if they wish, students can also accelerate the pace of their learning. Other benefits are that students feel more responsible for their learning, and more students can be accommodated in less laboratory space and with less staff.

Some of the major criticisms that are common to Audio-Tutorial courses were illustrated by Robert K. Snortland upon evaluating a course in graphics design. The primary criticism concerns the claim of responsibility. It seems that some students respond to the responsibility placed upon them, while others do not. There was a problem with the initial dropout rate, which seemed to be explained by the lack of willingness of some students to take on the amount of responsibility that was required in order to complete the course. Snortland advised that "since many freshmen students are not ready for additional self-discipline required of them in the A-T format, the choice of either a structured approach or an individualized approach should always remain open" (p. 8). Many other criticisms of Audio-Tutorial courses

are concerned with teacher control. The instructor dictates all of the material including the learning and feedback procedures. The criticism is that this is a severe form of teacher control over the student.

Like the Keller Plan, Audio-Tutorial allows the individual student to determine his or her own pace, and the content is fixed. Unlike the Keller Plan, however, there are more instructional delivery methods available when designing the course. Yet the locus of control remains with the instructor in the Audio-Tutorial as well.

CAI (Computer assisted instruction) or (Computer aided instruction)

Computer-assisted (or aided) instruction" (CAI) refers to instruction or remediation presented on a computer. These tools improve instructional qualities. CAI's were also known as CBTs (Computer based training) when they were used to "train" individuals for vocations.

### **Definition of CAI**

“CAI is an interaction between a students, a computer controlled display and a response entry device for the purpose of achieving educational outcomes.”-Bhatt and Sharma

Computer-assisted instruction has now taken as so many dimensions that it can no longer be considered as a simple derivative of the teaching machine or the kind programmed learning that skinner introduced.”-Hilgard and Bower

### **Features of CAI**

- Interactive and can illustrate a concept through attractive animation, sound, and demonstration.
- Allow students to progress at their own pace and work individually or problem solve in a group.
- Provide immediate feedback, letting students know whether their answer is correct. If the answer is not correct, the programme shows students how to correctly answer the question.
- Offer a different type of activity and a change of pace from teacher-led or group instruction.
- Improve instruction for students with disabilities because students receive immediate feedback and do not continue to practise the wrong skills.
- Capture the students' attention because the programmes are interactive and engage the students' spirit of competitiveness to increase their scores.
- Move at the students' own pace and usually do not move ahead until they have mastered the skill.
- Provide differentiated lessons to challenge students who are at risk, average or gifted.

### **Characteristics of Computer Assisted Instruction (CAI)**

There are two basic characteristics of computer assisted instruction (CAI). The first is that the computer can evaluate a student's (Learner's) responses instantly and indicates whether the response is correct or incorrect on the basis of predetermined Key words identified within it. Secondly, the computer can individualise instruction in a number of specified ways. Instruction can be individualised according to differential aptitude, achievement and interest. The computer makes note of the learner's performance and progress in learner about a unit, and on the basis of the evaluation of his ongoing achievement and as per his needs, it can modify his programme for further learning.

### Types of CAI

#### **Drill and practice**

Drill and practice provide opportunities for students to repeatedly practice the skills that have previously been presented and that further practice is necessary for mastery.

#### **Tutorials**

Tutorial activity includes both the presentation of information and its extension into different forms of work, including drill and practise, games and simulation.

### **Simulations**

Simulation software can provide an approximation of reality that does not require the expense of real life or its risk.

### **Critical thinking and enrichment**

This approach helps children develop specific problem solving skills and strategies.

### **Computer based laboratories**

Discovery approach provides a large database of information specific to a course or content area and challenges the learner to analyse, compare, infer and evaluate based on their explorations of the data.

### **Integrated learning systems**

This is made up of two components, computer aided instruction (CAI) modules (often called courseware) and a management system to manage the learning. The learning management systems are more recent innovations.

### **Advantages of CAI**

- One-to-one interaction
- Great motivator
- Freedom to experiment with different options
- Instantaneous response/immediate feedback to the answers elicited
- Self pacing - allow students to proceed at their own pace
- Helps teacher can devote more time to individual students
- Privacy helps the shy and slow learner to learn
- Individual attention
- learn more and more rapidly
- Multimedia helps to understand difficult concepts through multi-sensory approach
- Self-directed learning – students can decide when, where, and what to learn

### **Limitations of CAI**

- may feel overwhelmed by the information and resources available
- Over use of multimedia may divert the attention from the content
- Learning becomes too mechanical
- Non availability of good CAI packages
- Lack of infrastructure

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### **Computer Assisted Learning**

Computer-assisted learning (CAL) may be defined as any learning that is mediated by a computer and which requires no direct interaction between the user and a human instructor in order to run. As the name implies, CAL is the use of electronic devices/computers to provide educational instruction and to learn. CAL is developed by combining knowledge from all fields of education/learning, human computer interaction (HCI) and cognition.

To summarize it simply as “the use of electronic devices/computers to provide educational instruction and to learn.” CAL doesn’t just involve computers, it also includes the use of other electronics such as CD and MP3 players (or record players in the 1960s), DVD players, tablets, smartphones and televisions. These tools can be used to better illustrate a point the teacher or professor is trying to make, or to heighten engagement among students.

Just think about it: Wouldn’t you learn more from actually watching a foreign film for your language class than you would from just talking about it?

Computer Assisted Learning also includes online courses and supplemental course materials used in colleges, homeschooling and distance learning. Basically, any type of technology that can be used to learn most likely falls beneath the umbrella of Computer Assisted Learning.

The great thing about this teaching method is that it can be implemented in every type of classroom, from a kindergarten art class to a medical school class in which students use computer models to learn to operate on the human body. It can also help students take classes at home either on their own or to supplement their other learning. This can lead to a much more personalized experience, as well as a more in-depth understanding of the knowledge being transmitted.

#### Basic Goal of Computer Assisted Learning

The basic goal of CAL is to stimulate and develop the assimilation/learning capacity of students, increase the effectiveness and productivity teachers with the help of computer based technology and update students' knowledge to current trends as most of the concepts outside the last decade are gradually getting out of date. Another objective of CAL is to develop easily understandable and attractive tutorials and demonstrations of the field they are employed in.

#### **Computer Assisted Learning Assessment Tools**

**Multiple Choice Questions:** Mainly used for computer based tests, this type of exercise is used to assess a student's understanding of things they have been taught. It is used for CBTs.

**Fill-in the Gap:** Also used for CBTs, the student is required to type text in gaps/spaces where some of the words are missing. The student has to provide suitable words to solve the exercise. The test can be easily done within a few minutes and can be created with inexpensive software such as Hot Potato.

**Find the Answers:** In this test, the student(s) are given questions and they have to look for the answer on their own in e-libraries or using the Internet. The answers may be submitted to the teacher in various required submission formats.

**Scrabble/Crossword Puzzles:** Crossword puzzles are mainly used in computer assisted language learning or at the basic education level. They can be created from the vocabulary that students have just been learning and the game can be played during leisure hours.

**Online Interactive Chat:** Group chats can be a good learning avenue for students and teachers to share ideas online through text or speech. It is pretty easy to set up a group chat server using a social media tool. However, it can sometimes be difficult to moderate and it can become boring if there are only few users online in the chat room. When run with tasks and suitable groups of students (age groups, interests, etc.) chats can result into exciting communication, especially when post chat tasks are issued in the end in the instructor.

**Drills:** Real life scenario drills can be computer simulated to prepare the students for real on-field challenges. Drills can be carried out using software programs specially formulated for the purpose. Computer simulated drills can be expensive to organize, particularly when special equipment are required and also require high level of computer skill.

**WebQuest:** A WebQuest is an exercise where the students are required to provide answers to questions on issues mostly found on the web. WebQuest is meant to develop the student's skill on using/analyzing provided information rather than looking for it. In this case, the teacher will provide the students with the needed internet links to the exercise.

**Adventure Games:** These are computer simulated role-plays where the student is presented with a situation that he/she has to deal with and pass. The student has to be fast in analyzing the game and inputting the result either as text, by manipulating the game's controls, or by clicking on certain options. At the end of the game, the program gives feedback on the player's performance.

**Listening Exercises:** For these exercises, the computer replaces the tape recorder. The computer is connected to a sound system. Students are required to listen attentively to an audio recording being played from the computer. Podcasts, audio CD/DVD, audio streams,



etc., are often used. This exercise is used to promote listening skills in students. It can be followed immediately with multiple choice exercises if the students have grasped the content.

### Computer Based Test (CBT)

Computer-based test, also known as CBT test, refers to delivering assessments with computers as an alternative to using the pen-paper method. Such a test can be conducted online using the internet or a computer-aided facility. Usually, this test or examination is carried out by organizations to evaluate or analyze a candidate's performance, skill, or capability. With the integration of features like multiple-choice questions, descriptive answers, analytics-based questionnaires, etc, the CBT online test simplifies the evaluation task of teachers. An online exam may be perceived as a subsection of the CBT because, as the name suggests, the computer-based test is too comprehensive not to include online exams in its ambit. While the term online exam can be used for any examination conducted over the internet, the computer-based test is generically used for any test that is given and taken using computers, without depending on the internet.

To put it into perspective, a CBT may or may not be connected to a server on the intranet/internet and may act as standalone testing. Once the exam is over, the result can be transferred online to a web server or locally stored on the computer's hard disk.

In computer-based testing (CBT), computer technology is employed, which means the candidates use computers to answer questions presented on the monitor. The test-taker submits the answer using a keyboard or a mouse. The computer which the test taker is using can be referred to as a client computer. In contrast, the computer used for delivering the exam while being connected on an intranet/internet is referred to as a server computer. Therefore, computer-based exams take place in a client-server environment.

The appeal of online CBT lies in its functionality to streamline how educational assessments, certifications, or pre-employment tests are conducted in multiple ways. From its inception in the 1970s, to now when computers have assumed a ubiquitous status, it has become the ideal successor to paper-and-pencil tests. Interestingly, the term "online exam" and "computer-based exam" are often used interchangeably; however, there is a subtle difference between these two.

### **Benefits of using computer-based tests**

- Convenience
- Computer adaptive testing
- Integrity
- Wide reach
- Scalable
- Auto grading
- Uncovers new aspects of thinking
- Inclusivity
- Saves time and energy

### "Technology"

The term "technology" refers to advancements in the methods and tools we use to solve problems or achieve a goal. In the classroom, technology can encompass all kinds of tools from low-tech pencil, paper, and chalkboard, to the use of presentation software, or high-tech tablets, online collaboration and conferencing tools, and more.

The newest technologies allow us to try things in physical and virtual classrooms that were not possible before. What you use depends fundamentally on what you are trying to accomplish.

### Technology in teaching

Technology is transforming education, changing how, when and where students learn, and empowering them at every stage of their journey.

On the path to personalizing learning, technology empowers students by giving them ownership of how they learn, making education relevant to their digital lives and preparing them for their futures. With technology and access to resources beyond classroom walls, students are inspired to become problem-solvers, critical thinkers, collaborators, and creators. Where technology has been successfully integrated into classrooms, students develop a lifelong love of learning.

Educators are always striving to personalize learning for students. Technology can help them reach new levels with access to real-time student data, longitudinal information, content, apps, and more. Technology can help educators create blended learning environments and leverage digital tools for formative and summative assessments, bringing new models for learning and teaching to classrooms.

Technology in education and the right devices in students' hands helps prepare them with the career and technical skills they need to be successful today and in tomorrow's workforce. Relevant learning experiences in STEAM can inspire creativity, help students apply meaning to their learning, and prepare them for future career opportunities and jobs that haven't even been created yet. Specific skills in coding, programming, physical computing, and computational thinking have become common requirements in the workforce. Though making, students can gain these skills and hone their problem-solving and critical thinking skills for the 21st century. Learning by doing with maker mindsets and environments can be very engaging when designed and integrated with the right technology.

#### Importance of technology in education

#### **Increased Collaboration and Communication**

Educational technology can foster collaboration. Not only can teachers engage with students during lessons, but students can also communicate with each other. Through online lessons and learning games, students get to work together to solve problems. In collaborative activities, students can share their thoughts and ideas and support each other. At the same time, technology enables one-on-one interaction with teachers. Students can ask classroom-related questions and seek additional help on difficult-to-understand subject matter. At home, students can upload their homework, and teachers can access and view completed assignments using their laptops.

#### **Personalized Learning Opportunities**

Technology allows 24/7 access to educational resources. Classes can take place entirely online via the use of a laptop or mobile device. Hybrid versions of learning combine the use of technology from anywhere with regular in-person classroom sessions. In both scenarios, the use of technology to tailor learning plans for each student is possible. Teachers can create lessons based on student interests and strengths. An added benefit is that students can learn at their own pace. When they need to review class material to get a better understanding of essential concepts, students can review videos in the lesson plan. The data generated through these online activities enable teachers to see which students struggled with certain subjects and offer additional assistance and support.

#### **Curiosity Driven by Engaging Content**

Through engaging and educational content, teachers can spark inquisitiveness in children and boost their curiosity, which research says has ties to academic success. Curiosity helps students get a better understanding of math and reading concepts. Creating engaging content can involve the use of AR, videos, or podcasts. For example, when submitting assignments, students can include videos or interact with students from across the globe.

### **Improved Teacher Productivity and Efficiency**

Teachers can leverage technology to achieve new levels of productivity, implement useful digital tools to expand learning opportunities for students, and increase student support and engagement. It also enables teachers to improve their instruction methods and personalize learning. Schools can benefit from technology by reducing the costs of physical instructional materials, enhancing educational program efficiency, and making the best use of teacher time.

### **Become a Leader in Enriching Classrooms through Technology**

Educators unfamiliar with some of the technology used in education may not have been exposed to the tools as they prepared for their careers or as part of their professional development. Teachers looking to make the transition and acquire the skills to incorporate technology in education can take advantage of learning opportunities to advance their competencies.

## UNIT - IV

### DEVELOPING 21<sup>st</sup> CENTURY SKILLS

#### **Globalization**

Globalization means the speedup of movements and exchanges (of human beings, goods, and services, capital, technologies or cultural practices) all over the planet. One of the effects of globalization is that it promotes and increases interactions between different regions and populations around the globe.

According to WHO, globalization can be defined as” the increased interconnectedness and interdependence of peoples and countries. It is generally understood to include two inter-related elements: the opening of international borders to increasingly fast flows of goods, services, finance, people and ideas; and the changes in institutions and policies at national and international levels that facilitate or promote such flows.”

It is the free movement of goods, services and people across the world in a seamless and integrated manner.

#### **Education**

Education can be thought of as the transmission of the values and accumulated knowledge of a society. Education is designed to guide them in learning a culture, molding their behaviour in the ways of adulthood, and directing them toward their eventual role in society. In the most primitive cultures, there is often little formal learning—little of what one would ordinarily call school or classes or teachers. The term education can be applied to primitive cultures only in the sense of enculturation, which is the process of cultural transmission. A primitive person, whose culture is the totality of his universe, has a relatively fixed sense of cultural continuity and timelessness. The model of life is relatively static and absolute, and it is transmitted from one generation to another with little deviation.

#### **The aims and importance of global education**

- Let those who participates in educational process obtains skills of new cultures.
- Develop the ability of distinguishing intercultural differences.
- Aiding the people for criticizing events from global perspective.
- Explain how different cultures impact the activities of organizations.
- Help students realize how attitudes are shaped and how they influence the behaviours.
- The language and harmony skills of the managers who will work in different cultures should be developed.
- Provide the ability of working together with the people coming from different cultures.
- Develop the skill of multi-sided thinking by causing them gain the cultural sensitivity and experience.
- Teach how to behave according to cultural differences.

- Teach how to manage multinational groups.
- Develop the way of thinking from individuality to globalize.

### **Impact of globalization on education**

- Globalization has improved the quality of education. Due to globalization, countries got the opportunity to witness the best education systems worldwide and thus could replicate them.
- A new method of learning such as e-learning, blended learning was quickly adopted by many countries due to globalization.
- Knowledge sharing among the world countries resulted in teaching updated technologies to students across the world.
- Due to globalization, foreign universities were established in developing countries. These universities helped many students in getting a high-quality education. Moreover, foreign investments in the education sector of developing and underdeveloped countries also helped in improving the facilities and infrastructure.
- Now, more and more students are studying in colleges of other countries through e-learning.
- As the number of foreign students is increasing at a rapid rate, several countries are improving their quality of education and teaching practices continuously.
- Education should develop empathy and understanding in students. Globalization enabled students to develop an understanding of other cultures, which is like a practical education.
- Due to globalization, many realised the importance of education and hence literacy rates have improved worldwide.
- Globalization made many people aware of human rights and the loopholes in the governance of their own countries. This practical education helps students in taking part in the development of their countries.
- Globalization encouraged many countries to adopt alternative learning systems such as homeschooling, distance education, world schooling etc.
- Now, there is more emphasis on practical learning in many countries. For example, internships have now become a common thing.

### **Information Communication- Technology and Education**

Under the effects of globalization, education is driven to important changes. The effects of Globalization on education bring faster developments in technology and communications are foreseeing changes within school systems across the world as ideas, values and knowledge, changing the roles of students and teachers, and producing a shift in society from industrialization towards an information-based society. It reflects the impact on culture and brings about a new form of cultural imperialism.

It gives quick developments in technology and communications are foreseeing changes the rise of a global society, driven by technology and communication developments are shaping children, the future citizens of the world into „global citizens“, intelligent people with a broad range of skills and knowledge to apply to a competitive, information based society. The nature of delivering education to students is being changed by the introduction of technology into the classroom, is gradually giving way to a new form of electronic literacy , more programs and education materials are made available in electronic form, teachers are preparing materials in electronic form; and students are generating papers, assignments and projects in electronic form“. Video projection screens, books with storage device servers and CD ROMs as well as the rise of on-line digital libraries are now replacing blackboards. Even exams and grades are gradually becoming available by electronic means and notebooks are starting to give way to laptops. Also, Students can be examined through computer managed

learning systems and do tutorial exercises on a computer rather than in classroom. Such developments in education portray that there has been a shift from industrialization to information-based societies. Hence, technology is predicting in the education environment towards a reliance on electronic sources to deliver material.

## **Communication**

The word communication is derived from a Latin word “communicare” which means to share, or to make common. Communication is the act of giving, receiving, and sharing information. In other words, talking or writing, and listening or reading. Good communicators listen carefully, speak or write clearly, and respect different opinions.

Aim of communication is to transmit information from one person to another so that the sender and receiver understand the message in the same way. The responsibility for clear communication usually falls on the sender. But the receiver is also responsible to confirm a clear understanding of the message. Communication is a dynamic and cyclical process.

## **Definition**

Communication can be defined as “purposefully and actively exchanging information between two or more people to convey or receive the intended meanings through a shared system of signs and (symbols)”. The Communication is a two-way process wherein the message in the form of ideas, thoughts, feelings, opinions is transmitted between two or more persons with the intent of creating a shared understanding.

Effective communication is when the message conveyed by the sender is understood by the receiver in exactly the same way as it was intended. It involves (at least) one sender, a message and a recipient. The communication process includes the steps we take in order to ensure we have succeeded in communicating.

## Communication Process

The communication is a dynamic process that begins with the conceptualizing of ideas by the sender who then transmits the message through a channel to the receiver, who in turn gives the feedback in the form of some message or signal within the given time frame. Thus, there are Seven major elements of communication process:

**Sender:** The sender or the communicator is the person who initiates the conversation and has conceptualized the idea that he intends to convey it to others.

**Encoding:** The sender begins with the encoding process wherein he uses certain words or non-verbal methods such as symbols, signs, body gestures, etc. to translate the information into a message. The sender’s knowledge, skills, perception, background, competencies, etc. has a great impact on the success of the message.

**Message:** Once the encoding is finished, the sender gets the message that he intends to convey. The message can be written, oral, symbolic or non-verbal such as body gestures, silence, sounds, etc. or any other signal that triggers the response of a receiver.

**Communication Channel:** The Sender chooses the medium through which he wants to convey his message to the recipient. It must be selected carefully in order to make the message effective and correctly interpreted by the recipient. The choice of medium depends on the interpersonal relationships between the sender and the receiver and also on the urgency of the message being sent. Oral, virtual, written, sound, gesture, etc. are some of the commonly used communication mediums.

**Receiver:** The receiver is the person for whom the message is intended or targeted. He tries to comprehend it in the best possible manner such that the communication objective is attained. The degree to which the receiver decodes the message depends on his knowledge of the subject matter, experience, trust and relationship with the sender.

**Decoding:** Here, the receiver interprets the sender's message and tries to understand it in the best possible manner. An effective communication occurs only if the receiver understands the message in exactly the same way as it was intended by the sender.

**Feedback:** The Feedback is the final step of the process that ensures the receiver has received the message and interpreted it correctly as it was intended by the sender. It increases the effectiveness of the communication as it permits the sender to know the efficacy of his message. The response of the receiver can be verbal or non-verbal.

#### Classification of Communication

Communication in an organization can be broadly classified into two types:

- Formal Communication
- Informal Communication

This classification is based on channels of communication. The channel of communication refers to the path through which the information is transmitted

#### **Formal Communication**

Formal communication refers to the official communication which follows the formal channel. Formal channels are the paths of communication that are institutionally determined, that is, they are established by the organization. It can be oral or written.

Oral communication can take the form of interviews, meetings, presentations, and so on.

Written communication can take the form of notes, memos, letters, reports, and so on.

Further, Formal communication can be further classified into the following:

- vertical,
- horizontal
- diagonal

#### **Vertical communication**

Vertical communication is the flow of information both up and down the chain of command.

It can take place in two ways:

- Upward Communication
- Downward Communication

*Downward communication:* Downward communication is basically the opposite of upward communication. It is the process of sending a message from the top level management to the employees.

*Upward communication:* Upward communication refers to that form of communication that flows from bottom to top. This form of communication, helps employees, to express their views, ideas or grievances with the top management.

**Horizontal or Lateral communication:** Lateral communication generally takes place in an organization and is neither upward nor downward. It proceeds in a horizontal manner and takes place among equals and at peer level.

**Diagonal communication:** Diagonal communication is a multi-directional communication that involves the use of several methods including horizontal, upward and downward. Diagonal communication refers to the exchange of information between different levels within an organization. It takes place between employees without any consideration of the hierarchy or reporting chain.

### **Informal Communication**

Informal Communication is a casual or non-official type of discussion that happened between two individuals at the workplace. These type of communications may happen verbally or in written but does not hold any official responsibility. The informal communication network is often known as the 'grapevine'. It is a result of social interaction among the various members of the organization.

There are four types of Informal Communication (Grapevine) network that show how the communication is facilitated. These are:

- Single Strand Chain
- Gossip Chain
- Probability Chain
- Cluster Chain

### Types of communication

Verbal communication is any communication that uses words to share information with others. These words may be both spoken and written.

Basic Verbal Communication Skills: Effective Speaking and Listening

### **Effective speaking**

Effective speaking involves three main areas: the words you choose, how you say them, and how you reinforce them with other non-verbal communication.

Effective listening is vital for good verbal communication. There are a number of ways that you can ensure that you listen more effectively. These include:

### Nonverbal communication

Nonverbal communication is the use of body language to convey a message. It includes facial expressions, the tone and pitch of the voice, gestures displayed through body language (kinesics) and the physical distance between the communicators.

### **Written Communication**

It refers to the process of conveying a message through the written symbols. In other words, any message exchanged between two or more persons that make use of written words is called as written communication. Written communications skills are those skills that use written words to deliver your point.

### **21st Century skills**

21st Century skills are 12 abilities that today's students need to succeed in their careers during the Information Age.

### **The twelve 21st Century skills are:**

1. Critical thinking
2. Creativity
3. Collaboration
4. Communication
5. Information literacy
6. Media literacy
7. Technology literacy
8. Flexibility

9. Leadership
10. Initiative
11. Productivity
12. Social skills

Each 21st Century skill is broken into one of three categories:

1. Learning skills
2. Literacy skills
3. Life skills

**Learning skills (the four C's)** teaches students about the mental processes required to adapt and improve upon a modern work environment.

**Literacy skills (IMT)** focus on how students can discern facts, publishing outlets, and the technology behind them. There's a strong focus on determining trustworthy sources and factual information to separate it from the misinformation that floods the Internet.

**Life skills (FLIPS)** take a look at intangible elements of a student's everyday life. These intangibles focus on both personal and professional qualities.

**The 4 C's of 21st Century Skills are:**

- **Critical thinking:** Finding solutions to problems
- **Creativity:** Thinking outside the box
- **Collaboration:** Working with others
- **Communication:** Talking to others

**The three 21st Century literacy skills are:**

- **Information literacy:** Understanding facts, figures, statistics, and data
- **Media literacy:** Understanding the methods and outlets in which information is published
- **Technology literacy:** Understanding the machines that make the Information Age possible

**The five 21st Century life skills are:**

- **Flexibility:** Deviating from plans as needed
- **Leadership:** Motivating a team to accomplish a goal
- **Initiative:** Starting projects, strategies, and plans on one's own
- **Productivity:** Maintaining efficiency in an age of distractions
- **Social skills:** Meeting and networking with others for mutual benefit

Teaching aids

Teaching aids are tools used by the teacher to explain concepts to learners.

There are different types of teaching aids and they are:

### **1. Visual Aids**

As the name suggests teaching aids that include visuals are called visual aids. Charts, diagrams, graphs, etc. are effective visual aids that teachers use to convey concepts and lessons with more clarity and effectiveness.

### **2. Audio Aids**

Audio aids help to improve the listening and communication skills. As mentioned, there are different types of learners in a classroom and auditory learners are a part of it. Using audio teaching aids will help that segment to a great extent.

### **3. Audio-Visual Aids**

Videos and animations are used in the classroom to explain concepts better. With the development of technology, students have the opportunity to actually see how digestion takes place, understand the water cycle, can understand motion of vehicles, everything can be explained in a much detailed and better manner. Students understand new concepts better when they see it and experience it firsthand.



## Definition of panel discussion

A panel discussion is a format used at conventions, conferences, and meetings where a group of people who are skilled in a specific topic engage in conversation together in front of an audience. The purpose of a panel discussion is to spark conversation between a group of experts or industry and thought leaders, so that the audience can learn from their discourse and interaction.

## Group Discussion

"Group" is a collection of individuals who have regular contact and frequent interaction and who work together to achieve a common set of goals. "Discussion" is the process whereby two or more people exchange information or ideas in a face-to-face situation to achieve a goal. The goal, or end product, maybe increased knowledge, agreement leading to action, disagreement leading to competition or resolution or perhaps only a clearing of the air or a continuation of the status-quo.

## Project

A project is an activity to meet the creation of a unique product or service and thus activities that are undertaken to accomplish routine activities cannot be considered projects.

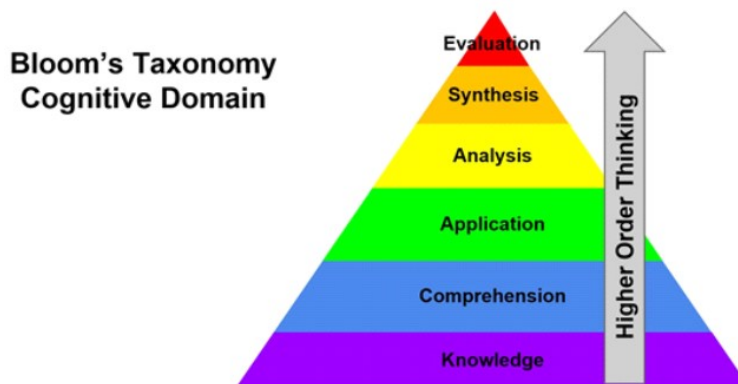
## Unit VI

### Role of technology in promoting higher order thinking skills

#### Higher order thinking (HOT)

Higher order thinking is thinking on a level that is higher than memorizing facts or telling something back to someone exactly the way it was told to you. When a person memorizes and gives back the information without having to think about it, we call that rote memory. That's because it's much like a robot; it does what it's programmed to do, but it doesn't think for itself.

A HOT is based on various taxonomies of learning, particularly the one created by Benjamin Bloom in his 1956 book, "Taxonomy of Educational Objectives: The Classification of Educational Goals." Higher-order thinking skills are reflected by the top three levels in Bloom's Taxonomy: analysis, synthesis, and evaluation.



Bloom's taxonomy was designed with six levels to promote higher-order thinking. The six levels were: knowledge, comprehension, application, analysis, synthesis, and evaluation. (The taxonomy's levels were later revised as remembering, understanding, applying, analyzing, revising, and creating.) The lower-order thinking skills (LOTS) involve

memorization, while higher-order thinking requires understanding and applying that knowledge.

The top three levels of Bloom's taxonomy which is often displayed as a pyramid, with ascending levels of thinking at the top of the structure are analysis, synthesis, and evaluation. These levels of the taxonomy all involve critical or higher-order thinking. Students who are able to think are those who can apply the knowledge and skills they have learned to new contexts. Looking at each level demonstrates how higher-order thinking is applied in education.

#### Analysis

Analysis, the fourth level of Bloom's pyramid, involves students use their own judgment to begin analyzing the knowledge they have learned. At this point, they begin understanding the underlying structure of knowledge and also are able to distinguish between fact and opinion. Some examples of analysis would be:

- Analyze each statement to decide whether it is fact or opinion.
- Compare and contrast the beliefs of W.E.B. DuBois and Booker T. Washington.
- Apply the rule of 70 to determine how quickly your money will double at 6 percent interest.
- Illustrate the differences between the American alligator and the Nile crocodile.

#### Synthesis

Synthesis, the fifth level of Bloom's taxonomy pyramid, requires students to infer relationships among sources, such as essays, articles, works of fiction, lectures by instructors, and even personal observations. For example, a student might infer a relationship between what she has read in a newspaper or article and what she has observed herself. The high-level thinking of synthesis is evident when students put the parts or information they have reviewed together to create new meaning or a new structure.

At the synthesis level, students move beyond relying on previously learned information or analyzing items that the teacher is giving to them. Some questions in the educational setting that would involve the synthesis level of higher-order thinking might include:

- What alternative would you suggest for \_\_\_?
- What changes would you make to revise \_\_\_?
- What could you invent to solve \_\_\_?

#### Evaluation

Evaluation, the top level of Bloom's taxonomy, involves students making judgments about the value of ideas, items, and materials. Evaluation is the top level of Bloom's taxonomy pyramid because at this level that students are expected to mentally assemble all they have learned to make informed and sound evaluations of the material. Some questions involving evaluation might be:

- Evaluate the Bill of Rights and determine which is the least necessary for a free society.
- Attend a local play and write a critique of the actor's performance.
- Visit an art museum and offer suggestions on ways to improve a specific exhibit.

#### Critical thinking

Critical thinking is a higher-order thinking skill. Higher-order thinking skills go beyond basic observation of facts and memorization. They are what we are talking about when we want our students to be evaluative, creative and innovative.

When most people think of critical thinking, they think that their words (or the words of others) are supposed to get "criticized" and torn apart in argument, when in fact all it means is that they are criteria-based. These criteria require that we distinguish fact from fiction; synthesize and evaluate information; and clearly communicate, solve problems and discover truths.

**Using Bloom's Taxonomy of thinking skills, the goal is to move students from lower- to higher-order thinking:**

- from knowledge (information gathering) to comprehension (confirming)
- from application (making use of knowledge) to analysis (taking information apart)
- from evaluation (judging the outcome) to synthesis (putting information together) and creative generation

This provides students with the skills and motivation to become innovative producers of goods, services, and ideas. This does not have to be a linear process but can move back and forth, and skip steps.

## UNIT - VII

Role of technology in fostering a student-centric learning environment

### Student-centered learning

Student-centered learning moves students from passive receivers of information to active participants in their own discovery process. What students learn, how they learn it and how their learning is assessed are all driven by each individual student's needs and abilities.

At the system level, this requires implementing curriculum planning practices, pedagogy and assessment methods that support a student-centric approach. In the classroom, teachers craft instruction and apply technology in a way that best serves each student's learning journey.

Technology use is always guided by two primary criteria:

- What's appropriate for the task at hand?
- How can activities be designed to develop higher-order thinking skills?

### **Importance of Student Centric Classroom**

When students take responsibility for their own learning, they become explorers capable of leveraging their curiosity to solve real-world problems. To that end, the ISTE Standards guide teachers toward designing learning experiences that permit student independence and foster lifelong learning.

Technology allows for an unprecedented level of personalized learning, with valuable opportunities to monitor progress and engagement, follow student thinking, and digitally assess competencies. When schools effectively leverage both technology and pedagogy, both students and teachers become empowered to make decisions about their own learning and teaching.

True student-centered learning requires more than just an increase in technology implementation. It represents a shift in the educational culture toward a system that supports technology for standards-based learning and real-world problem solving. As a system transitions to a student-centered approach, educators can more effectively apply technology to improve learning outcomes and help students develop the skills for college and career readiness.

### **Virtual classroom**

A virtual classroom refers to an online system that allows students and teachers to communicate and collaborate. Virtual classrooms are typically cloud-based learning solutions that are part of larger learning management systems (LMS). They are highly customizable and are accessible to users on a variety of devices, like smartphones, tablets and laptops.

## Features of virtual classroom

- **Video conferencing:** using the best web conferencing software to facilitate learner-teacher-learner communication
- **Digital whiteboards:** offering real-time demonstrations and diagrams
- **Instant messaging:** allowing typed conversations on lower bandwidths
- **Participation controls:** enabling students to participate in discussions, mute their surroundings or virtually “raise” their hands
- **Sub-chats:** breakout rooms to facilitate collaboration between learners
- **Video recording:** to save live lectures as video-on-demand for later reference
- **End-to-end encryption:** to ensure virtual classroom access is restricted to authorized learners

## SMART Board

A SMART Board is an interactive whiteboard that is receptive to touch, which allows you to write and move things around. SMART Boards work by connecting to a PC via an HDMI cable. The SMART Board displays what’s on the computer and allows you to see what’s on the board.

SMART Boards grant you the ability to tap things with a finger, and they also come with special-coloured pens to write with. This can save teachers time from buying EXPO markers when it comes to writing on a whiteboard. Advanced versions of smart boards now allow students to work on a problem on the board at the same time. Before, only one person could touch the board since smart boards wouldn’t respond to multiple touches.

## **SMART Boards in Classrooms**

SMART Boards can engage students with the lesson. This can encourage students to take notes and participate, and it can facilitate active learning. It enhance cooperation and collaboration, making the class interesting and fun—all the more reason why smart boards should be installed in every classroom. Students will brainstorm more in group activities, resulting in effective problem-solving. Check out how teachers can engage with students using this technology.

## Open Educational Resources

Open Educational Resources (OER) are learning, teaching and research materials in any format and medium that reside in the public domain or are under copyright that have been released under an open license, that permit no-cost access, re-use, re-purpose, adaptation and redistribution by others.

OER can:

- Increase access to education
- Provide students with an opportunity to assess and plan their education choices

- Showcase an institution's intellectual outputs, promote its profile, and attract students
- Convert students exploring options into fee-paying enrollments
- Accelerate learning by providing educational resources for just-in-time, direct, informal use by both students and self-directed learners
- Add value to knowledge production
- Reduce faculty preparation time
- Generate cost savings – (this case has been particularly substantiated for open textbooks)
- Enhance quality
- Generate innovation through collaboration

## **UNIT - VIII**

### **USING TECHNOLOGY TO TRANSFORM EDUCATIONAL INSTITUTIONS**

#### Impact of Technology Integration leading to transformation

Digital transformation involves improving the core business processes of a company to effectively fulfill customer expectations through data and technology leveraging. In the educational sector, students, faculty, staff and graduates can be the target consumer and both students and professors can benefit from digital transformation in schools.

Digital transformation to enhance student experience may include:

- Enabling students to enter through the mobile app or web application.
- Providing a broad range of choices for online learning.
- Using technology to track the progress of students and enforce intervention protocols.
- Enabling online class organization faculties.
- Key areas of digital transformation in education
- Use of classroom coaching technologies

After the pandemic, the coaching of classes has been closed in schools, colleges and conventional bricks and mortar institutes. Nearly all institutions have been adapted to digital education approaches. However, the learning findings are also unclear. Now that the outbreak of Covid seems to be under control and schools and colleges gradually start teaching, parents are uncertain that they can send their wards to the institution. This has pushed institutions to accept the digital educational transformation.

#### **Sanitation and thermal screening**

it will be mandatory to calculate the temperature of students and teachers. Adequate sanitation and control of health would also gain ground. It is easy to recognize if a student and teacher who is contaminated comes into contact with another person and is taking precautionary actions. Daily health checks in institutions can have secondary benefits. Students' health is always unaffected and their academic performance is hampered. Possessing health problems promptly helps increase your learning skills.

#### **Contactless attendance**

Restaurants use a contactless menu. You can search for a QR code for a menu by using your mobile phones. Institutions may also take advantage of this technology. By scanning their ID cards or using a face recognition device, students can record their attendance. Daily biometric participation would soon be uncontested.

### **Social distance control system**

AI-based systems have been used in some jurisdictions to monitor public meetings and prevent the virus spread. These technologies can also be used by educational institutions to enforce social distance and to track health standards.

### **Data Management**

Data management is the practice of collecting, keeping, and using data securely, efficiently, and cost-effectively. The goal of data management is to help people, organizations, and connected things optimize the use of data within the bounds of policy and regulation so that they can make decisions and take actions that maximize the benefit to the organization. A robust data management strategy is becoming more important than ever as organizations increasingly rely on intangible assets to create value.

### **Computer networks**

Computer networks are the basis of communication in IT. They are used in a huge variety of ways and can include many different types of network. A computer network is a set of computers that are connected together so that they can share information. Computer networks are used to carry out a large number of tasks through the sharing of information.

#### *Use of Computer networks*

- Communicating using email, video, instant messaging and other methods
- Sharing devices such as printers, scanners and photocopiers
- Sharing files
- Sharing software and operating programs on remote systems
- Allowing network users to easily access and maintain information

### **HTML editor**

An HTML editor is software for editing and creating HTML code that is used for websites or other web documents. With text-based HTML editors, the source code can be edited directly. WYSIWYG editors show the document to be edited already the way it displayed in the browser later. HTML editors are usually part of an integrated development environment. However, HTML editors differ from pure text editors in that they are integrated in a development environment or offer numerous additional functions:

- Automatic detection of HTML tags
- Detection of syntax errors
- Autocomplete function
- Shortcuts for common tags

- Extended use for PHP
- Editing of HTML code directly in the layout of a web document (WYSIWYG editors)

## **UNIT - IX**

### **Using internet as pedagogical and communication tool**

#### **WWW**

The World Wide Web (WWW) is a network of online content that is formatted in HTML and accessed via HTTP. The term refers to all the interlinked HTML pages that can be accessed over the Internet. The World Wide Web was originally designed by Tim Berners-Lee.

#### **Website**

A website is a collection of many web pages, and web pages are digital files that are written using HTML (HyperTextMarkup Language). To make your website available to every person in the world, it must be stored or hosted on a computer connected to the Internet round a clock. Such computers are known as a Web Server. A website refers to a central location with more than one web page or several web pages. For example, Computer Hope is considered a website, which contains thousands of different web pages.

#### **Web page**

A web page or webpage is a document, commonly written in HTML, that is viewed in an Internet browser. A web page can be accessed by entering a URL address into a browser's address bar. A web page may contain text, graphics, and hyperlinks to other web pages and files.

#### **URL**

URL stands for Uniform Resource Locator. A URL is nothing more than the address of a given unique resource on the Web. In theory, each valid URL points to a unique resource. Such resources can be an HTML page, a CSS document, an image, etc. In practice, there are some exceptions, the most common being a URL pointing to a resource that no longer exists or that has moved. As the resource represented by the URL and the URL itself are handled by the Web server, it is up to the owner of the web server to carefully manage that resource and its associated URL.

#### **Search engine**

A search engine is software accessed on the Internet that searches a database of information according to the user's query. The engine provides a list of results that best match what the user is trying to find.

#### **Online Conferencing**

An Online Conferencing service is an audio web video conferencing solution that combines all services into one online conference solution. Online meeting services allow you to use internet access from your computer for a complete online conference solution. Online Conferencing can be done as scheduled, or reservationless, with operator assisted

conferencing available. Online teleconferencing participants are bridged together seamlessly with the online collaboration tools providing the visual participation.

### **Video Conferencing**

It is a type of online meeting where two or more people engage in a live audio-visual call. With a strong internet connection, the participants can see, hear, and talk to each other in real time, no matter where in the world they are.

Basic components of a video conferencing system

- A stable internet connection
- A video display device (laptop, desktop monitor, or a television screen)
- A computer or conference phone
- Other peripherals (webcam, microphone, headset, speaker, etc.)
- Video conferencing software

### **Weblog**

A weblog or blog is a listing of text, images, or other objects that are arranged in a chronological order that first started appearing in 1998. Blogs are often maintained and run by a single individual, updated daily, or contain personal remarks about a topic, a personal ramble, or an update on the person's life. Weblogs are like a personal journal, offering the user a way to publicly discuss their life. It provides a personal way to learn more about people, events, places, and people around the world.

### **Chat Room**

A chat room is a designated virtual channel where users communicate with each other through the Internet, traditionally in plain text only. More recent developments in Web technology now allow the transmission of images and emoticons in a chat room as well. The term can mean online chatting, instant messaging and online forums using either synchronous or asynchronous conferencing. Some chat rooms require a username and password combination in order to log in or join a conversation, allowing for privacy among the users.

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### **Wiki**

A wiki is a website that allows the site visitors to add and edit content. Generally, site visitors use their browser to edit text without requiring HTML code. Additionally, some Wikis allow



adding and editing of graphics, tables and interactive components. The term wiki may also simply refer to the software used to create such a Web site.

### **Electronic journal**

An electronic journal is a periodical publication which is published in electronic format, usually on the Internet.

### **Digital Library**

A Digital Library is a special library with a focused collection of digital objects that can include text, visual material, audio material, video material, stored as electronic media formats, along with means for organizing, storing, and retrieving the files and media contained in the library collection. Digital libraries can vary immensely in size and scope, and can be maintained by individuals, organizations, or affiliated with established physical library buildings or institutions, or with academic institutions. The electronic content may be stored locally, or accessed remotely via computer networks. An electronic library is a type of information retrieval system.

### **Online examination**

Online examination is conducting a test online to measure the knowledge of the participants on a given topic. In the olden days, everybody had to gather in a classroom at the same time to take an exam. With online examination students can do the exam online, in their own time, with their own device, regardless of where they live. You only need a browser and an internet connection.

#### *Online examination systems*

The teacher or course builder creates an account with an exam builder. In such an exam system you can create questions and add them to the exam. You can choose between multiple choice questions or free text questions. The students are provided with a link to the online exam, they sign up and can take the exam. They see the results immediately afterwards.

### **E-learning**

E-learning is a type of learning conducted digitally via electronic media, typically involving the internet. It can be accessed via most electronic devices including a computer, laptop, tablet or smartphone, making it a versatile and easy way for students to learn wherever they are. E-learning resources come in a variety of forms – from software programmes and digital courses to interactive online platform and apps.

#### Critical issues in Internet usage

### **Plagiarism**

Plagiarism is a major academic dishonesty and follows academic ethics. It is subject to sanctions like penalties, suspension from the working place, and even dismissal. Plagiarism is not a crime, but involves copyright violation. Plagiarism is a serious ethical offence in

educational institutions and business sectors. Plagiarism and copyright violation overlap with each other, but they are not equivalent concepts. Many types of plagiarism are not found in copyright violation, which is defined by copyright law but are punishable. Plagiarism is not defined. Although the individual committing plagiarism is not punished by law, he/she is punished by the institution where he/she works in. Most used plagiarism softwares are discussed in the following sub-sections.

### **Copyright**

Copyright is the exclusive rights given to the creator of the original work to reproduce, translate, adapt, copy, perform, authorize, receive royalty on the work and engage in any other economic benefits arising out of the work. The issue of copyright becomes more complex in the digital world. Many access websites without password protection and make use of the web materials in their work. In fact, a website is like a book. So, the copyright laws are also applicable to the websites. Unless the author/creator of the website gives open permission to use the contents, we can't make use of the same in our work. However, fair use of the contents in the website for the purpose of research and criticism are always permitted. Some also think that the websites are in public domain. In fact, they are not. Any material under 'Public Domain' means that it is not covered by copyright laws or the intellectual rights.

### **Privacy Policy**

Privacy policies are one legal page that any site collecting any type of information from their customers should have. A privacy policy should cover:

- your use of cookies and other trackers;
- how you use personal information collected;
- who you distribute collected information to;
- contact information for erasing private information;
- information about third-party sites that might collect information (such as advertisers); and
- editing dates when the document is changed.

### **Cyber bullying**

Cyber bullying is the modern form of bullying done over the web. Cyber bullying is one of the most mentally destructive problems that people face today. Many young people spend most of their time in social media. When they come across negative words, images, and messages in the social media, they are psychologically disturbed. With the continuous addiction to social media, it is getting difficult to prevent cyber bullying. Apps and sites such as Whatsapp, Instagram, Snapshot, Facebook, Twitter, etc. are mostly used by the young people. Sometimes, they become victims of cyber bullying in these Apps and sites. We need new strategies to address and prevent cyber bullying in today's hyper connected world.

## UNIT - X

### Technology supported project based learning

#### **Project**

Project is defined as a sequence of tasks that must be completed to attain a certain outcome.

#### Project based learning

Project based learning gives a thorough practical exposure to a problem upon which the project is based. Projects are developed generally in groups where students can learn various things such as working together, problem solving, decision making, and investigating activities. Project based learning involves the steps such as analysing the problem, formulating the problem into small modules, applying the mechanism or method to solve each module and then integrating the solution of all the modules to arrive at the complete solution of the problem. To solve a problem it is required that those who work on it gather the relevant data and process it by applying a particular method. Data may be collected as per the requirement of the project in a particular format. All the team members should be associated to accomplish the task. After collecting data, it should be processed to solve the problem. The results should be reported in a predetermined format.

#### **Modular approach to projects**

There are several approaches to execute a project such as modular approach, top down approach and bottom up approach. Amongst the most common forms of project based learning, the modular approach to execute a project is the most reliable technique. A structured or a modular approach to a project means that a project is divided into various manageable modules and each of the modules has a well defined task to be performed with a set of inputs. This would lead to a set of outputs which when integrated leads to the desired outcome.

Steps in Project Based Learning:

- Identification of a project
- Defining a plan
- Fixing of a time frame and processing
- Providing guidance and monitoring a project
- Outcome of a project

1. Identification of a project: The project idea may come through any real life situation. For example one could think of doing a project for organising a seminar. One needs to understand the usefulness of the project and its impact. Students must be encouraged to undertake interdisciplinary projects.

2. Defining a plan: Normally for any kind of project, there are several project members involved in it. One project leader has to be identified. The roles of project leader and each

project member have to be clearly defined. Students who are performing a project must be assigned with specific activities. The various tools for executing these activities must be known. To obtain a better solution, one should always think of the extreme situations.

3. Fixing of a time frame and processing: Every project is a time relevance project. A student must understand the importance of time frame for completion of the project. All the activities which are performed in the projects require certain amount of time. Every project must be well structured and at the same time it must be flexible in its time frame.

4. Providing guidance and monitoring a project: Many times, the participants in the project get stuck up with the process and become unable to proceed further. In such a case or otherwise they need guidance. Guidance can be obtained from various resources such as books, websites and experts in the field. While it is essential that project leader should ensure monitoring of the project, the guide teacher also helps in monitoring the project.

5. Outcome of a project: One needs to understand what can be the outcome of the project. The outcome can be single or it can be multiple. The outcome of the project can be peer reviewed and it can be modified as per the feedback from users or experts.

Let us consider a project “Organising a seminar for career counselling in a school”. The project can be broken into sub-tasks such as :

- Drafting the concept note that would establish the need for organising such a seminar
- Arranging a hall for the seminar having proper sitting arrangements with audio-visual facilities
- Making a list of participants and sending information to the participants
- Sending invitations to the guests
- Arranging career counsellors to speak at the seminar
- Arranging for hospitality to the guests, etc.

The above example demonstrates the need of a modular approach to a project. A separate team of people may be assigned to perform each of the above listed sub-tasks. The advantage of modular approach is that it is much easier to design a smaller task. Also, some of the modules can be re-used if they have already been done for some other project. For example the list of participants may be re-used if it was already prepared for some other seminar. It also ensures that some tasks can be done in parallel which is very helpful for executing a project in short time.

## **A SUCCESSFUL LEARNING EXPERIENCE**

In order for projects to be successful learning experiences, each student should:

- have a sense of participation
- have enough time to work on a project
- have some choices in the creation of questions, approaches, etc.,
- possess the skills to work with others

- have the knowledge necessary to explore questions that arise
- understand the teacher's method of evaluation.

Some of the projects with the objective to provide exposure to students to undertake and implement various aspects of real life projects, such as creating a magazine, Awareness of Pulse Polio Programme, Robotics, Health Analyser System, farewell to class XII, Know your District/Region, create a website as teamwork and establishment of a computer network etc.