

Programming Laboratory

Course Code: CS-13001

Dr. Jasaswi Prasad Mohanty
School of Computer Engineering
KIIT Deemed to be University
Bhubaneswar

Course Objective

- The course aims to provide exposure to problem-solving through programming.
- It aims to train the student to the basic concepts of the C-programming language.
- This course involves lab component which is designed to give the student hands-on experience with the concepts.

Course Contents

Module#	Name	Details
1	Introduction	<ul style="list-style-type: none"> ● Introduction to computer and its organization ● Computer memory ● Introduction to programming (High level/low level languages, procedural/structural programming) ● Introduction to Flowchart & Algorithm ● Number system representation
2	Variables, constants, Data types, Operators	<ul style="list-style-type: none"> ● Types of variables and constants ● Console input/output operations (library functions) ● Operators ● Type casting
3	Control statements	<ul style="list-style-type: none"> ● Decision control and branching statements (if, nested if and switch case statements, etc.) ● Looping control and their types (while, do-while, for, etc.) ● break and continue statements
4	Arrays	<ul style="list-style-type: none"> ● Introduction to Array ● Single Dimensional Array ● Multidimensional array
5	Functions	<ul style="list-style-type: none"> ● Library & User defined Functions, Formal and Actual parameters ● Declaring, defining and calling functions ● Parameter Passing – call-by-value and call-by-reference, Recursion

Module#	Name	Details
6	Storage Classes	<ul style="list-style-type: none"> ● Introduction to different types of storage classes – (auto, static, extern, register)
7	Character Arrays and Strings	<ul style="list-style-type: none"> ● String Manipulation
8	Pointers	<ul style="list-style-type: none"> ● Pointer variable, Pointer Arithmetic, ● Passing parameters by reference, ● Pointer to pointer, Pointer to functions
9	User Defined Data Types – Structures and Unions	<ul style="list-style-type: none"> ● Structure: definition, structure variable, creation, initialization and assignment ● Pointers to structures ● Union and their uses ● Enum and their uses
10	Dynamic Memory Allocation	<ul style="list-style-type: none"> ● Memory allocation functions (malloc, calloc, realloc, etc.) ● Memory de-allocation function (free)
11	File Handling	<ul style="list-style-type: none"> ● File operations - opening, closing, reading, writing etc.
12	Additional Features	<ul style="list-style-type: none"> ● Command line arguments ● Bitwise operators ● Macros

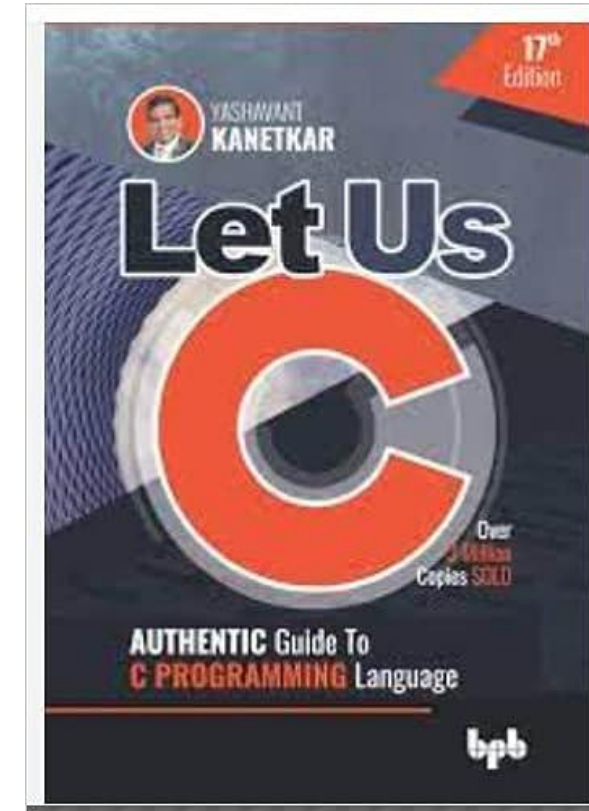
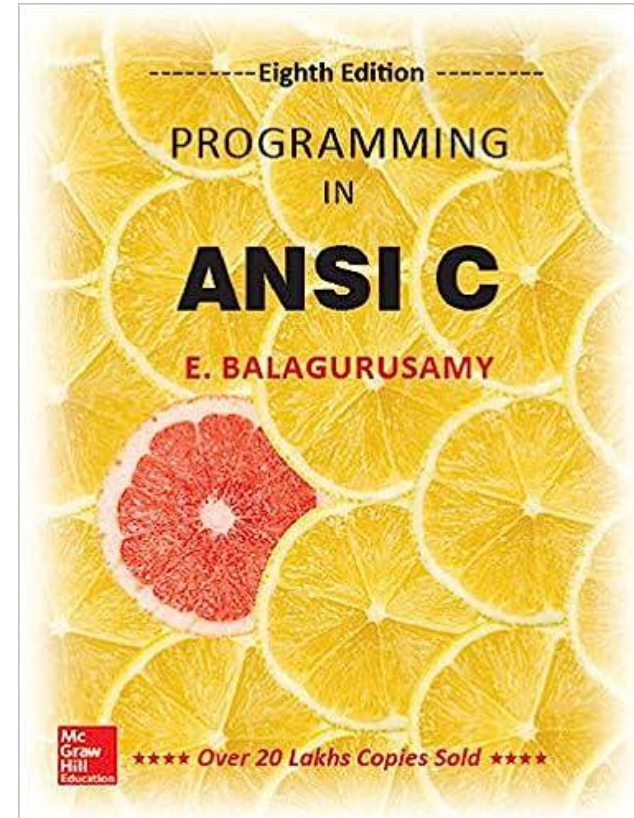
Books

■ Text books

- E. Balagurusamy, Programming in ANSI C, 8th Edition, McGraw-Hill Education, 2019.

■ Reference books

- B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd Edition, Pearson Education, 2015
- Y. Kanetkar, Let Us C, 17th Edition, BPB Publications, 2018



What is a Computer

- An **electronic device** which is capable of receiving information (**data**) in a particular form and of performing a sequence of operations in accordance with a predetermined but variable set of procedural instructions (**program**) to produce a result (**output**) in the form of information or signals.
- NOTE:
 - Electronic apparatus (although the first computers were mechanical and electro-mechanical)
 - Data processing
 - Computer assisted controls or operations
 - Can perform only those operations or calculations that can be expressed in logical and numerical terms.
 - It has the ability to store both data and instructions.



Why Computers

✓ High Speed

- Computer is a very fast device.
- It is capable of performing calculation of very large amount of data.
- It can perform millions of calculations in a few seconds as compared to man who will spend many months to perform the same task.

✓ Accuracy

- In addition to being very fast, computers are very accurate.
- Computers perform all jobs with 100% accuracy provided that the input is correct.

✓ Storage Capability

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

Why Computers

✓ **Diligence**

- Unlike human beings, a computer is free from monotony, tiredness, and lack of concentration.
- It can work continuously without any error and boredom.
- It can perform repeated tasks with the same speed and accuracy.

✓ **Versatility**

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

✓ **Reliability**

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

Why Computers

✓ Automation

- Computer is an automatic machine.
- Automation is the ability to perform a given task automatically. Once the computer receives a program i.e., the program is stored in the computer memory, then the program and instruction can control the program execution without human interaction.

✓ Reduction in Paper Work and Cost

- The use of computers for data processing in an organization leads to reduction in paper work and results in speeding up the process.
- As data in electronic files can be retrieved as and when required, the problem of maintenance of large number of paper files gets reduced.
- Though the initial investment for installing a computer is high, it substantially reduces the cost of each of its transaction.

Limitations of Computer

✓ No I.Q.

- A computer is a machine that has no intelligence to perform any task.
- Each instruction has to be given to the computer.
- A computer cannot take any decision on its own.

✓ Dependency

- It functions as per the user's instruction, thus it is fully dependent on humans.

✓ Environment

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

✓ No Feelings

- Computers have no feelings or emotions.
- It cannot make judgment based on feeling, taste, experience, and knowledge unlike humans.

Use of Computers

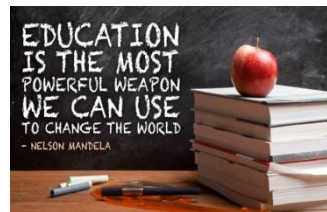
➤ Business

- Payroll calculations
- Budgeting
- Sales analysis
- Financial forecasting
- Managing employee database
- Maintenance of stocks, etc



➤ Banking

- Payroll calculations
- Budgeting
- Sales analysis
- Financial forecasting
- Managing employee database
- Maintenance of stocks, etc



➤ Insurance

- Payroll Procedure to continue with policies
- Starting date of the policies
- Next due installment of a policy
- Maturity date
- Interests due
- Survival benefits
- Bonus

➤ Education

- Keep students' records
- Computer based learning
- Admission process
- Placement centre

Use of Computers

➤ Health care

- Diagnostic system
- Patient monitoring system
- Hospital administration
- Pharma information system



➤ Engineering design

- Structural engineering
- Architectural engineering
- Industrial engineering



➤ Government services

- Budgets
- Sales tax department
- Income tax department
- Computerization of voters lists
- Computerization of PAN card
- Weather forecasting



➤ Military

- Missile Control
- Military Communication
- Military Operation and Planning
- Smart Weapons



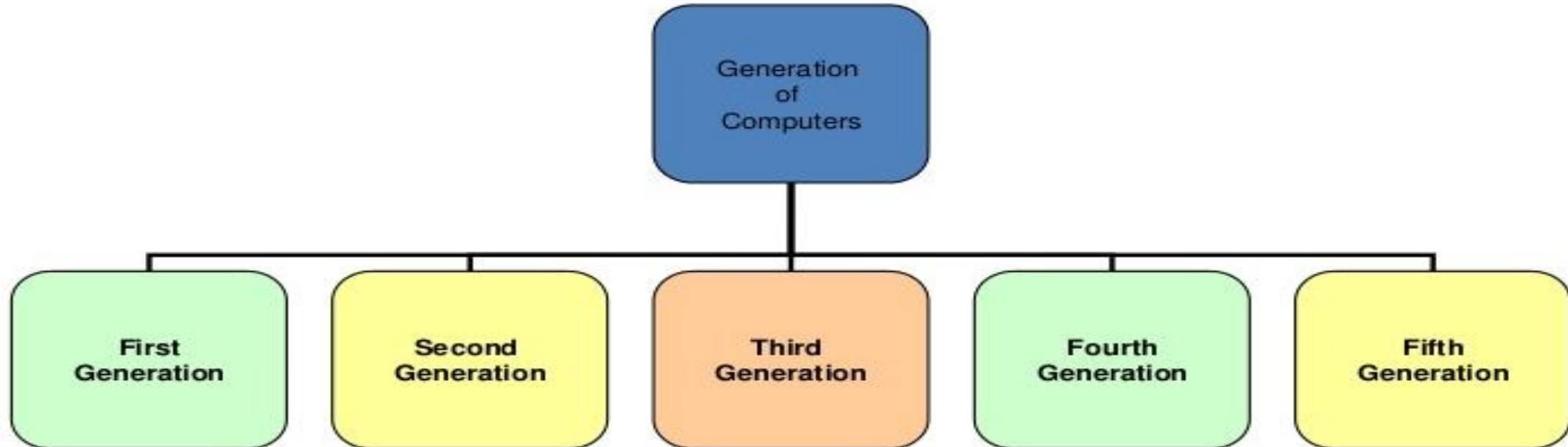
➤ Communication and social media

- Email
- Facebook
- Twitter
- Video conferencing
- whatsapp








Generation of Computers

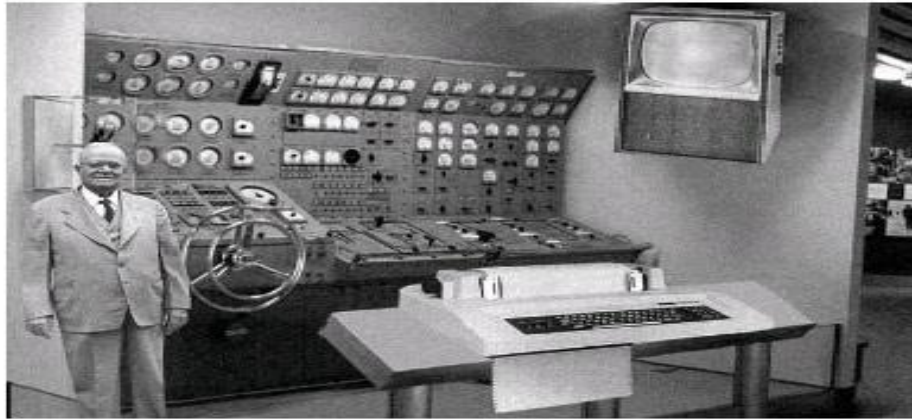
- ✓ Generation in computer terminology is a change in technology a computer is/was being used.
- ✓ Initially, the generation term was used to distinguish between varying hardware technologies.
- ✓ Nowadays, generation includes both **hardware and software**, which together make up an entire computer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



Generation of Computers

GENERATION	HARDWARE COMPONENTS		CHARACTERISTICS	COMPUTERS
First Generation (1942-1959)		⊙ Vacuum Tubes	<ul style="list-style-type: none"> ⊙ Machine Language ⊙ Huge Size ⊙ Highly Expensive ⊙ High Consumption of Electricity 	<ul style="list-style-type: none"> ⊙ ENIAC ⊙ UNIVAC ⊙ EDVAC ⊙ EDSAC ⊙ IBM-701
Second Generation (1959-1965)		<ul style="list-style-type: none"> ⊙ Transistors ⊙ Magnetic Tapes 	<ul style="list-style-type: none"> ⊙ Batch processing, Multiprogramming OS ⊙ Expensive ⊙ FORTRAN, COBOL 	<ul style="list-style-type: none"> ⊙ IBM 7000 ⊙ CDC 1604 ⊙ ATLAS ⊙ NCR 304 ⊙ Honeywell 400
Third Generation (1965-1975)		⊙ Integrated Circuits	<ul style="list-style-type: none"> ⊙ Remote processing, time-sharing, Multiprogramming OS ⊙ Faster, Compact & Cheaper ⊙ PASCAL PL/I, BASIC, ALGOL-68 	<ul style="list-style-type: none"> ⊙ IBM 360/370 ⊙ PDP 8/11 ⊙ CDC 6600
Fourth Generation (1975-1988)		⊙ VLSI Microprocessor circuits	<ul style="list-style-type: none"> ⊙ Time-sharing, real-time networks, distributed, GUI OS ⊙ Faster, Compact & Affordable ⊙ C, C++, DBASE 	<ul style="list-style-type: none"> ⊙ DEC 10 ⊙ STAR 1000 ⊙ CRAY-1/II ⊙ Apple II ⊙ VAX 9000
Fifth Generation (1988-Present)		⊙ ULSI Microprocessor circuits	<ul style="list-style-type: none"> ⊙ Parallel Processing & Artificial Intelligence technology ⊙ C and C++, Java, .Net 	<ul style="list-style-type: none"> ⊙ IBM ⊙ Pentium ⊙ Param

FIVE Generations of Computers



First Generation



Second Generation



Third Generation





Fourth Generation







Fifth Generation

Classification of Computers

S.No	Type	Specifications	
1	Super computer	<ul style="list-style-type: none"> It is an extremely fast computer, most expensive. Can execute hundreds of millions of instructions per second. Used where immense amount of mathematical calculations are there like <ul style="list-style-type: none"> ✓ weather forecasting ✓ Nuclear energy research ✓ Petroleum exploration 	 <p>▪The <u>IBM Blue Gene/P</u> supercomputer</p>
2	Main Frame	<ul style="list-style-type: none"> It is a multi-user computer system Capable of supporting vast number of users simultaneously. Large in size, expensive Can process large amount of data at very high speed and support many input, output. 	

Classification of Computers

S.No.	Type	Specifications	
3	Mini Computer	<ul style="list-style-type: none"> It is a multi-user computer system (10 to 100) Smaller in size and memory capacity. Ex – Digital equipment corporation VAX, IBM AS/400 	
4	Micro computers	<ul style="list-style-type: none"> Intended for personal need for an individual <ul style="list-style-type: none"> ✓ Desktop – on a desk ✓ Laptop – portable ✓ Palmtop computer/digital diary/Notebook – no separate key board 	<div>   </div> <div> <p>Palmtop Computer</p> <p>Palmtop computer is a hand-sized computer, palmtops have no keyboard but the screen serves both as an input and output devices.</p>  </div>

Five basic operations

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

Computer System

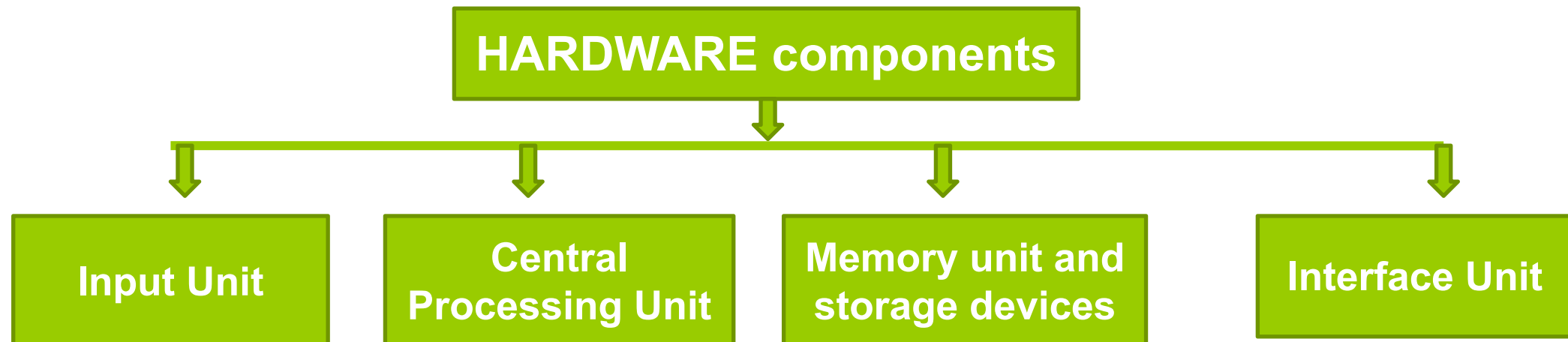
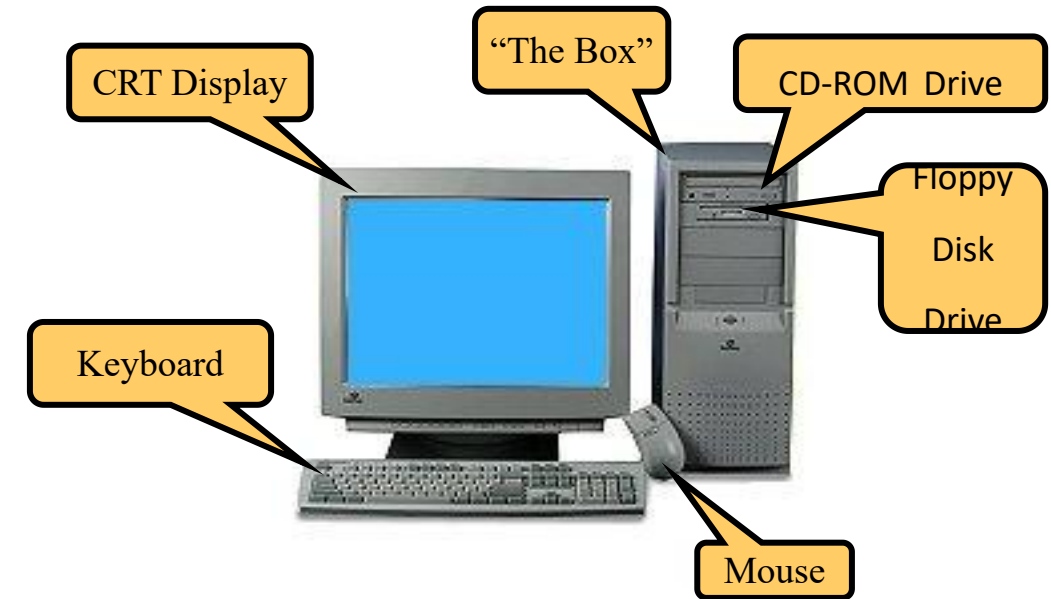


A Computer System consists of:

- Hardware
- Software
- User

Hardware

- The physical parts that make up a computer (the central processing unit, input devices, output devices, and memory) are called hardware.
- Physical components of computer that includes all Mechanical, Electrical, Electronic, and magnetic parts attached to it

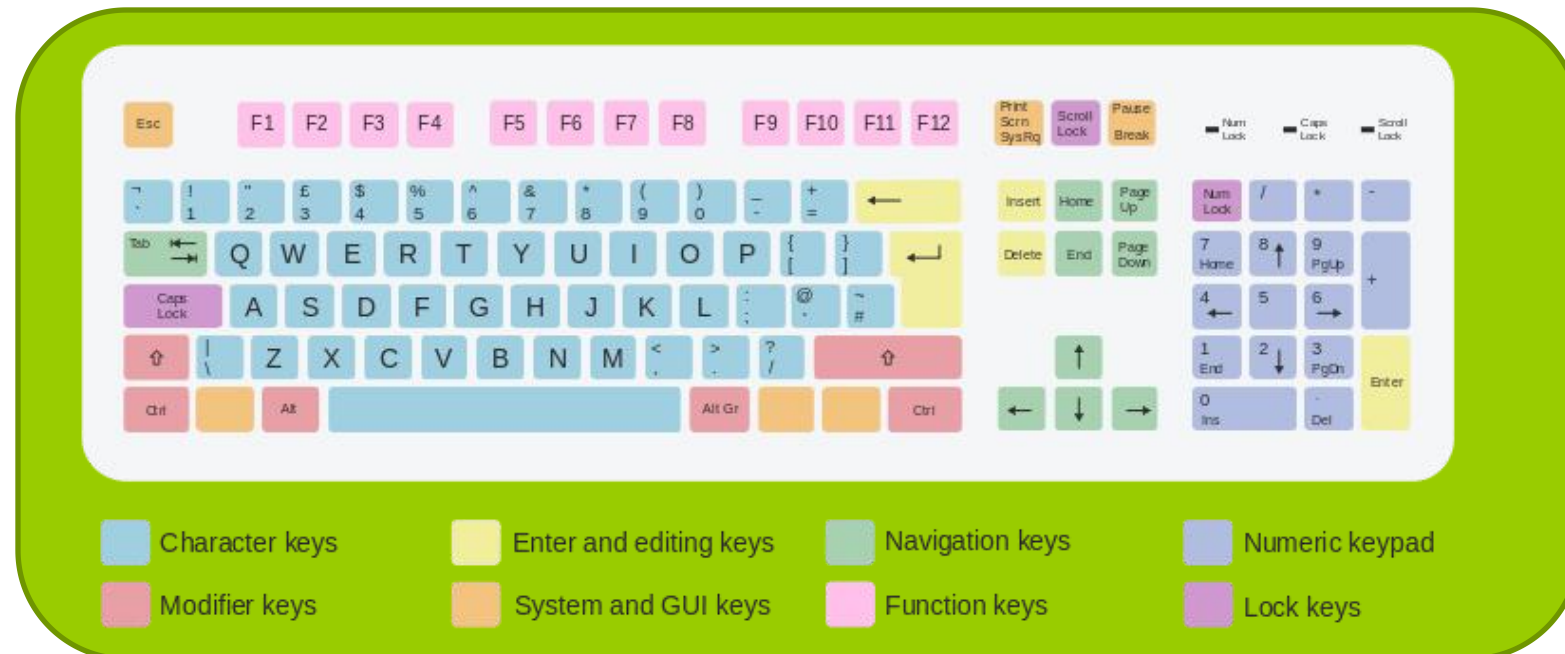


- Data and instructions are typed, submitted
- They are electronic or electromechanical component
- Provides means of communicating with computer system for feeding input data and instruction.
- Most common input devices
 - **Keyboard**
 - **Mouse**
 - **Scanner**

Input devices – keyboard (104 keys)

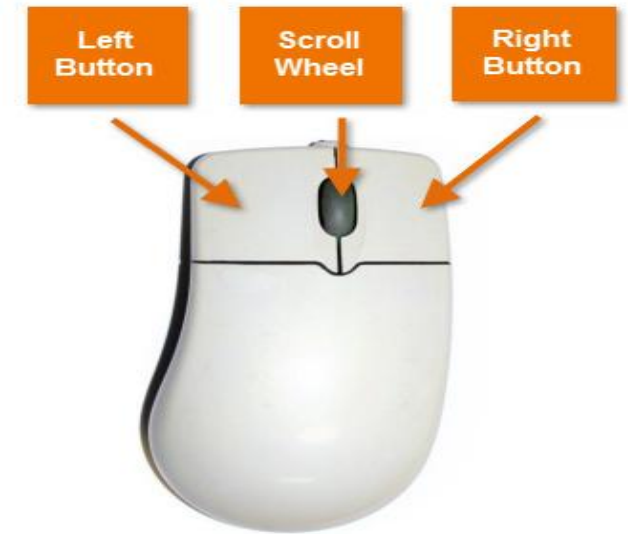
- **Character keys** : Letters, numbers, punctuation marks
- **Function keys** : 12 functional keys, F1 to F12, top of keyboard. They perform different functions depending on operating system or software.
- **Control keys** : Alt, Ctrl, shift, insert, delete, home, end
- **Navigation keys**: Arrows, pg up, pg down
- **Toggle keys** : Scroll lock, Num lock, Caps lock
- **Miscellaneous key**: Insert, delete, escape

Key Matrix : Keys are arranged in rows and columns, When a key is pressed, that position sends a signal to the circuit board inside the keyboard, The coordinates x and y of the key is used to determine which key is pressed. Therefore the corresponding data or instruction is identified



MOUSE

- It is the **pointing device**
- **Moves the cursor** around the screen and to point an object (icon, menu, command button etc)
- It has commonly 3 buttons.
- Mouse tracks the motion of the mouse pointer and senses the clicks and sends them to compute to act accordingly.
- It can connect to the system
 - Through infrared (wireless)
 - USB connector



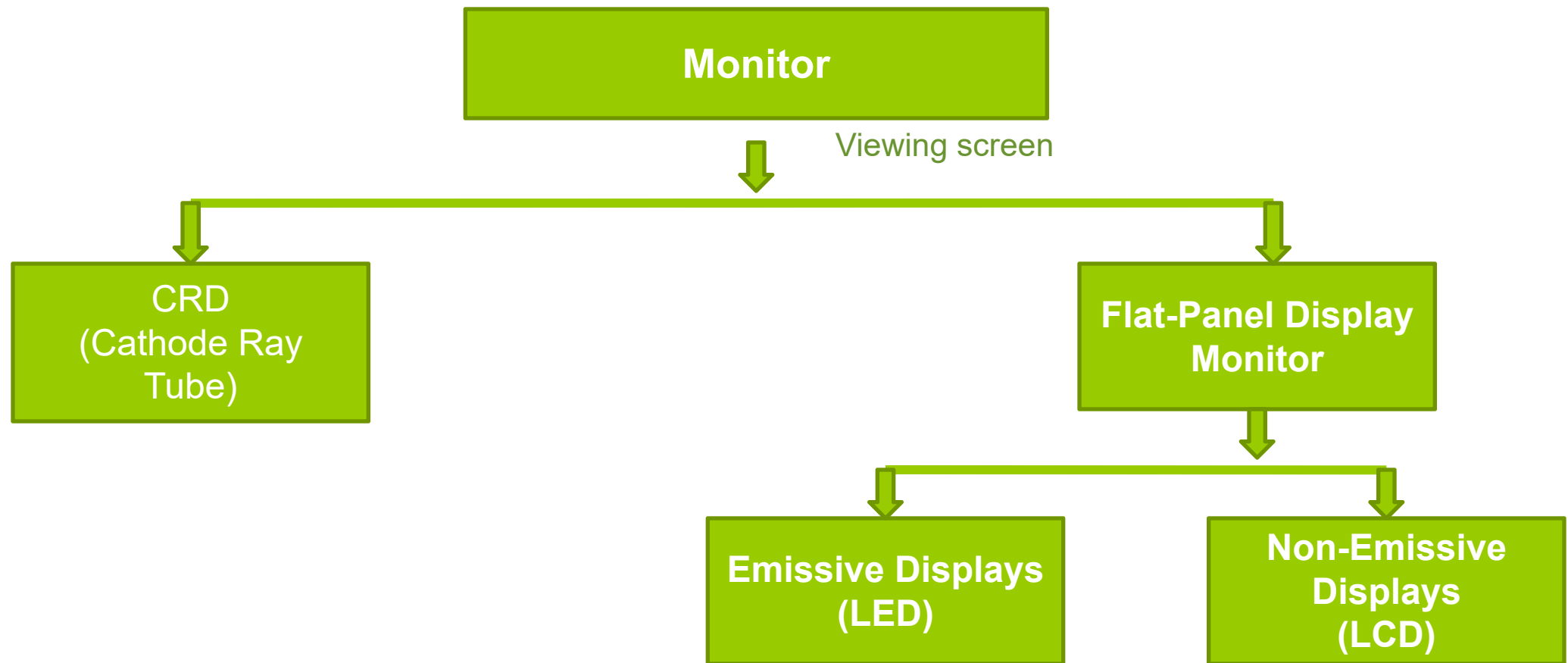
SCANNER

- Scans picture or document that can be stored.
- Stores in storage, can be modified suitably and transported to other computers
- Or can be printed on a printer



Output Devices - Monitor

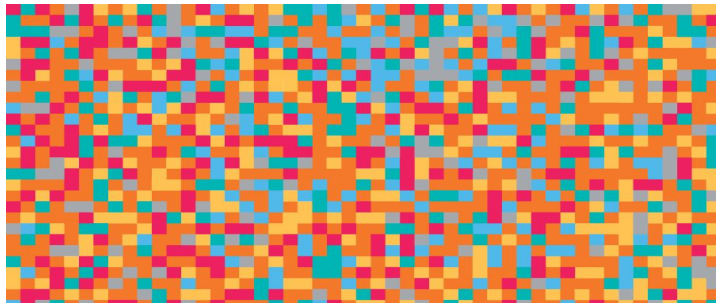
- Monitors, commonly called as **Visual Display Unit (VDU)**, are the main output device of a computer.



Output Devices - Monitor

Cathode-Ray Tube (CRT) Monitor

- **The CRT display is made up of small picture elements called pixels.** The smaller the pixels, the better the image clarity or resolution. It takes more than one illuminated pixel to form a whole character, such as the letter 'e' in the word help.
- A finite number of characters can be displayed on a screen at once. The screen can be divided into a series of character boxes - **fixed location on the screen where a standard character can be placed.**
- There are some disadvantages of CRT –
 - **Large in Size**
 - **High power consumption**



Flat-Panel Display Monitor

- The flat-panel display refers to a class of video devices that have reduced volume, weight and power requirement in comparison to the CRT. You can hang them on walls or wear them on your wrists. Current uses of flat-panel displays include calculators, video games, monitors, laptop computer, and graphics display.
- The flat-panel display is divided into two categories –
 - ✓ **Emissive Displays** – Emissive displays are devices that convert electrical energy into light. Example: plasma panel and **LED (Light-Emitting Diodes)**.
 - ✓ **Non-Emissive Displays** – Non-emissive displays use optical effects to convert sunlight or light from some other source into graphics patterns. Example: **LCD (Liquid-Crystal Device)**.



Output Devices - Printer

Printer

- Printer is an output device, which is used to print information on paper.
- Information can contain data, report, document, picture, diagrams.
- There are two types of printers –
 - ✓ Impact Printers
 - ✓ Non-Impact Printers

Impact Printers

- Impact printers print the characters by striking them on the ribbon, which is then pressed on the paper.
- Characteristics of Impact Printers are the following –
 - ✓ Very low consumable costs
 - ✓ Very noisy
 - ✓ Useful for bulk printing due to low cost
 - ✓ There is physical contact with the paper to produce an image
 - ✓ Example : Dot Matrix printer



Non-impact Printers

- Non-impact printers print the characters without using the ribbon. These printers print a complete page at a time, thus they are also called as Page Printers.
- These printers are of two types –
 - ✓ Laser Printers (use laser lights to produce the dots)
 - ✓ Inkjet Printers (spraying small drops of ink onto paper)
- Characteristics of Non-impact Printers
 - ✓ Faster than impact printers
 - ✓ They are not noisy
 - ✓ Supports many fonts and different character size



Central Processing Unit (CPU)

Central Processing Unit (CPU) consists of the following features:

- CPU is considered as the brain of the computer.
- CPU performs all types of data processing operations.
- It controls the operation of all parts of the computer.
- Physically it is an integrated circuit silicon chip, mounted on a small square plastic slab, surrounded by metal pins.
- Different functional units of CPU

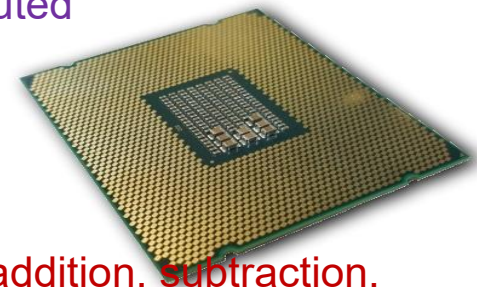


1. Registers

- High speed storage devices
- Serves some special purpose, like IR – instruction register holds current instructions being executed

2. Arithmetic Logic Unit (ALU)

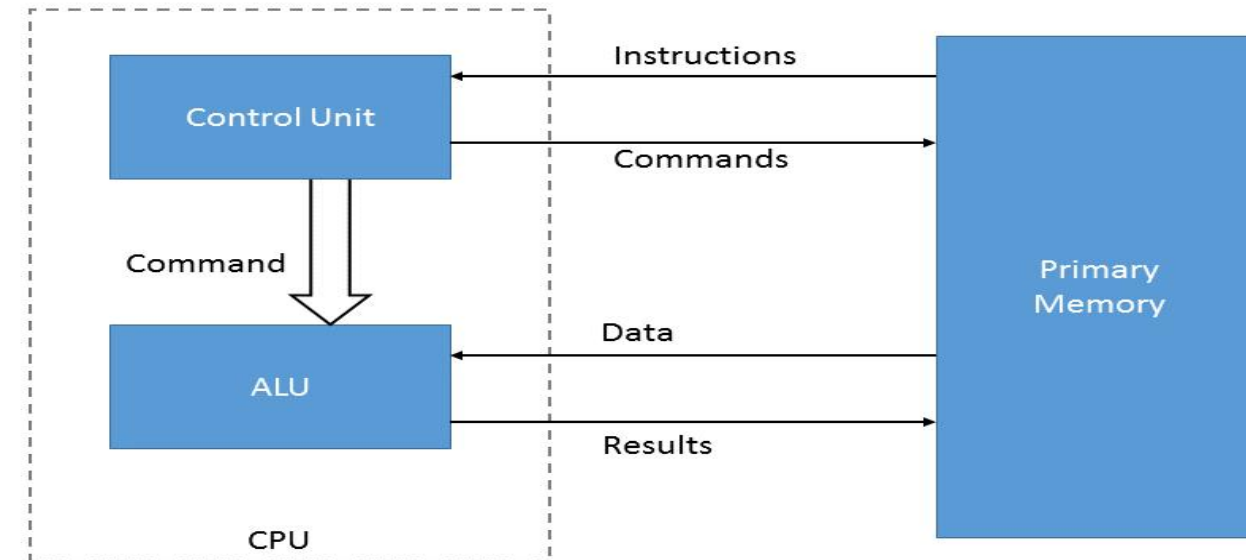
- This unit consists of two subsections namely,
 - **Arithmetic Section** : Function of arithmetic section is to perform arithmetic operations like addition, subtraction, multiplication, and division
 - **Logic Section**: Function of logic section is to perform logic operations such as comparing, selecting, matching, and merging of data.



Central Processing Unit (CPU)

3. Control Unit

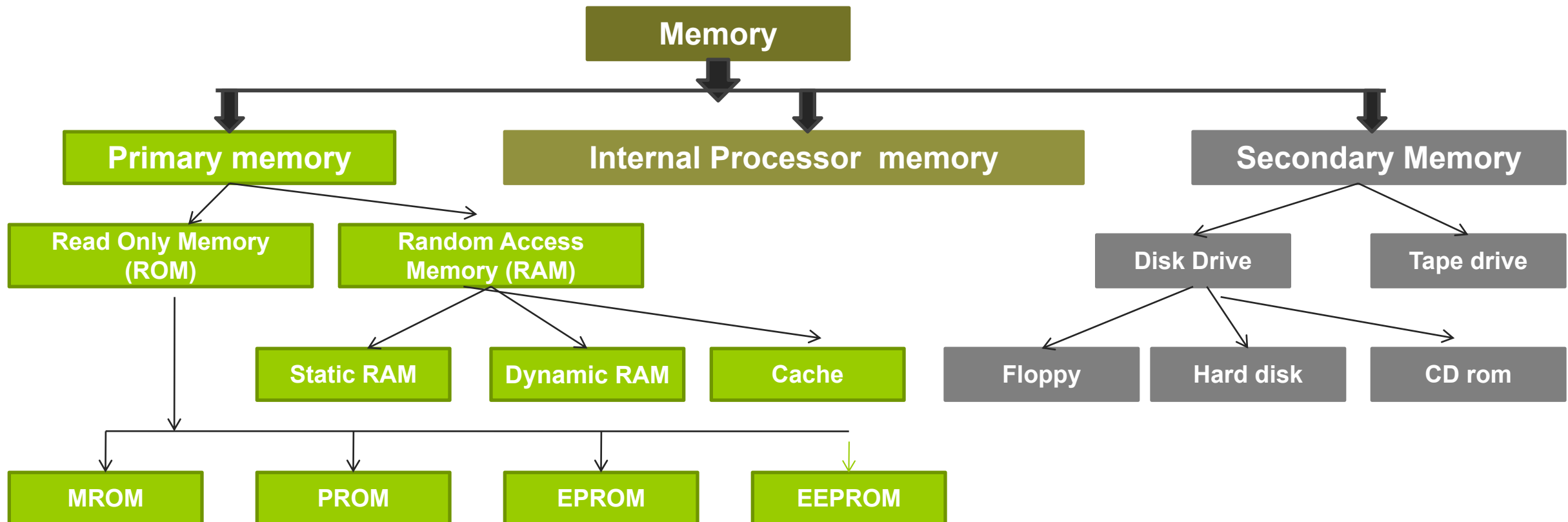
- This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.
- Functions of this unit are:
 - ✓ It is responsible for controlling the transfer of data and instructions among other units of a computer.
 - ✓ It manages and coordinates all the units of the computer.
 - ✓ It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
 - ✓ It communicates with Input/Output devices for transfer of data or results from storage.
 - ✓ It does not process or store data.



Functions of Control Unit

Memory unit

- It is used to **store data and instructions**. Computer memory is the storage space in the computer, where data is to be processed and instructions required for processing are stored.
- The memory is divided into large number of small parts called cells. Each location or cell has a unique address.



Primary (main) Memory

Primary Memory

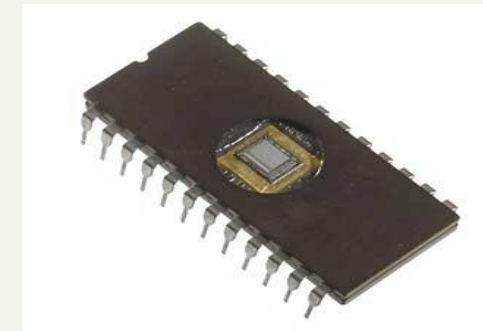
- ❑ Primary memory holds only those data and instructions on which the computer is currently working.
- ❑ It is the working memory of the computer.
- ❑ Faster than secondary memories.
- ❑ A computer cannot run without the primary memory.
- ❑ It is generally made up of semiconductor device. It is divided into two subcategories RAM and ROM.

ROM

- ❑ ROM stands for Read Only Memory.
- ❑ The memory from which we can only read but cannot write on it. This type of memory is non-volatile.
- ❑ The information is stored permanently in such memories during manufacture.
- ❑ A ROM stores such instructions that are required to start a computer. This operation is referred to as bootstrap.

MROM (Masked ROM)

- ❑ The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions.



Memory Unit

Characteristics

PROM (Programmable Read Only Memory)

- ☐ PROM is read-only memory that can be modified only once by a user.

EPROM (Erasable and Programmable Read Only Memory)

- ☐ EPROM can be erased by exposing it to ultra-violet light for a duration of up to 40 minutes. Data can be written electrically.

EEPROM (Electrically Erasable and Programmable Read Only Memory)

- ☐ EEPROM is programmed and erased electrically. It can be erased and reprogrammed about ten thousand times. Both erasing and programming take about 4 to 10 ms (millisecond).

RAM

- ☐ **RAM (Random Access Memory)** is the internal memory of the CPU for storing data, program, and program result.
- ☐ It is a read/write memory which stores data until the machine is working.
- ☐ Holds data and instructions waiting to be processed
- ☐ As soon as the machine is switched off, data is erased.



Memory Unit - RAM



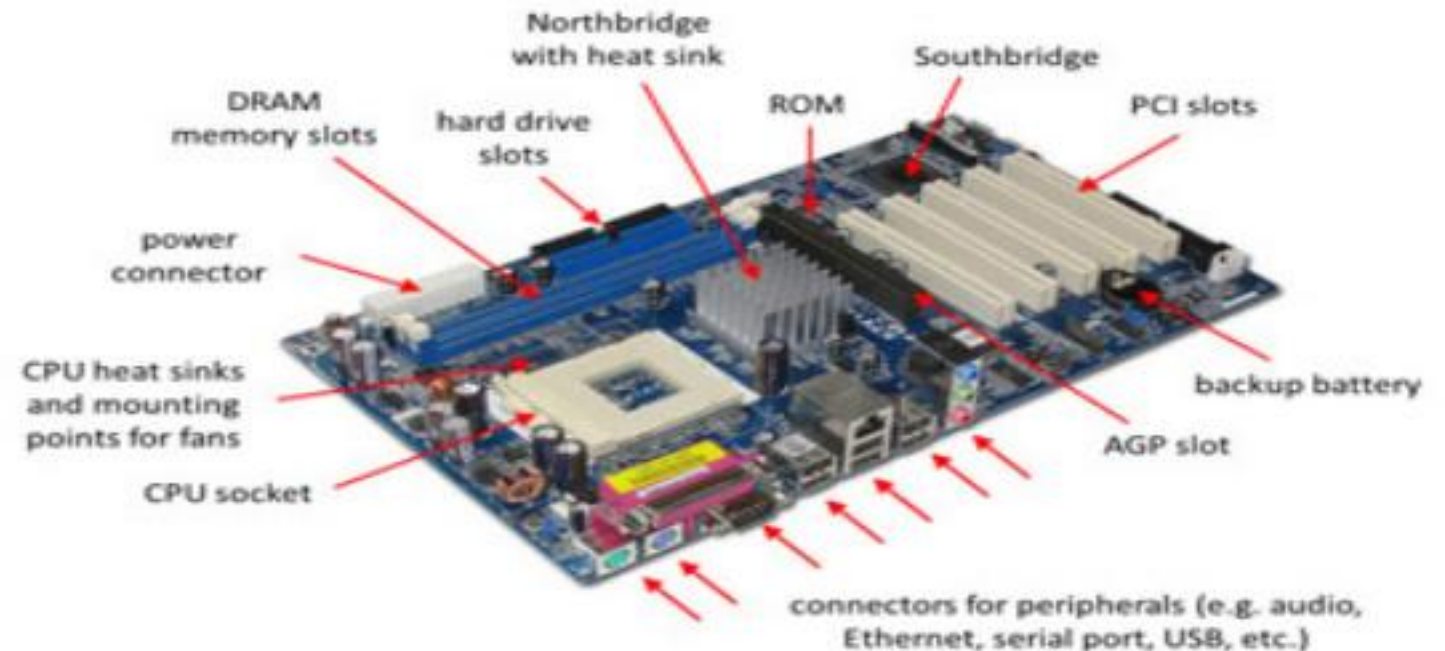
Static RAM (SRAM)	Dynamic RAM (DRAM)
Memory retains its contents as long as power is being supplied.	DRAM, unlike SRAM, must be continually refreshed in order to maintain the data. This is done by placing the memory on a refresh circuit that rewrites the data several hundred times per second
SRAM need not be refreshed on a regular basis. Long life.	Short life, need to be refreshed.
Large size, expensive	Small size, less expensive
SRAM chips use a matrix of 6-transistors and no capacitors.	All DRAMs are made up of memory cells, which are composed of one capacitor and one transistor.

Memory unit

	RAM	ROM
Definition	Random Access Memory or RAM is a form of data storage that can be accessed randomly at any time, in any order and from any physical location., allowing quick access and manipulation.	Read-only memory or ROM is also a form of data storage that can not be easily altered or reprogrammed. Stores instructions that are not necessary for re-booting up to make the computer operate when it is switched off. They are hardwired.
Stands for	Random Access Memory	Read-only memory
Use	RAM allows the computer to read data quickly to run applications. It allows reading and writing.	ROM stores the program required to initially boot the computer. It only allows reading.
Volatility	RAM is volatile i.e. its contents are lost when the device is powered off.	It is non-volatile i.e. its contents are retained even when the device is powered off.
Types	The two main types of RAM are static RAM and dynamic RAM.	The types of ROM include PROM, EPROM and EEPROM.

Motherboard

- The motherboard serves as a single platform to connect all of the parts of a computer together.
- It connects the CPU, memory, hard drives, optical drives, video card, sound card, and other ports and expansion cards directly or via cables.
- It can be considered as the backbone of a computer.
- Motherboard supports a single type of CPU and few types of memories.
- Following are the popular manufacturers of the motherboard.
 - Intel
 - ASUS
 - AOpen



Software

- Programs that tell a computer what to do are called software.
- Software is a collection of programs.
- A program is a set of instructions.
- Software Types:
 - System Software
 - Application Software

System Software

- A computer program that controls the hardware system and interacts with application software.
- The system software is a collection of programs designed to operate, control, and extend the processing capabilities of the computer itself.
- System software is generally prepared by the computer manufacturers.
- **Example:** Operating system, Compiler, Linker, Interpreter, Assemblers etc.

Application Software

- Application software (in short application) is any program designed to perform a specific function directly for the user or, in some cases, for another application program.
- Application software products are designed to satisfy a particular need of a particular environment.
- Application software may consist of a single program, such as Microsoft's notepad for writing and editing a simple text.
- It may also consist of a collection of programs, often called a software package, which work together to accomplish a task, such as a MS Office package.
- Typical types of application software include: Word processing, Electronic spreadsheet, Database, Email reader, Web browser, Graphics software and so on.

Units of Memory

- Memory unit is the amount of data that can be stored in the storage unit. This storage capacity is expressed in terms of Bytes.
- The following table explains the main memory storage units.

S.No.	Unit & Description
1	Bit (Binary Digit) A binary digit is logical 0 and 1 representing a passive or an active state of a component in an electric circuit.
2	Nibble A group of 4 bits is called nibble.
3	Byte A group of 8 bits is called byte. A byte is the smallest unit, which can represent a data item or a character.

Memory Capacity Conversion Chart

Term (Abbreviation)	Approximate Size
Byte (B)	8 bits
Kilobyte (KB)	1024 bytes / 10^3 bytes
Megabyte (MB)	1024 KB / 10^6 bytes
Gigabyte (GB)	1024 MB / 10^9 bytes
Terabyte (TB)	1024 GB / 10^{12} bytes
Petabyte (PB)	1024 TB / 10^{15} bytes
Exabyte (EB)	1024 PB / 10^{18} bytes
Zettabyte (ZB)	1024 EB / 10^{21} bytes
Yottabyte (YB)	1024 ZB / 10^{24} bytes

Operating System

- It is a system software that lies between computer hardware (Disk, Memory, Processor, etc.) and the Application programs (Word Processors, Web Browsers, spread Sheets etc.)
- It provides the most basic computing functions like:
 - Managing system memory
 - Sharing the processor
 - Opening and closing of devices and so on

Types of Operating System

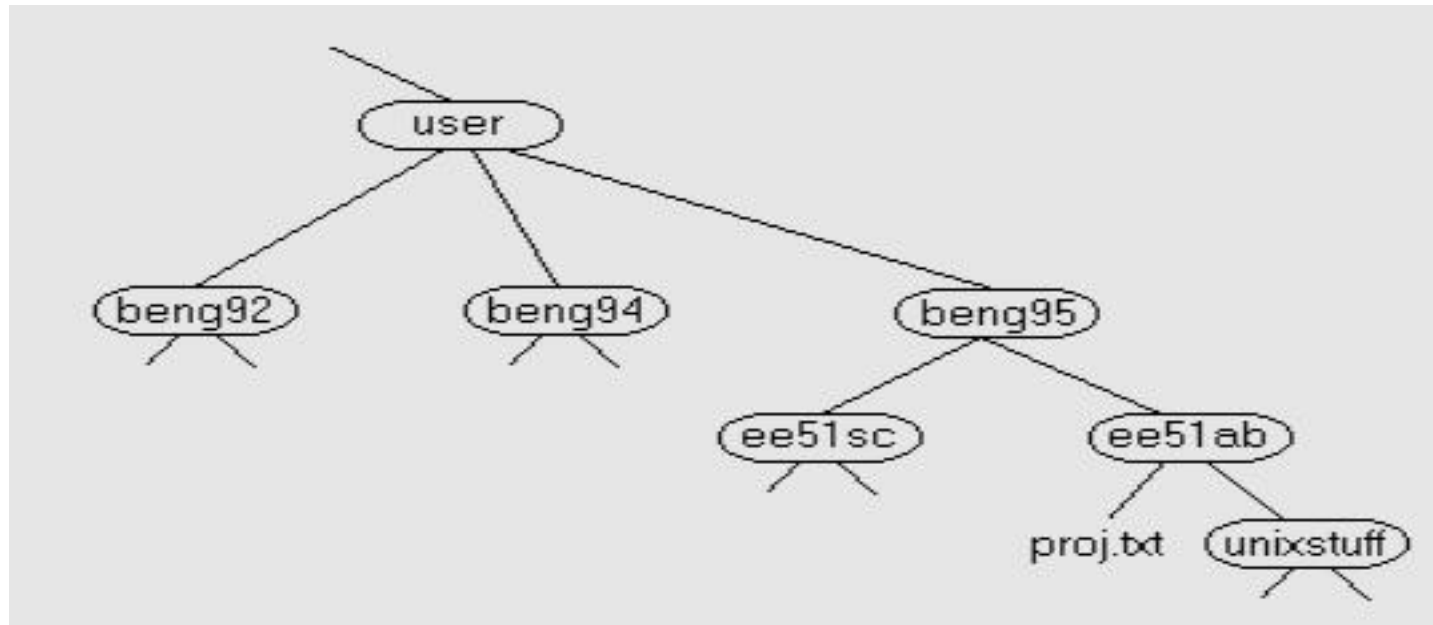
- According to the number of users the OS can handle :
 - Single User OS (DOS, WINDOWS 98)
 - Multi User OS (LINUX, UNIX, WINDOWS NT Server)
- According to the user interface:
 - Character User Interface (DOS, UNIX)
 - Graphical User Interface (WINDOWS, LINUX)

File & Directory

- **File:** Any named collection of information stored on a disk. Application programs and documents are examples of files. We make a file when we create information (such as text or graphics) using a program, name it and save it on a disk.
- **Directory:** It is a special kind of file that contains other files and directories. Directories can be nested to any depth.

Directory Structure

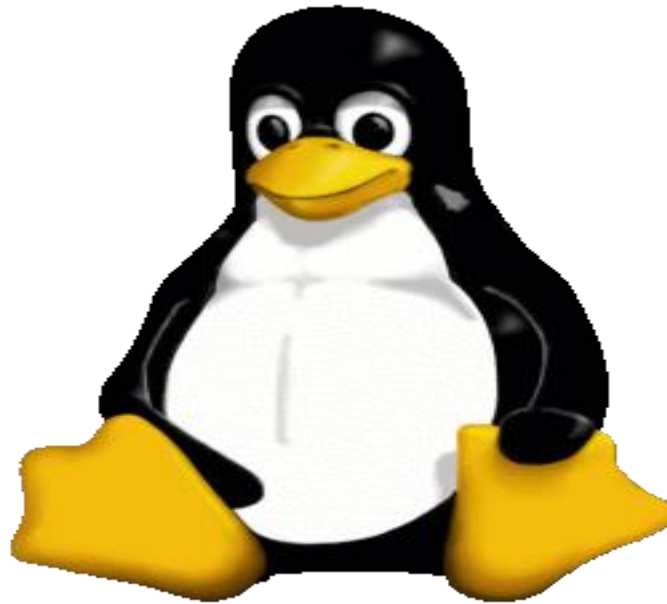
- All the files are grouped together in the directory structure. The file-system is arranged in a hierarchical structure, like an inverted tree. The top of the hierarchy is traditionally called **root**.



Path

- Path is the specification of a file or directory in a hierarchical file system using pathname separators ("/" in Unix/Linux, "\" in MS-DOS) between directories.
- The pathname tells the shell where in the directory tree to find a file.
- Types of Path:
 - **Absolute path:** It is the full specification of a path beginning with the root directory (the topmost node of a hierarchical file system) and including all directory levels the system passes through to locate the file. Its first character must be a pathname separator, e.g., the Unix forward slash or MS-DOS backslash.
 - **Relative path:** is the location of the file or directory relative to the directory in which the user is currently located (the current working directory).

Linux OS



Linux What is it?

- Linux is a free Unix-like operating system Developed under the GNU General Public License
- It is a multi-user, multitasking OS with support for Networking
- The source code for Linux is freely available to everyone.

History of Linux

- The development of Linux started from UNIX.
- UNIX is a trade mark of AT & T, originally developed by Ken Thompson, Dennis Ritchie and others back in 1970s.
- It is a multitasking and multi user OS.
- Unix is mostly used in servers and web servers.
- It is written with 'C' language.
- It is a foundation for many OS like Linux, Novell etc.



Dennis Ritchie, 1941



Ken Thompson, 1943

History continues

- Linux OS uses Unix as the base and gives further more facilities and applications.
- It was first released by its inventor Linus Torvalds in 1991.
- In Linux GUI is made having Unix as its core.
- Linux is the ultimate Unix.



The Big Boss!

**Linus Torvalds,
1969**

Basic Linux Commands

- A command is an instruction to perform a task in operating system
- A command prompt looks like

`[cs0203@linuxserver cpp]$`

`cs0203`: user name

`linuxserver`: machine name / server name

`cpp`: current working directory

Command Arguments

- An argument, also called a command line argument, is a file name or other data that is provided to a command in order for the command to use it as an input
- Arguments are entered on the command line in the console or terminal window after the command and any options.
- Each argument is separated by one or more spaces from adjacent arguments, options or the command.

Command Options

- An option, also referred to as a flag or a switch, is a single-letter or full word that modifies the behavior of a command in some predetermined way.
- Options are used on the command line following the name of the command and before any arguments.
- They are separated from the name of the command and arguments by at least one space.
- The options are preceded by a – (Hyphen) in Linux.

Guidelines

- All commands must always be entered in small case letters.
- Between command name and the options there must be a space.
- The options are usually preceded by a '-' sign.
- Two or more options may be combined like
ls -a -l as ls -al
- To repeat a command up-down arrow keys may be used.

Basic Linux Commands

■ date

- prints current date and time
- O/P: Tue Nov 22 15:24:12 IST 2005

■ cal

- Prints calender of current year
- O/P: November 2005

Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

■ Clear

- clears all text and leaves with the \$ prompt at the top of the window.

Basic Linux Commands

- who (who am i)
 - Displays the users logged in to the system
 - O/P:
ee05183 pts/278 Nov 22 15:23 (192.168.5.8)
et05428 pts/286 Nov 22 15:29 (192.168.5.9)
ee05410 pts/285 Nov 22 15:29 (192.168.5.10)
- pwd
 - Displays present working directory
 - O/P: /home/cs0230/cpp

Basic Linux Commands

■ ls

- Lists files and folders of current directory
- O/P:

Automata DAA DSTC GATEClassSlides.pptx IRIS Java OS std.txt

■ ls -l

- Long listing of files and folders of current directory
- O/P:

drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	Automata
drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	DAA
drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	DSTC
-rwxrwxr-x	1	lab1050	lab1050	2857354	Jul 18 14:13	GATE.pptx
drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	IRIS
drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	Java
drwxrwxr-x	1	lab1050	lab1050	4096	Jun 17 14:23	OS
-rwxrwxr-x	1	lab1050	lab1050	8554	Jul 18 14:13	std. txt

Getting Help

- `man <command>`
 - Displays the system manual.
 - Command `man man` displays information on man command.

- `info <command>`
 - Displays information in a different format.
 - Command `info info` displays information on info command.

Basic Linux Commands

- touch <file name>
 - Creates an empty file
- cat
 - Used to create and display a file.
 - cat <file name> : displays file contents
 - cat > <file name>: creates a file and save with ctrl+d
 - cat file1 file2 >> file3 : concatenates files

File related commands

- `mkdir <dir name>`
 - To create directory(s)
- `cd <dir name>`
 - To change directory
- `file <file name>`
 - Display file type

File Related Commands

- `cp <srcfile> <destfile>`
 - Copies srcfile to destfile
 - If destination file is present then overwrites
 - Else creates a new file with name destfile

File Related Commands

- mv
 - moves/renames a file or directory
 - mv <oldfile> <newfile> : renaming
 - mv <file> <path/file>: moves to path directory
 - mv <file1> <path/file2>: moves with renaming
- rm <file>
 - Removes/deletes a file
- rmdir <dir>
 - Removes/deletes an empty directory