
SYLLABUS
FUNDAMENTALS OF INFORMATION TECHNOLOGY

Programme: BCA-CBCS–RevisedSyllabusw.e.f.-Year2022–2023			
Semester	**Course Code**	**Course Title**	
I	**101**	**Fundamental of Information Technology**	
	Prepared by	**Dr. Bhaskar V. Patil**	
Type	**Credits**	**Evaluation**	**Marks**
DSC	3	UE:IE	60:40

Course Objectives:

- The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive medias, Internet basics.

Course Outcomes:

After completing the course the students shall be able to

CO1: Understand basic concepts and types of Computers, memory devices and software.
CO2: Remember types of computers and its peripherals
CO3: Demonstrating MS-office tools for data processing, mathematical operations in worksheets, presentations.
CO4: Analyse the use of various components of computer

Unit		Sessions (Hrs)	COs Number	Teaching Methodology	Cognition Level	Evaluation Tools
1	• Computer-Definition, Characteristics, Concept of Hardware, Software, Evolution of computer and Generations • Types of Computers – Analog and Digital computers, Hybrid Computers, General Purpose and Special Purpose Computer Limitations of Computer, Applications of Computer in Various Fields.	9	CO1	As per individual faculty discretion	Remember	As per individual faculty discretion
2	• Input Device – Keyboard, Mouse, Scanner, MICR, OMR. Output Devices – VDU, Printers – Dot Matrix, Daisywheel, Inkjet, Laser, Line Printers and	8	CO1, CO2	As per individual faculty discretion	Understand	As per individual faculty discretion

	Plotters.					
3	• Memory Concept, Memory Cell, Memory Organisation, Semiconductor Memory – RAM, ROM, PROM, EPROM Secondary Storage Devices – Magnetic Tape, Magnetic Disk (Floppy Disk and Hard Disk.), Compact Disk.	8	CO2	As per individual faculty discretion	Analyze	As per individual faculty discretion
4	• Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. • Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w. Concept of Network and its Type, Basic Elements of a Communication System, Data Transmission Media, Topologies	8	CO4	As per individual faculty discretion	Create	As per individual faculty discretion
5	• **MS Office:** Introduction to MS Office, Components and Features. • **MS Word:** Creating Letter, Table, Fonts, Page Layout Document, Formatting, Spell Check, Print Preview, Template, Color, Mail Merge, Auto Text, Inserting Picture, Word Art. • **MS Excel:** Introduction to Excel, Sorting, Queries, Graphs, Scientific Functions. • **PowerPoint:** Introductio n to PowerPoint, Creation of Slides, Inserting Pictures, Preparing Slide Show with Animation. **MS Access:** Creation and Manipulation of Files.	12	CO3	As per individual faculty discretion	Create	As per individual faculty discretion

Memory Concept

- Memory is the electronic holding place for the instructions and data a computer needs to reach quickly. It's where information is stored for immediate use.
- Memory is one of the basic functions of a computer, because without it, a computer would not be able to function properly. Memory is also used by a computer's operating system, hardware and software.
- There are technically two types of computer memory:

- Primary and Secondary. The term *memory* is used as a synonym for *primary memory* or as an abbreviation for a specific type of primary memory called *random access memory (RAM).*
- This type of memory is located on microchips that are physically close to a computer's microprocessor.
- If a computer's central processer (CPU) had to only use a secondary storage device, computers would become much slower.
- In general, the more memory (primary memory) a computing device has, the less frequently the computer must access instructions and data from slower (secondary) forms of storage.

How does computer memory work?

- When a program is open, it is loaded from secondary memory to primary memory. Because there are different types of memory and storage, an example of this could be a program being moved from a solid-state drive (SSD) to RAM.
- Because primary storage is accessed faster, the opened program will be able to communicate with the computer's processor at quicker speeds. The primary memory can be accessed immediately from temporary memory slots or other storage locations.

- Memory is volatile, which means that data in memory is stored temporarily. Once a computing device is turned off, data stored in volatile memory will automatically be deleted. When a file is saved, it will be sent to secondary memory for storage.
- There are multiple types of memory available to a computer. It will operate differently depending on the type of primary memory used, but in general, semiconductor-based memory is most associated with memory.
- Semiconductor memory will be made of integrated circuits with silicon-based metal-oxide-semiconductor (MOS) transistors.

Memory Cell

- The memory cell is the fundamental unit of computer memory. It is a circuit that can store a single bit of information, either a 0 or a 1. The most common types of memory cells used in computer systems are:

1. Static RAM (SRAM) cell: This consists of a flip-flop circuit that can hold a bit of data as long as power is supplied. SRAM is fast and does not need to be regularly refreshed, but it is more expensive and takes up more space than DRAM.

2. Dynamic RAM (DRAM) cell: This uses a capacitor to store the bit of data.

Since the capacitor can slowly discharge, DRAM memory cells need to be

regularly refreshed to retain the stored information. DRAM is less

expensive and more compact than SRAM.

3. The memory cells are organized into larger memory structures like RAM

chips, ROM chips, and memory modules. The specific design and

Memory Cell

- A memory cell in a computer is a fundamental building block used to store data. It is the smallest unit of storage in a memory system and is designed to hold a single bit of information—either a 0 or a 1. Here’s a detailed look at what a memory cell is and how it functions within a computer:
- **1. Basic Concept**
- **Storage Unit:** A memory cell stores a single bit of

- **2. Components and Structure**
- **Transistors:** Memory cells are typically made up of transistors, which are electronic switches that can turn on or off to represent the binary states. The specific type of transistor and its configuration depend on the type of memory being used.
- **Capacitors:** In dynamic random-access memory (DRAM), each memory cell contains a capacitor that stores electrical charge. The presence or absence of charge represents the bit value.
- **Flip-Flops:** In static random-access memory (SRAM), memory

- **3. Types of Memory Cells**
- **DRAM (Dynamic RAM):**
  - **Structure:** Each cell consists of a transistor and a capacitor. The capacitor holds the charge (or lack thereof) that represents the bit of data.
  - **Operation:** DRAM cells need to be refreshed periodically because the charge in the capacitor leaks away over time.
- **SRAM (Static RAM):**
  - **Structure:** Each cell is made up of multiple transistors arranged to form a flip-flop.
  - **Operation:** SRAM cells do not need to be refreshed like

- **4. Function in Memory Systems**
- **Storage:** Memory cells are organized into arrays in memory chips. These arrays form the basis of computer memory, including RAM (Random Access Memory), ROM (Read-Only Memory), and cache memory.
- **Addressing:** Each memory cell is addressed by its location in the memory array. The addressing scheme allows the computer to read from or write to specific cells.
- **Data Manipulation:** The CPU (Central Processing Unit) interacts with memory cells to perform operations such as reading data from memory, writing new data, and executing

- **5. Memory Hierarchy**
- **Registers:** The smallest and fastest type of memory, located inside the CPU. Registers hold data that the CPU is currently processing.
- **Cache Memory:** A small, high-speed memory located between the CPU and main memory. It stores frequently accessed data to speed up processing.
- **RAM:** Main memory used for temporary storage of data that the CPU needs while performing tasks. RAM is volatile, meaning it loses its contents when power is off.

- 6. Advancements Flash Memory: A type of non-volatile memory that uses memory cells to store data without power. It is widely used in USB drives, SSDs (Solid State Drives), and memory cards.3D NAND: An advanced form of flash memory where memory cells are stacked vertically to increase storage density and performance. Understanding memory cells is crucial for comprehending

Semiconductor Memory

- The silent workhorse of modern electronics, semiconductor memory stores data and instructions and makes it possible for smartphones, computers, medical equipment, and industrial automation to function. This little wonder, worked with silicon and inventiveness, utilizes electrical charges to address double data, the “1s” and “0s” that structure the language of advanced innovation.
- The widespread use of semiconductor memory is fueled by its remarkable properties:
- **High Storage Density:** Semiconductor memory can store a lot of information in a little space.

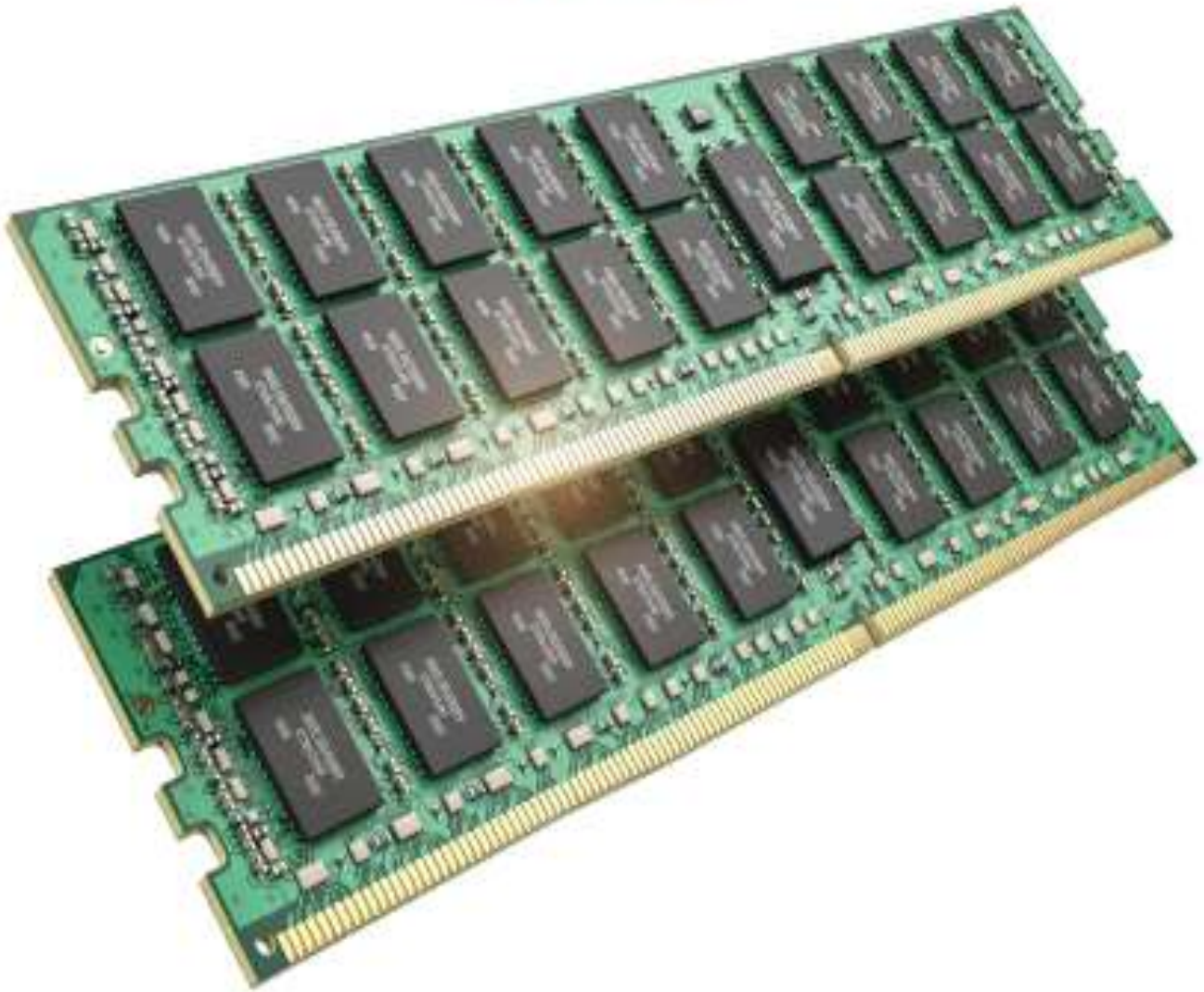
- **Fast Access Time:** Information can be gotten rapidly from semiconductor memory, making it appropriate for elite execution applications.
- **Lower Power Consumption:** reduces environmental impact, extends battery life, and minimizes energy consumption.
- **Scalability:** Compared to other kinds of memory, like magnetic storage, semiconductor memory uses less power.
- Semiconductor memory is the invisible foundation of our digital world and can be found in everything from smartphones and computers to complex systems. Its steady development guarantees significantly quicker, denser, and more effective methods for putting away and controlling the data that characterizes our lives.

- **What is Semiconductor Memory?**
- A type of electronic memory known as semiconductor memory stores digital data by making use of semiconductor materials, most commonly silicon. Data is stored in binary format in this memory, with “1s” and “0s” representing electrical charges.
- Semiconductor memory is a sort of computerized electronic memory that utilizes semiconductor material, ordinarily silicon, to store and recover advanced information. It is the essential sort of memory utilized in PCs, cell phones, and other electronic gadgets.

- Types of Semiconductor Memory
- There are two types of semi conductor memory
- Random Access Memory(RAM)
- Read-Only Memory(ROM)

- **Random Access Memory(RAM)**
- It permits information to be gotten to in any request, making it appropriate for brief capacity.
- **Type:** Unpredictable – information evaporates without power.
- **Function:** stores data for active applications on a temporary basis.
- **Speed:** lightning-fast access in a flash.
- **Capacity:** Normally more modest than ROM.
- **Applications:** Running projects, open documents, program tabs.

RAM



- **Read Only Memory(ROM)**
- Information is for all time put away and can’t be changed during typical activity. It is utilized for putting away firmware and other basic information.
- **Type:** Non-unstable – information perseveres even without power.
- **Function:** provides permanent storage for essential functions.
- **Speed:** More slow than Smash, as information recovery isn’t as incessant.
- **Capacity:** Variable based on device complexity.
- **Applications:** Firmware, the operating system, and device drivers.

ROM

https://commons.wikimedia.org/wiki/File:PokemonSilverBoard.jpg

Advantages of Semiconductor Memory

- **High Speed:** Fast data retrieval from semiconductor memory enables responsive performance and smooth operation. Applications like gaming, real-time video, and online transaction all depend on this.
- **Low power consumption:** Compared to other types of memory, such as magnetic storage, semiconductor memory is very energy efficient. This is important for laptops and mobile devices, as it extends battery life.

- **High storage density:** Semiconductor memory can pack an enormous measure of information into a minuscule space. Because of this, it is ideal for high-performance computing systems and portable devices like smartphones and tablets where space is at a premium.
- **Scalability:** Semiconductor memory innovation can be effortlessly scaled to satisfy the rising needs of registering. This indicates that the capacity of semiconductor memory chips will also increase in tandem with our demand for data storage.
- **Non-volatile(except for RAM):** Non-volatile semiconductor memory, such as read-only memory (ROM) and flash memory, stores data even when the power is turned off. Because of this, they are excellent for storing long-term data like operating systems and firmware.

Disadvantages of Semiconductor Memory

- **Volatile(for RAM):** When the power is turned off, data stored in traditional RAM are lost. This can be risky on the off chance that you are chipping away at something significant and the power goes out of the blue.
- **Can be much expensive:** When compared to other types of storage, such as hard disk drives, high-performance or large-capacity semiconductor memory can be expensive.

- **Limited lifespan(for Flash memory):** Flash memory has a set number of compose cycles before it breaks down. As a result, flash memory devices will eventually require replacement.
- **Security issues:** Semiconductor memory can be helpless against information breaks and hacking. This is due to the fact that the data is stored electronically and can be accessed in the event that the device is hacked.
- **Effect on the Environment:** The process of manufacturing semiconductor memory chips can be resource-intensive and harmful to the environment. However, efforts are being made to develop production methods that are more environmentally friendly.

- **Applications of Semiconductor Memory**
- Semiconductor memory is used in a wide variety of applications, including:
- **Digital Cameras:** Used for storing photographs and recordings.
- **Smartphones:** Used for storing applications, music, photos and other valuable information.
- **Computers:** Used for storing program instruction and working data.
- **USB drivers:** Used for storing potable data storage.
- **Solid state drive(SSD):** Used for high-performance storage in computers.
- **MP3 Player:** Used to store music

PROM: Programmable Read-only Memory

- PROM stands for programmable read-only memory. The acronym PROM means programmable read-only memory.
- It belongs to the non-volatile class of computer memory. PROM stores the firmware and programs for microcontrollers and other digital devices.
- Data written on PROM cannot be erased as a result. A digital memory type known as a programmable read-only memory (PROM) allows its contents to be modified once the device has been manufactured.
- The information is then irreversible and cannot be altered. One form of read-only memory is this (ROM).

- PROMs permanently store low-level programs like firmware or microcode in digital electronic systems.
- A PROM and a typical ROM differ primarily because a PROM has data programmed into it after manufacture. In contrast, a ROM has data written into it at the time of manufacture.
- As a result, ROMs are typically only used for massive manufacturing runs of thoroughly vetted data.
- PROMs may be used when a factory-programmed ROM is not cost-effective due to the volume needed.
- They may also be utilized when developing a system that may eventually be converted to ROMs in a mass-produced version.

- Depending on the technology, PROMs are made from blank materials and can be programmed at the wafer, final test, or system level.
- A PROM programmer is a device used to program blank PROM chips.
- To avoid big volume commitments, businesses might keep a supply of blank PROMs on hand and program them as needed.
- Many consumer and automotive electronics products regularly use these memories.

Erasable Programmable Read Only Memory (EPROM)

- The Erasable Programmable Read Only Memory is a memory chip that does not lose data even when the power is switched off.
- This is a non-volatile memory type i.e. it retains data even when the power is switched off. Each EPROM is individually programmed by an electronic device.
- After that, the data can be erased by exposing the EPROM to strong ultraviolet light.
- An EPROM contains a transparent fused quartz window at the top of the package which allows exposure to ultraviolet light. The silicon chip is visible from this window.

• Applications of EPROM

- It was assumed that EPROM was too expensive for mass production and would be used in development only. However, EPROM was found to be economical as a part for small volume production.
- On-chip EPROM was used by some microcontrollers such as Intel 8048, Freescale 68HC11, PIC microcontroller (C version) etc. These microcontrollers were available in windowed versions that were primarily used for program development and program debugging.

- Advantages of EPROM
- Some of the advantages of EPROM are as follows:
- EPROM is non-volatile so it retains its memory even without power. So no external memory is required.
- EPROM is quite effective.
- EPROM is reprogrammable i.e. the data in the EPROM can be erased and reprogrammed.

- Disadvantages of EPROM

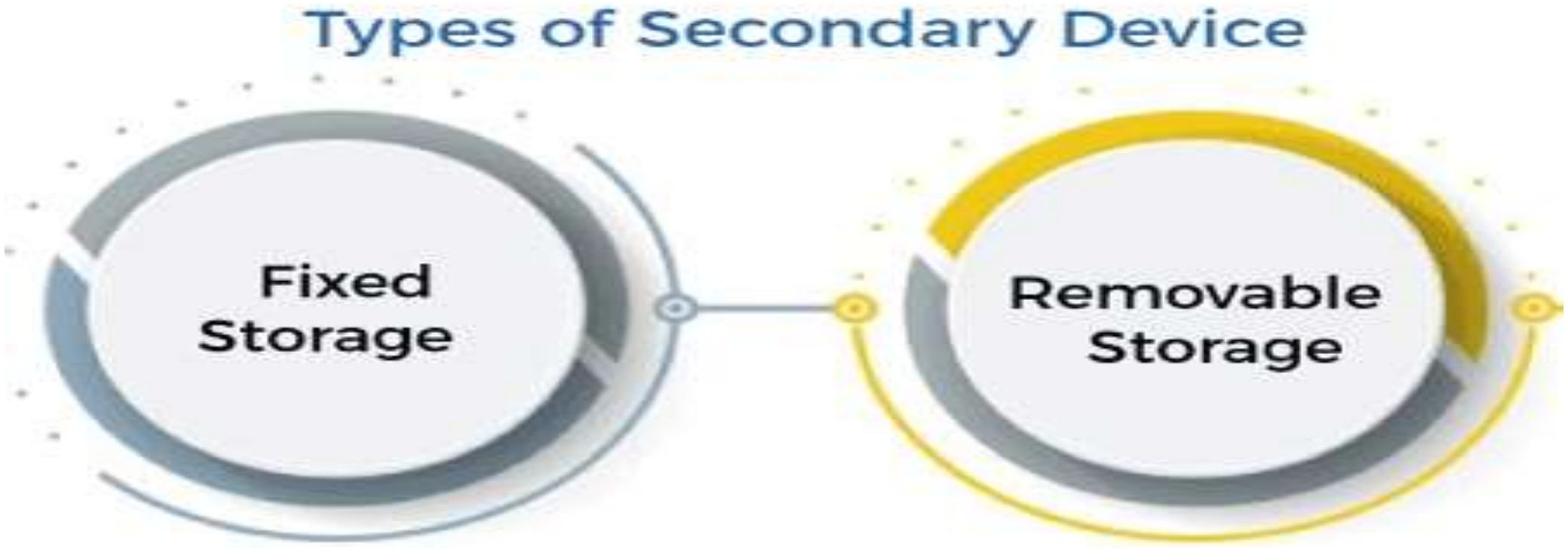
- Some of the disadvantages of EPROM are as follows;
- Transistors used in EPROM have a higher resistance.
- The EPROM needs UV light to erase the data. This can’t be done using electrical signals.
- It is not possible to erase a particular byte of data in EPROM. The whole data is deleted.
- The static power consumption of EPROM is quite high.
- It takes some time to erase the data in EPROM. This is different than EEPROM where the data can be instantaneously erased.

- A ***secondary storage device*** refers to any non-volatile storage device that is internal or external to the computer.
- It can be any storage device beyond the primary storage that enables permanent data storage. A secondary storage device is also known as an auxiliary storage device, backup storage device, tier 2 storage, or external storage.
- These devices store virtually all programs and applications on a computer, including the operating system, device drivers, applications and general user data.
- The Secondary storage media can be ***fixed*** or ***removable***. Fixed Storage media is an internal storage medium like a hard disk that

- A storage medium that is portable and can be taken outside the computer is termed removable storage media. The main advantage of using secondary storage devices is:
- In Secondary storage devices, the stored data might not be under the direct control of the operating system. For example, many organizations store their archival data or critical documents on secondary storage drives, which their main network cannot access to ensure their preservation whenever a data breach occurs.
- Since these drives do not interact directly with the main infrastructure and can be situated in a remote or secure site, it is unlikely that a hacker may access these drives unless they're physically stolen.

- **Characteristics of Secondary Storage Devices**
- These are some characteristics of secondary memory, which distinguish it from primary memory, such as:
- It is non-volatile, which means it retains data when power is switched off
- It allows for the storage of data ranging from a few megabytes to petabytes.
- It is cheaper as compared to primary memory.
- Secondary storage devices like CDs and flash drives can transfer the data from one device to another.

- Types of Secondary Storage Device
- Here are the two types of secondary storage devices, i.e., fixed storage and removable storage

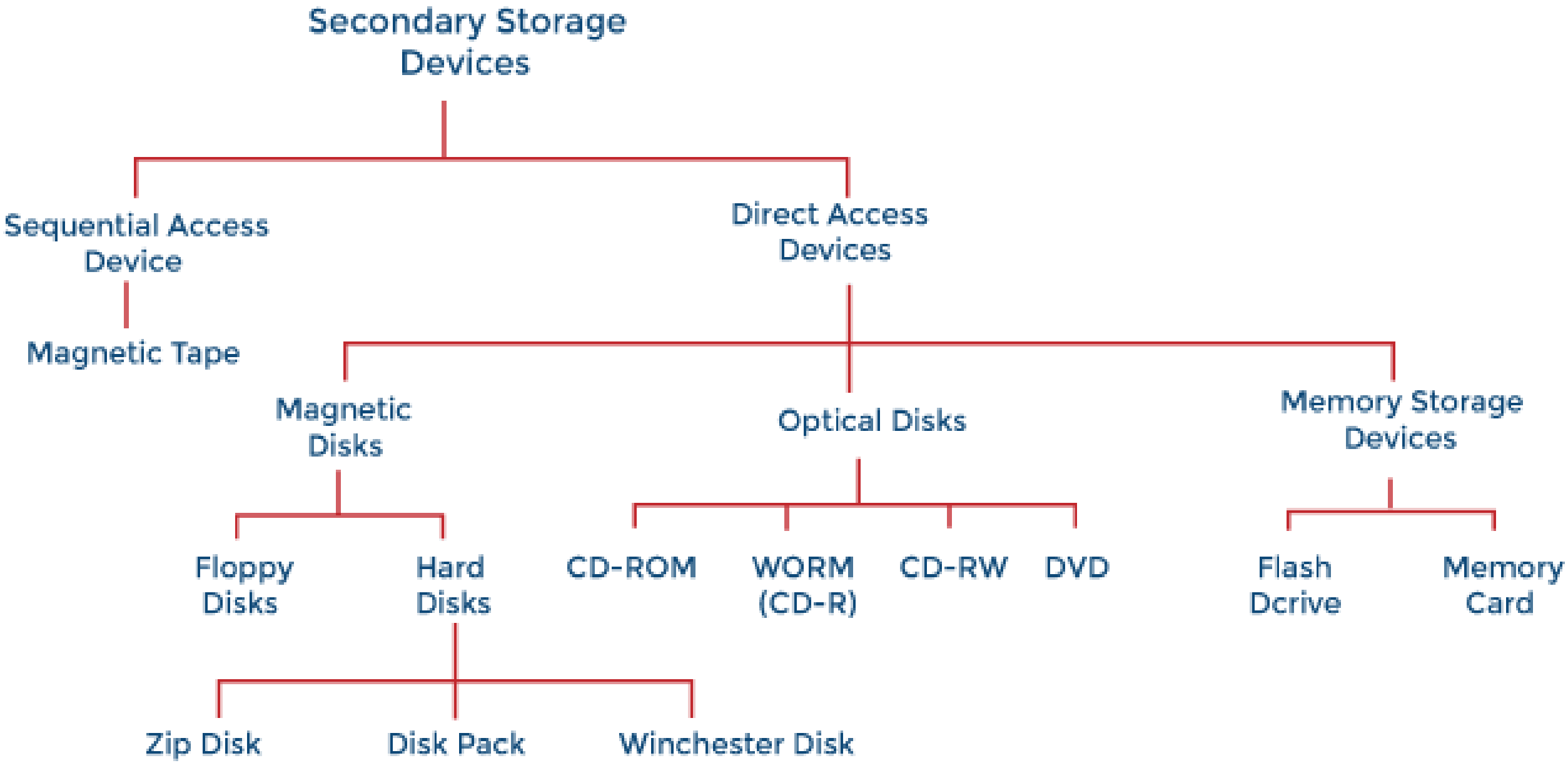


- **1. Fixed Storage**
- Fixed storage is an internal media device used by a computer system to store data. Usually, these are referred to as the fixed disk drives or Hard Drives.
- Fixed storage devices are not fixed. These can be removed from the system for repairing work, maintenance purposes, and also for an upgrade, etc. But in general, this can not be done without a proper toolkit to open up the computer system to provide physical access, which needs to be done by an engineer.
- Technically, almost all data, i.e. being processed on a computer system, is stored on some built-in fixed storage device. We have the following types of fixed storage:
- Internal flash memory (rare)
- SSD (solid-state disk) units
- Hard disk drives (HDD)

- **2. Removable Storage**
- Removable storage is an external media device that is used by a computer system to store data.
- Usually, these are referred to as the Removable Disks drives or the External Drives.
- Removable storage is any storage device that can be removed from a computer system while the system is running.
- Examples of external devices include CDs, DVDs, Blu-ray disk drives, and diskettes and USB drives.
- Removable storage makes it easier for a user to transfer data from one computer system to another.

- The main benefit of removable disks in storage factors is that they can provide the fast data transfer rates associated with storage area networks (SANs). We have the following types of Removable Storage:
- Optical discs (CDs, DVDs, Blu-ray discs)
- Memory cards
- Floppy disks
- Magnetic tapes
- Disk packs
- Paper storage (punched tapes, punched cards)

Classification of Secondary Storage Devices



- Classification of Secondary Storage Devices
- The following image shows the classification of commonly used secondary storage devices.
- Sequential Access Storage Device
- It is a class of data storage devices that read stored data in a sequence. This is in contrast to random access memory (RAM), where data can access in any order, and magnetic tape is the common sequential access storage device.

i.Magnetic tape: It is a medium for magnetic recording, made of a thin, magnetizable coating on a long, narrow strip of plastic film.

Devices that record and play audio and video using magnetic

tape are tape recorders and videotape recorders. A device

that stores computer data on magnetic tape is known as

it was a key technology in early computer development,

allowing unparalleled amounts of data to be mechanically created, stored for long periods, and rapidly accessed.

- Direct Access Storage Devices
- A direct-access storage device (DASD) is another name for secondary storage devices that store data in discrete locations with a unique address, such

- **1. Magnetic disks:** A magnetic disk is a storage device that uses a magnetization process to write, rewrite and access data. It is covered with a magnetic coating and stores data in the form of tracks, spots and sectors. Hard disks, zip disks and floppy disks are common examples of magnetic disks.

i.Floppy Disk: A floppy disk is a flexible disk with a magnetic coating on it, and it is packaged inside a protective plastic envelope. These are among the oldest portable storage devices that could store up to 1.44 MB of data, but now they are not used due to very

- **Hard Disk Drive (HDD):** Hard disk drive comprises a series of circular disks called ***platters*** arranged one over the other almost ½ inches apart around a ***spindle***. Disks are made of non-magnetic material like aluminium alloy and coated with 10-20 nm magnetic material.
- The standard diameter of these disks is 14 inches, and they rotate with speeds varying from 4200 rpm (rotations per minute) for personal computers to 15000 rpm for servers.
  Data is stored by magnetizing or demagnetizing the magnetic coating.
- A magnetic reader arm is used to read data from and write data to the disks. A typical modern HDD has a capacity in terabytes (TB).
- **2. Optical Disk:** An optical disk is any computer disk that uses optical storage techniques and technology to read and write data. It is a computer storage disk that stores data digitally and uses laser beams to

i.CD Drive: CD stands for Compact Disk. CDs are circular disks that use optical rays, usually lasers, to read and write data. They are very cheap as you can get 700 MB of storage space for less than a dollar. CDs are inserted in CD drives built into the CPU cabinet. They are portable as you can eject the drive, remove the CD and carry it with you. There are three types of CDs:

i. **CD-ROM (Compact Disk - Read Only Memory):** The manufacturer recorded the data on these CDs. Proprietary Software, audio or video are released on CD-ROMs.

ii. **CD-R (Compact Disk - Recordable):** The user can write data once on the CD-R. It cannot be deleted or modified later.

iii. **CD-RW (Compact Disk - Rewritable):** Data can repeatedly be written and deleted on these optical disks.

ii.DVD Drive: DVD stands for digital video display. DVD is an optical device that can store 15 times the data held by CDs. They are usually used to store rich multimedia files that need high storage capacity. DVDs also come in three varieties - read-only, recordable and rewritable.

iii.Blu Ray Disk: Blu Ray Disk (BD) is an optical storage media that stores high definition

- **3. Memory Storage Devices:** A memory device contains trillions of interconnected memory cells that store data. When switched on or off, these cells hold millions of transistors representing 1s and 0s in binary code, allowing a computer to read and write information. It includes USB drives, flash memory devices, SD and memory cards, which you'll recognize as the storage medium used in digital cameras.

i. **Flash Drive:** A flash drive is a small, ultra-portable storage device. USB flash drives were essential for easily moving files from one device to another. Flash drives connect to computers and other devices via a built-in USB Type-Aor USB-C plug, making one a USB device and cable combination.

Flash drives are often referred to as pen drives, thumb drives, or jump drives. The terms *USB drive* and *solid-state drive (SSD)* are also sometimes used, but most of the time, those refer to larger, not-so-mobile USB-based storage devices like external hard drives.

These days, a USB flash drive can hold up to 2 TB of storage. They're more expensive per gigabyte than an external hard drive, but they have prevailed as a

i. Pen drive has the following advantages in computer organization, such as:

i. **Transfer Files:** A pen drive is a device plugged into a USB port of the system that is used to transfer files, documents, and photos to a PC and vice versa.

ii. **Portability:** The lightweight nature and smaller size of a pen drive make it possible to carry it from place to place, making data transportation an easier task.

iii. **Backup Storage:** Most of the pen drives now come with the feature of having password encryption, important information related to family, medical records, and photos can be stored on them as a backup.

iv. **Transport Data:** Professionals or Students can now easily transport large data files and video, audio lectures on a pen drive and access them from anywhere. Independent PC technicians can store work-related utility tools, various programs, and files on a high-speed 64 GB pen drive and move from one site to another.

ii. **Memory card:** A memory cardor memory cartridge is an electronic data storage device used for storing digital information, typically using flash memory. These are commonly used in portable electronic devices, such as digital cameras, mobile phones, laptop computers, tablets, PDAs, portable media players, video game consoles, synthesizers, electronic keyboards and digital pianos, and allow adding memory to such devices without compromising ergonomy, as the card is usually contained within the device rather than protruding like USB flash drives.

Difference between Primary and Secondary Memory

Below are some main differences between primary and secondary memory in computer organization.

Primary Memory	Secondary Memory
Primary memory is directly accessed by the Central Processing Unit (CPU).	Secondary memory is not accessed directly by the Central Processing Unit (CPU). Instead, data accessed from a secondary memory is first loaded into Random Access Memory (RAM) and then sent to the Processing Unit.
RAM provides a much faster-accessing speed to data than secondary memory. Computers can quickly process data by loading software programs and required files into primary memory (RAM).	Secondary memory is slower in data accessing. Typically primary memory is six times faster than secondary memory.
Primary memory is volatile and gets completely erased when a computer is shut down.	Secondary memory provides a feature of being non-volatile, which means it can hold on to its data with or without an electrical power supply.