MUNGAI ANGELA

SCM224-0982/2025

1. Introduction to Information Technology

Definition

Information Technology (IT) refers to the use of computers, software, networks, and other electronic systems to store, process, transmit, and retrieve information.

Components of IT

1. **Hardware** – physical components of a computer system.
2. **Software** – programs that run on the hardware.
3. **Data** – raw facts used for processing.
4. **People** – users such as statisticians.
5. **Procedures** – rules and steps for operating systems.
6. **Networks** – communication links between devices.

Importance of IT in Statistics

- Data collection and entry (surveys, online forms)
- Data storage and database management
- Data processing and analysis (SPSS, R, Python)
- Data visualization (graphs, dashboards)
- Report generation and communication
- Enhancing accuracy, speed, access, and security

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2. Computer Hardware

A. Input Devices

- Keyboard, mouse
- Scanner
- Microphone
- Camera
- Barcode reader
- Digital pens

B. Output Devices

- Monitor
- Printer (inkjet, laser)
- Plotter
- Speakers
- Projectors

C. Processing Unit

- **CPU (Central Processing Unit)**
  - Control Unit (CU)
  - Arithmetic Logic Unit (ALU)
- **Memory**
  - RAM – temporary storage (volatile)
  - ROM – permanent instructions (non-volatile)

D. Storage Devices

- Hard Disk Drive
- Solid State Drive
- Flash drives
- SD cards
- Cloud storage (Google Drive, OneDrive)

E. Types of Computers

- Microcomputers (PCs, laptops)
- Minicomputers
- Mainframes
- Supercomputers (scientific computation)

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3. Computer Software

Types of Software

A. System Software

Controls and manages computer hardware.

1. **Operating Systems (OS)**
   - Windows, Linux, macOS
   - Functions:
     - File management
     - Memory management

- Device control
- User interface (GUI/CLI)

2. **Utility Programs**
   - Antivirus
   - File compression
   - Disk cleanup
   - Backup utilities

B. Application Software

Used to perform specific tasks.

For statistics:

- SPSS
- R & RStudio
- Stata
- SAS
- Excel
- Python

General applications:

- Word processors
- Spreadsheets
- Database systems
- Presentation software

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4. Data and Information

Data

Raw, unprocessed facts. e.g., 23, 40, 78.

Information

Processed data that is meaningful and useful. e.g., "Mean age = 35 years."

Characteristics of Good Information

- Accurate
- Relevant
- Timely

- Complete
- Reliable
- Accessible

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5. Number Systems

Understanding number systems is important in computer operations.

Types

1. **Binary (Base 2)** – 0, 1
2. **Octal (Base 8)** – 0–7
3. **Decimal (Base 10)** – 0–9
4. **Hexadecimal (Base 16)** – 0–9, A–F

Conversions

- Binary → Decimal
- Decimal → Binary
- Binary → Hex
- Hex → Binary
  (Useful in programming and data encoding)

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6. Computer Networks

Definition

A network is a system of connected computers that share resources.

Types of Networks

- **LAN** – Local Area Network
- **MAN** – Metropolitan Area Network
- **WAN** – Wide Area Network
- **PAN** – Personal Area Network

Network Devices

- Router
- Switch
- Hub

- Modem
- Network Interface Card (NIC)

Internet Concepts

- WWW
- Email
- Cloud computing
- IP address
- Domain names

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7. Database Concepts

Used heavily in statistics for storing large datasets.

Definitions

- **Database** – organized collection of related data
- **DBMS (Database Management System)** – software for managing databases
  - Examples: MySQL, SQL Server, PostgreSQL, Oracle, Access

Functions of DBMS

- Create, store, update, retrieve data
- Ensure data security
- Reduce data redundancy
- Support multi-user access

Data Models

- Hierarchical
- Network model
- Relational model (most common)

Basic SQL Commands

- **SELECT** – retrieve data
- **INSERT** – add data
- **UPDATE** – modify data
- **DELETE** – remove data

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8. Computer Security

Threats

- Malware (virus, worms, trojans)
- Hacking
- Phishing scams
- Data loss
- Unauthorized access

Security Measures

- Strong passwords
- Antivirus software
- Firewalls
- Regular backups
- Encryption
- Access control

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9. Statistical Software and IT Tools

Common Statistical Software

- **SPSS** – easy, GUI-based
- **R** – powerful, open source
- **Stata** – econometrics focus
- **Excel** – basic analysis and visualization
- **Python** – advanced analytics and machine learning

Uses in Statistics

- Data entry and cleaning
- Descriptive statistics
- Inferential statistics
- Regression analysis
- Time series analysis
- Data visualization
- Report generation

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10. Ethical Issues in IT

- Privacy
- Intellectual property rights
- Digital divide
- Cybercrime
- Data protection and confidentiality (important in statistics)

TOPIC 2. FUNDAMENTALS OF COMPUTER OPERATIONS – DETAILED SUMMARY NOTES

1. Introduction to Computer Operations

Computer operations refer to the basic activities a computer performs to accept data, process it, store it, and produce useful output.
They include how hardware, software, and users interact to perform tasks.

Basic Functions of a Computer

1. **Input** – entering data into the system
2. **Processing** – manipulating data into meaningful information
3. **Output** – displaying the processed results
4. **Storage** – saving data permanently or temporarily
5. **Control** – directing all system operations

2. Computer System Components

A computer system is made of **hardware**, **software**, **data**, **procedures**, and **people**.

2.1 Hardware

A. Input Devices

- **Keyboard**, **Mouse**, **Scanner**, **MICR**, **OCR**, **Barcode reader**, **Joystick**, **Touch screen**, **Digital camera**

B. Output Devices

- **Monitor**, **Printer** (inkjet/laser), **Plotter**, **Speakers**, **Projectors**, **Braille display**

C. Central Processing Unit (CPU)

The CPU executes instructions.
It contains:

- **Control Unit (CU)** – directs operations
- **Arithmetic Logic Unit (ALU)** – performs arithmetic & logical operations
- **Registers** – small, fast storage for active instructions/data

D. Memory

1. Primary Memory

- **RAM (Random Access Memory)** – temporary and volatile
- **ROM (Read Only Memory)** – permanent and non-volatile
- **Cache memory** – high-speed buffer between CPU & RAM
- **Registers** – fastest memory inside CPU

2. Secondary Storage

- **Hard Disk Drives (HDD)**
- **Solid State Drives (SSD)**
- **Flash drives**
- **SD cards**
- **Optical disks (CD/DVD)**
- **Cloud storage**

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3. Booting and System Startup

Booting is the process of starting a computer.

Types of Booting

1. **Cold Booting** – starting the computer from OFF.
2. **Warm Booting** – restarting the computer when it is ON.

Booting Steps

1. Power ON

2. **POST (Power-On Self Test)** – checks hardware functionality
3. Load **BIOS/UEFI**
4. Locate and load OS from disk
5. Load system files
6. Display user interface (desktop/login)

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4. Types of Computer Software

4.1 System Software

Controls and manages hardware.

1. Operating Systems (OS)

Functions of an OS:

- File management
- Memory management
- Process management
- Device management
- User interface (GUI/CLI)
- Security & access control

2. Utility Programs

- Antivirus
- Disk cleanup
- Backup tools
- Compression tools
- File managers

4.2 Application Software

Used for user tasks.

Examples:

- **Word processors**
- **Spreadsheet software**
- **Database applications**

- **Presentation software**
- **Statistical software** (SPSS, R, Stata)
- **Browsers**

4.3 Programming Languages

- Machine language (binary)
- Assembly language
- High-level languages (Java, Python, C++)

5. Data Representation and Number Systems

Computers use binary to represent data.

Data Units

- 1 bit
- 1 byte = 8 bits
- Kilobyte (KB), Megabyte (MB), Gigabyte (GB), Terabyte (TB)

Number Systems

1. **Binary (Base 2)**
2. **Octal (Base 8)**
3. **Decimal (Base 10)**
4. **Hexadecimal (Base 16)**

Conversions

- Decimal ↔ Binary
- Binary ↔ Hexadecimal

Character Encoding

- ASCII
- Unicode

6. Operating System Operations

Process Management

- Starting and stopping programs
- Multitasking
- Process scheduling

Memory Management

- Allocation of RAM
- Virtual memory
- Swapping

File System Operations

- Creating, naming, deleting files
- Organizing them in folders/directories

Device Management

- Controlling input/output devices through drivers
- Handling communication

User Management

- Logins
- Permissions
- Password control

7. Computer Storage & File Management

Primary Storage

- Fast but temporary

Secondary Storage

- Permanent but slower

File Management Tasks

- Naming files
- Creating folders

Saving files

- Copying, renaming, deleting
- Backing up data
- Searching for files

File Extensions

- .docx
- .xlsx
- .pdf
- .exe
- .jpg
- .mp4

8. Computer Processing Cycle

The computer follows the **IPO Cycle**:

Input → Processing → Output → Storage

- Input devices capture data
- CPU processes data using instructions
- Output devices display results
- Data is stored for future use

9. Computer Networks

Definition

Interconnection of computers to share resources.

Types

- LAN
- WAN
- MAN
- PAN

Network Devices

- Routers
- Switches
- Hubs
- Modems
- Network Interface Card (NIC)

Network Services

- Email
- File sharing
- Internet access
- Cloud services

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10. Computer Security

Threats

- Viruses
- Worms
- Trojans
- Ransomware
- Phishing
- Unauthorized access

Security Measures

- Antivirus
- Firewalls
- Strong passwords
- Encryption
- Backup
- User access rights

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11. Computer Maintenance

Routine Maintenance

- Disk cleanup
- Antivirus scans
- Software updates

- Hardware cleaning
- Backups

Hardware Care

- Avoid dust
- Use surge protectors
- Correct storage temperature

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12. ICT Applications

Common Uses

- Education
- Business
- Banking
- Health
- Communication
- Research & Statistics
- Manufacturing
- Government services

Here is a **clear, structured, and exam-ready detailed summary** for **Fundamentals of Computer Operations**.
This covers all common topics taught in computer fundamentals courses.

TOPIC 3. FUNDAMENTALS OF COMPUTER OPERATIONS – DETAILED SUMMARY NOTES

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- Government services

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TOPIC 4.COMPUTER HARDWARE I: INPUT AND OUTPUT DEVICES – DETAILED SUMMARY NOTES

1. Introduction to Computer Hardware

Computer hardware refers to the **physical, tangible components** of a computer system. They include **input devices, output devices, processing units, and storage devices**.

Input and output devices form the essential interface between the user and the computer.

INPUT DEVICES

Input devices are hardware tools used to **enter data, commands, or signals** into a computer system.

Characteristics of Input Devices

- Translate human-readable data into machine-readable form
- Allow users to control computer operations
- Improve speed and efficiency of data entry
- Provide accuracy in data capture

TYPES OF INPUT DEVICES

Input devices can be categorized as:

A. Traditional Input Devices

1. Keyboard

- Primary input device for text/data entry
- Organized into sections:
    - Alphanumeric keys
    - Function keys
    - Navigation keys
    - Numeric keypad
    - Special keys (Ctrl, Alt, Shift)

2. Mouse

- Pointing device for GUI interactions
- Functions:
    - Point
    - Click
    - Drag
    - Scroll

B. Pointing Devices

1. Touchpad

- Flat surface used mostly in laptops
- Detects finger movement for cursor control

2. Trackball

- A stationary device with a rotating ball on top
- Better precision in limited space

C. Scanning and Recognition Devices

1. Scanner

- Converts physical documents/pictures into digital images
- Types: flatbed, sheet-fed, handheld

2. OCR (Optical Character Recognition)

- Converts printed or handwritten text into editable text

3. OMR (Optical Mark Recognition)

- Detects shaded areas on forms (exams, surveys)

4. MICR (Magnetic Ink Character Recognition)

- Reads bank cheques using magnetic ink characters

5. Barcode Reader

- Reads barcodes using laser light; used in supermarkets and inventory

6. QR Code Scanner

- Scans two-dimensional QR codes for digital information access

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D. Audio Input Devices

1. Microphone

- Captures sound waves and converts them into digital audio data

2. Voice Recognition Systems

- Convert speech to text or commands
- Used in virtual assistants, dictation software

E. Video Input Devices

1. Digital Camera

- Captures still photos and videos in digital format

2. Webcam

- Used for live video capture in video conferencing

3. Camcorder

- A digital video recorder used in media production

F. Biometric Input Devices

1. Fingerprint Scanner

Here is a **clear, well-structured, and exam-ready detailed summary** for **Computer Hardware II: Storage Devices and Memory**.

TOPIC 4.COMPUTER HARDWARE II – STORAGE DEVICES AND MEMORY (DETAILED SUMMARY)

1. Introduction

Storage devices and memory are essential components of a computer system responsible for **holding data**, **saving files**, and **supporting processing operations**.

A computer uses two main types of storage:

- **Primary storage (main memory)**
- **Secondary storage (auxiliary / permanent storage)**

Understanding the differences, types, uses, and characteristics is fundamental for computer studies.

PRIMARY STORAGE (MAIN MEMORY)

Primary memory is the memory directly accessible by the **CPU** during processing.

Characteristics of Primary Memory

- Fastest type of memory
- Temporarily holds data and instructions during processing
- Limited in size
- Directly accessed by CPU
- Volatile (except ROM)

TYPES OF PRIMARY MEMORY

Primary memory includes:

RAM – Random Access Memory

RAM stores data and program instructions **currently being used**.

Characteristics of RAM

- Volatile → loses data when power is off
- Read/Write memory
- Fast access speed
- Used by CPU for active processing

Types of RAM

a. DRAM – Dynamic RAM

- Needs constant refreshing
- Cheaper, widely used

b. SRAM – Static RAM

- Faster and more expensive
- Used in **cache memory**

Differences: SRAM vs DRAM

SRAM	DRAM
Very fast	Slower
Expensive	Cheaper
Used in cache	Used in main RAM
No refreshing	Needs refreshing

ROM – Read Only Memory

ROM stores **permanent instructions** for computer startup.

Characteristics of ROM

- Non-volatile
- Read-only (not easily modified)
- Stores BIOS/firmware
- Used during the booting process

Types of ROM

1. **PROM** (Programmable ROM) – written once
2. **EPROM** (Erasable PROM) – erased using UV light
3. **EEPROM** (Electrically Erasable PROM) – erased & rewritten electrically
4. **Flash ROM** – used in modern devices like BIOS, USB, SSDs

CACHE MEMORY

Cache is a **very high-speed memory** between CPU and RAM.

Purpose

- Speeds up data access
- Stores frequently used instructions

Levels

- **L1 cache** – inside CPU, fastest
- **L2 cache** – slightly slower
- **L3 cache** – largest but slowest among cache types

REGISTERS

Registers are the **fastest memory**, located inside the CPU.

Types of Registers

- Instruction register
- Accumulator
- Program counter

- Memory address register (MAR)
- Memory data register (MDR)

SECONDARY STORAGE DEVICES

Secondary storage provides **long-term, non-volatile** storage for data and programs.

Characteristics of Secondary Storage

- Non-volatile
- Larger storage capacity than RAM
- Slower than primary memory
- Stores data permanently
- Cheaper per gigabyte

TYPES OF SECONDARY STORAGE

Magnetic Storage Devices

Use magnetic fields to store data.

a. Hard Disk Drive (HDD)

- Common storage in computers
- Uses spinning magnetic disks
- Large capacity (GB–TB)
- Slower than SSDs
- Cheaper

Components of HDD

- Platters
- Spindle
- Read/write heads
- Actuator arm
- Motor

b. Magnetic Tapes

- Sequential access
- Used for backups and archival storage
- Very cheap per GB but slow

Optical Storage Devices

Use **laser technology** to read and write data.

Types

- **CD (Compact Disc)** → 700MB
- **DVD (Digital Versatile Disc)** → 4.7GB–9GB
- **Blu-ray** → 25GB–50GB

Formats

- **ROM** – read-only
- **R** – write once
- **RW** – rewritable

Solid State Storage Devices (Electronic Storage)

Use **microchips**, no moving parts.

a. SSD (Solid State Drive)

- Fastest secondary storage
- Durable and shock-resistant
- Expensive
- Used in modern computers

b. USB Flash Drives

- Portable
- Uses flash memory
- Capacities: 2GB–1TB

c. Memory Cards (SD, microSD)

- Used in cameras, smartphones
- Portable and lightweight

Cloud Storage

Online storage accessed through the internet.

Examples

- Google Drive
- OneDrive
- Dropbox
- iCloud

Advantages

- Access anywhere
- Automatic backups
- Easy file sharing

Disadvantages

- Requires internet
- Security and privacy concerns
- Subscription cost for large storage

6.COMPARISON: PRIMARY vs SECONDARY STORAGE

Aspect	Primary Storage	Secondary Storage
Speed	Very fast	Slow
Volatility	Mostly volatile	Non-volatile
Capacity	Small	Very large
Cost	Expensive	Cheap
Role	Used by CPU during processing	Permanent data storage

7.DATA STORAGE UNITS

- 1 bit
- 1 byte = 8 bits
- **Kilobyte (KB)** = 1024 bytes
- **Megabyte (MB)** = 1024 KB
- **Gigabyte (GB)** = 1024 MB
- **Terabyte (TB)** = 1024 GB
- **Petabyte (PB)** = 1024 TB

8. FACTORS TO CONSIDER WHEN SELECTING A STORAGE DEVICE

- Capacity
- Cost per GB
- Portability
- Speed
- Durability
- Access method (sequential vs random access)
- Reliability
- Security features

9.ACCESS METHODS

Random Access

- Data accessed directly
- Devices: RAM, HDD, SSD

Sequential Access

- Data accessed in order
- Devices: magnetic tapes

10. COMMON STORAGE DEVICE PROBLEMS

- Bad sectors
- Mechanical failure (HDD)
- Virus attacks
- Fragmentation
- Overheating
- Corruption of files
- Wear-out of flash memory

TOPIC 5. COMPUTER SOFTWARE

1. Introduction to Computer Software

Computer software refers to a set of **programs**, **procedures**, and **related documentation** that instruct a computer on what to do and how to do it.
Software is the **non-physical (intangible)** component of a computer system.

Characteristics of Software

- Intangible (cannot be touched)
- Developed using programming languages
- User-friendly (varies by design)
- Can be copied, modified, updated
- Needs hardware to operate

Functions of Software

- Manage hardware resources
- Provide a platform for users
- Enable execution of tasks and applications
- Enhance productivity and efficiency
- Control and coordinate computer activities

2. CATEGORIES OF COMPUTER SOFTWARE

Computer software is classified into two broad categories:

1. **System Software**
2. **Application Software**

3. SYSTEM SOFTWARE

System software manages hardware, runs the computer, and provides a platform for application software.

3.1 Operating Systems (OS)

The operating system is the most important system software.

Definition

Software that controls hardware components, manages resources, and provides an interface between the user and the computer.

Examples

- Windows
- Linux
- macOS
- Android
- iOS
- UNIX

Functions of an Operating System

1. **Memory Management** – allocates RAM to programs
2. **Processor Management** – schedules processes (multitasking)
3. **File Management** – creates, deletes, organizes files
4. **Device Management** – controls I/O devices through drivers
5. **User Interface Provision**
   - GUI (Graphical User Interface)
   - CLI (Command Line Interface)
6. **Security Management** – authentication, passwords

7. **Error Handling**
8. **Networking Support**
9. **Resource Allocation**
10. **Booting the system**

3.2 Utility Software (Utility Programs)

Utilities support the operating system by performing **maintenance and optimization tasks**.

Examples

- Antivirus tools
- Disk cleanup
- Disk defragmenter
- Backup utilities
- File compression (WinRAR, 7-Zip)
- System monitoring tools
- Firewall tools

Functions of Utility Programs

- Protect system from viruses
- Improve performance
- Manage files
- Compress and decompress data
- Maintain disk health
- Provide data backup and recovery

3.3 Device Drivers

Special programs that enable the OS to communicate with hardware devices.

Examples

- Printer drivers
- Display drivers
- Network drivers
- Keyboard drivers

Functions

- Translate OS commands to hardware actions
- Allow installation and operation of new hardware
- Improve performance and compatibility

3.4 Firmware

Software that is permanently stored in ROM.

Examples

- BIOS/UEFI
- Firmware in smartphones
- Embedded device firmware (TV, camera, router)

Functions

- Controls hardware at a low level
- Starts system boot process
- Provides instructions for device operation

4. APPLICATION SOFTWARE

Application software helps users perform specific tasks or solve particular problems.

4.1 General Purpose Application Software

Used by many types of users.

Examples

- Word processors (Microsoft Word)
- Spreadsheets (Excel)
- Presentations (PowerPoint)
- Databases (Access, MySQL)
- Browsers (Chrome, Firefox)
- Media players (VLC)

Uses

- Document creation
- Calculations and data analysis
- Presentations
- Internet browsing
- Multimedia playback

4.2 Specialized (Custom) Application Software

Designed for **specific tasks or industries**.

Examples

- Accounting software (QuickBooks, Sage)
- Hospital Information Systems
- Payroll systems
- School management systems
- Statistical software (SPSS, Stata, R)
- GIS software (ArcGIS)
- CAD software (AutoCAD)

4.3 Customized Software

Software developed **according to a client's specific needs**.

Advantages

- Tailored functions
- High efficiency
- Competitive advantage

Disadvantages

- Expensive
- Longer development time
- Requires skilled developers

5. CLASSIFICATION OF APPLICATION SOFTWARE

Application software may also be grouped as:

a. Stand-alone Software

Installed and runs on one computer.

b. Web-based Software

Runs on a browser.
.

c. Mobile Apps

Designed for smartphones/tablets.

d. Open-source Software

Free to use and modify.

e. Proprietary Software

Paid; closed-source.

6. SOFTWARE DISTRIBUTION METHODS

1. Shareware

Free trial for limited use.

2. Freeware

Completely free to use.

3. Open Source

Free, with access to source code.

4. Commercial Software

Paid and licensed.

5. Public Domain

No copyright restrictions.

7. SOFTWARE INSTALLATION AND UPDATING

- Acquire software
- Run installer
- Accept license agreement
- Choose location
- Complete setup

Purpose of Software Updates

- Fix bugs
- Add new features
- Improve security
- Enhance performance

8. SOFTWARE LICENSES

A software license defines user rights and restrictions.

Common Software Licenses

- Single-user license
- Multi-user license
- Site license
- Educational/Academic license
- Commercial license
- OEM (Original Equipment Manufacturer)

9. RELATIONSHIP BETWEEN HARDWARE AND SOFTWARE

- Hardware cannot function without software
- Software needs hardware to run
- OS acts as a bridge between software and hardware
- Application software relies on system software

10. DIFFERENCE BETWEEN SYSTEM SOFTWARE AND APPLICATION SOFTWARE

11. SOFTWARE ERRORS (BUGS)

Feature	System Software	Application Software
Purpose	Manages hardware	Performs user tasks
Runs	Background	On demand
Dependency	Required for all apps	Requires OS
Examples	Windows, Linux	Word, Excel

Errors in software caused by:

- Poor coding
- Logic mistakes
- Compatibility issues
- Hardware-related faults

Debugging

Process of finding and fixing errors.

12. MALICIOUS SOFTWARE (MALWARE)

Software designed to harm systems.

Types of Malware

- Virus
- Worm
- Trojan horse
- Spyware
- Ransomware
- Adware

Prevention

- Antivirus
- Regular updates
- Avoid suspicious downloads
- Strong passwords

TOPIC 6.DATA FILES & FILE MANAGEMENT

1. INTRODUCTION

Every computer system stores information in form of **files**.
File management refers to the techniques and processes used to **create, store, organize, retrieve, name, protect, and maintain files** in a computer system.

It ensures data remains **organized, secure, accurate, and easy to access**.

2. DEFINITION OF KEY TERMS

Data

Raw facts that have no meaning until processed.

File

A file is a **collection of related data** stored under a single name (filename) on a storage device.

Folder/Directory

A folder is a container used to group and organize files.

File Management

The process of **storing, naming, organizing, editing, retrieving, protecting, and maintaining** files.

3. TYPES OF FILES

Files can be categorized based on purpose, content, or processing.

Classification by Content

a. Text Files

Contain letters, numbers, symbols.
Example: `.txt, .docx`

b. Data Files

Contain numeric records used in databases or spreadsheets.
Example: `.csv, .xlsx`

c. Audio Files

Sound recordings.
Example: `.mp3, .wav`

d. Video Files

Movies or recordings.
Example: `.mp4, .avi`

e. Image Files

Pictures and graphics.
Example: `.jpg, .png`

f. Executable Files

Contain runnable programs.
Example: `.exe, .apk`

Classification by Use in Processing

a. Master Files

Permanent data stored for long periods.
Example: Employee database, customer records.

b. Transaction Files

Contain day-to-day operational data.
Example: Sales records for the day.

c. Reference Files

Contain data used for reference only.
Example: Price lists, postal codes.

d. Backup Files

Copies of data for recovery purposes.

e. Report Files

Output files containing processed results.
Example: Monthly sales report.

3.3 Classification by Access Method

a. Sequential Files

Records accessed in order (beginning to end).
Used in: Magnetic tapes.

b. Random (Direct) Access Files

Records accessed directly using an address or index.
Used in: Hard disks, SSDs.

c. Indexed Sequential Files

Combination of sequential + indexed access.
Used in: Banking systems, payroll.

4. FILE NAMING CONVENTIONS

Rules used when creating file names:

1. Should be meaningful
2. Avoid special characters (\ / : * ? " < > |)
3. Use valid file extensions (e.g., .docx, .pdf, .jpg)
4. Use short but descriptive names
5. Avoid spaces (optional; underscores can be used)
6. Follow organizational naming standards

5. FILE EXTENSIONS

A file extension is the suffix at the end of a filename showing its type.

Examples

Extension	Meaning
.docx	Word document
.pdf	Portable document
.xlsx	Excel spreadsheet
.pptx	PowerPoint
.jpg	Image
.mp4	Video
.exe	Executable program
.zip	Compressed file
.txt	Text file

6. FILE ORGANIZATION METHODS

Methods used to arrange data inside a file.

Sequential Organization

- Records arranged one after another
- Suitable for batch processing
- Slow for searching
- Used in payroll, billing

Random (Direct) Organization

- Uses hashing or addresses

- Fast access
- Common in databases

Indexed Sequential Organization

- Uses index + sequential layout
- Balanced performance
- Common in large data systems

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7. FILE OPERATIONS

Common tasks performed during file management:

1. Creating a File

- Opening a program and saving new data.

2. Opening a File

- Making a file available for viewing or editing.

3. Saving a File

- Storing changes permanently on storage media.

4. Renaming

- Giving the file a new name.

5. Moving

- Relocating files to another directory/device.

6. Copying

- Making a duplicate.

7. Deleting

- Removing a file permanently or sending it to Recycle Bin.

8. Searching

- Locating files using keywords.

9. Sorting & Organizing

- Arranging files alphabetically, by date, size, or type.

8. FOLDER (DIRECTORY) MANAGEMENT

Organizing files into well-structured folders improves efficiency.

Best Practices

- Group related files into folders
- Use subfolders for further organization
- Name folders clearly (e.g., "Invoices 2025")
- Archive old files
- Avoid clutter

9. FILE STORAGE MEDIA

Files can be stored on:

- Hard disks
- SSDs
- Flash drives
- CD/DVD
- Memory cards
- Cloud storage

10. FILE SECURITY AND PROTECTION

Protecting files from unauthorized access, loss, or damage.

Methods

1. **Password protection**

2. **File permissions (read/write restrictions)**
3. **Encryption**
4. **Regular backups**
5. **Use of antivirus**
6. **Access control lists**
7. **Cloud backup and versioning**

11. BACKUP AND ARCHIVING

Backup

A copy of data stored in a separate location for recovery.

Types of Backup

- Full backup
- Incremental backup
- Differential backup

Archiving

Long-term storage of **old, inactive** files for future reference.

12. IMPORTANCE OF FILE MANAGEMENT

- Prevents loss of data
- Enhances productivity
- Makes retrieval faster
- Improves data security
- Saves time and storage space
- Ensures accuracy and organization
- Supports teamwork and collaboration

13. COMMON FILE MANAGEMENT TOOLS

- Windows File Explorer
- macOS Finder
- Linux file managers (Nautilus, Dolphin)

- Cloud file systems (Drive, Dropbox)
- Search tools (Spotlight, Everything)

14. COMMON FILE MANAGEMENT PROBLEMS

- Unorganized folders
- Duplicate files
- Corrupted files
- Accidental deletion
- Virus attacks
- Running out of storage
- Poor naming practices

15. DIFFERENCE BETWEEN FILE & FOLDER

File	Folder
Stores data	Stores files & subfolders
Has extension	No extension
Single document	Can contain many files
Example: report.docx	Example: Documents/