CSC 101

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Quick Resources

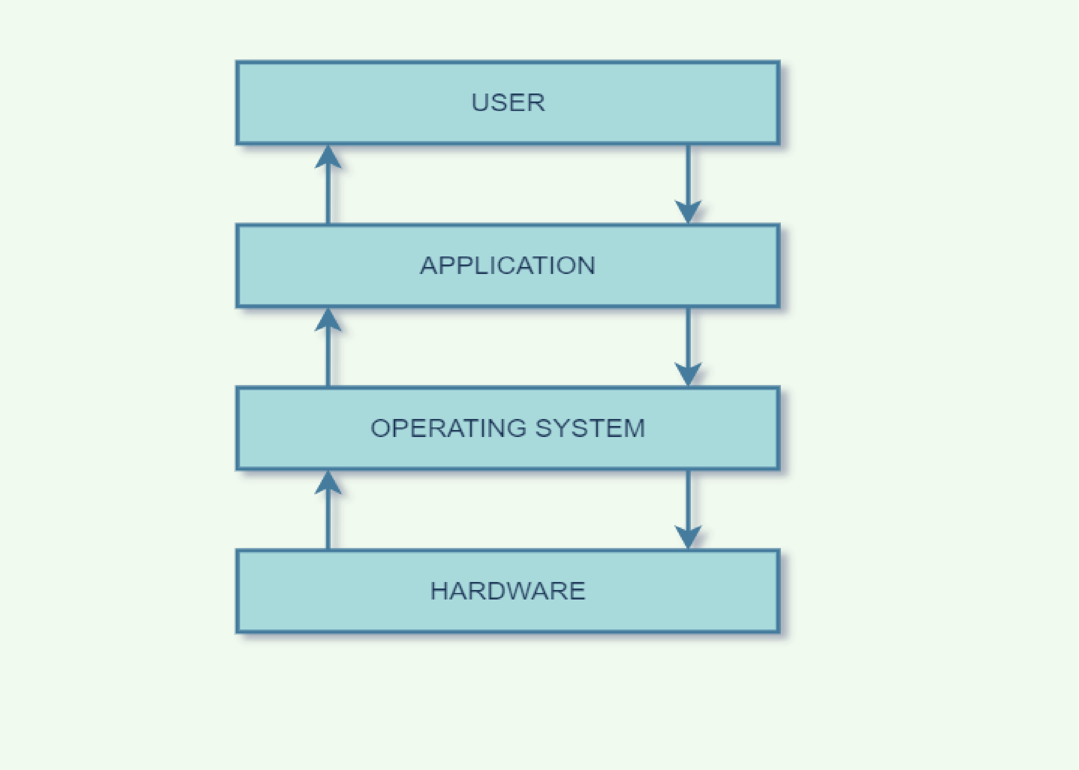
Understanding Operating Systems: https://youtu.be/fkGCLIQx1MI

Understanding Software Types: https://youtu.be/BTB86HeZVwk

Week 4: OPERATING SYSTEMS AND UTILITIES

What is Operating System?

An operating system (OS) is a computer program that manages all other user applications and programs in a computer. It is loaded into the computer by a boot program. It enables user applications to interact with a computer's hardware. To run other programs, every computer has to have at least one operating system installed.



OPERATING SYSTEM

Microsoft Windows, Mac OS and Linux are examples of operating systems that enable the user to use programs or applications like MS Office, Notepad, and games on the computer. Android and iOS are examples of operating systems that enable the user to use programs or applications like games on mobile phones. It is necessary to have at least one operating system installed in the computer to run basic programs like browsers.

Features of Operating Systems

Here is a list of some important features of operating systems:

1. Provides a platform for running applications
2. Handles memory management and CPU scheduling
3. Provides file system abstraction
4. Provides networking support
5. Provides security features
6. Provides user interface
7. Provides utilities and system services
8. Supports application development

Functions of Operating System

- **Processor Management:** An operating system manages the processor’s work by allocating various jobs to it and ensuring that each process receives enough time from the processor to function properly.
- **Memory Management:** An operating system manages the allocation and deallocation of the memory to various processes and ensures that the other process does not consume the memory allocated to one process.
- **Device Management:** There are various input and output devices. An OS controls the working of these input-output devices. It receives the requests from these devices, performs a specific task, and communicates back to the requesting process.
- **File Management:** An operating system keeps track of information regarding the creation, deletion, transfer, copy, and storage of files in an organized way. It also maintains the integrity of the data stored in these files, including the file directory structure, by protecting against unauthorized access.

- **Security:** The operating system provides various techniques which assure the integrity and confidentiality of user data. Following security measures are used to protect user data:
    - Protection against unauthorized access through login.
    - Protection against intrusion by keeping Firefall active.
    - Protecting the system memory against malicious access.
    - Displaying messages related to system vulnerabilities.
- **Error Detection:** From time to time, the operating system checks the system for any external threat or malicious software activity. It also checks the hardware for any type of damage. This process displays several alerts to the user so that the appropriate action can be taken against any damage caused to the system.
- **Job Scheduling:** In a multitasking OS where multiple programs run simultaneously, the operating system determines which applications should run in which order and how time should be allocated to each application.

Advantages of Operating System

There are several advantages of operating systems:

- Ensuring correct and efficient use of the computer’s hardware.
- Allowing different applications to run concurrently.
- Managing files and folders.
- Providing a user interface.
- Managing security.
- Managing resources.
- Managing printing.
- Providing a platform for software development.

Disadvantages of Operating System

There are several disadvantages of operating systems:

- They can be complex and difficult to use.
- They can be expensive to purchase and maintain.
- They can be vulnerable to attacks from malicious users.

Utilities

Utilities or Utility programs are system softwares or programs that perform specific tasks. They help to maintain the proper and smooth functioning of a computer system and assist the Operating System to manage, organize, maintain, and optimize the functioning of the computer system.

Utility Softwares perform certain tasks like virus detection, installation, and uninstallation, data backup, deletion of unwanted files, etc. Some examples are antivirus software, file management tools, compression tools, disk management tools, etc.

Types of Utility Software

1. **Antivirus**

A virus is a malicious software that enters the system along with a host program. It multiplies with time and makes several copies which in turn slows down and corrupts the system.

An antivirus is a utility software that helps to keep the computer virus-free. It notifies when any malicious file is detected and removes such files. In addition, it scans any new device attached to the computer and discards any virus if there. It also scans the system from time to time for any threats and disposes of them. Examples of antivirus are McAfee Antivirus, Quickheal Antivirus, Windows Defender, etc.

2. **File Management System**

These utility software are used to manage files of the computer system. Since files are an important part of the system as all the data is stored in the files. Therefore, this utility software help to **browse, search, arrange, find information, and quickly preview** the files of the system.

Windows Explorer is a default file management tool present in the system. Some other examples of file management tools are Google Desktop, Double Commander, Directory Opus, etc.

3. **Compression Tools**

An important part of a computer is storage space, it is very important to maintain this storage. Therefore, we use certain utility software to compress big files and decrease their size, these are compression tools. The format of the files changes while compressing and we cannot access or edit them directly. In addition, we can easily decompress the file and get the original file back. Examples of compression tools are WinZip, WinRAR, WinAce, PeaZip, 7-Zip, etc.

4. **Disk Management Tools**

These utility software are used to manage data on disks. Moreover, they perform functions like partitioning devices, manage drives, etc. Examples of disk management tools are MiniTool Partition Wizard, Paragon Partition Manager, etc.

5. **Disk Cleanup Tool**

This utility software helps to free up the disk space. In addition, the files which are no longer in use are removed from the disk. Examples are Razer Cortex, Piriform CCleaner, etc.

6. **Disk Defragmenter**

This utility software helps to reduce the fragmentation and hence, reduces the access speed. Defragmenting refers to rearranging files and storing them in contiguous memory locations. Moreover, saves time in reading from files and writing files to disk. Examples of disk defragmenters are Perfect disk, Deflaggler, etc.

7. **Backup Utility**

This utility software helps to back up the files, folders, databases, or complete disks. Moreover, backup refers to duplicating the disk information so that the data can be restored if any data loss happens.

Advantages of Utility Software

The advantages are as follows:

1. Enhances performance.
2. Manages space.
3. Manages files and data.
4. Helps to customize interface and desktop.
5. Helps to remove useless files.
6. Keep the system safe and secure.
7. Helps to recover files after a loss.

Application software: Areas of application of computers.

An **Application Software** is basically is a program or set of programs that perform a specific task. In addition to this, end-users use this software. Hence, the name **end-user programs.** We can also name this software as **an app**. There are different types of application software both for simple as well as complex tasks.

They enable the computer to perform specific tasks like processing words, handling calculations, accounting, result preparation etc. Some basic examples are MS-Word, Photoshop, Google Chrome, etc.

Types of Application Software

This software has two basic categories:

1. General-purpose software
2. Customized software

1. General-Purpose Software

General-purpose software performs a large range of specific basic tasks. They fulfill all the general tasks that a person needs to perform on the system. There are numerous applications that a user needs to perform. Among them, some variety of applications that are frequently used comes under this category. Some examples of application suites can be WPS Office, MS Office, Apache OpenOffice, etc. The general-purpose software is divided further as follows:

Word Processing Software

This software contains the features to create, edit, delete, access, format, and customize text files. In addition, they have several features like thesauruses, Word Art, etc. to customize and make the files more attractive and useful. They have additional features for publishing, sending mails, etc. Furthermore, it basically helps to create reports, letters, newsletters, manuals, books, etc. Examples are MS-Word, WPS Writer, Open Office Writer, Word pad, etc.

MS WORD

- **Spreadsheets**

This software contains the data in the form of rows and columns. The intersection of a row and column is a cell. They store the data and have various formulas which in turn helps to analyze, calculate, and draw conclusions from data. The business and financial sectors use this software more often. They also contain additional features like graphs, charts, 3D graphs, tables, etc. for effective results. Report presentation is thus quite easy considering these results. Examples are MS Excel, Google Sheets, LibreOffice Calc, etc.

MS EXCEL

- **Database Management Systems**

A database is a collection of related data or information in an organized form. A database management system is a tool that is used to store, search, extract, or delete information from a database. Moreover, we use them so that the operations which we perform on the database, are in an organized manner and safe. Some database management tools help in handling records on the system like phone numbers, mailing lists, catalogs, etc. Examples are MS Access, Filemaker, dBASE, etc. While some others help to manage large and complex databases. Examples are SQL, Oracle, etc.

- **Desktop Publishing Software**

They help in designing interactive animations and 3D images using texts and graphics. Moreover, this software has many tools that help the user to produce different and innovative animations and graphics. Their basic applications are logos, magazines, newspapers, business cards, etc. Examples are Adobe InDesign, QuarkExpress, etc.

- **Web Browsers**

Web Browser is a software which we use to access information on the web (World Wide Web). Browsers allow users to search for information, read files, watch videos, download images, etc. Examples are Google Chrome, Mozilla Firefox, Safari, Internet Explorer, etc.

- **Presentation Software**

This software helps the users to display their projects and information in the form of slides. Hence, the slideshow is the basic feature of presentation software. Besides, those other features are graphs, charts, adding audio, videos, transitions, etc. Examples are PowerPoint, Corel Presentations, etc.

- **Video Editing Software**

This software helps the user to edit the videos. They can add text, animations, sound, etc. as per their requirement. They also have features to merge, split, or change the speed of the videos. Therefore, they are useful in creating documentaries, advertisements, etc. Examples are Adobe Premiere, Pinnacle Studio, etc.

- **Games**

Games are one of the favorite software. They are used by almost all types of users. There is a large variety of games available ranging from puzzles and mysteries to real-world animation games. There are hundreds of features in this software. Hence, the programming of such software is also complex. Examples are FIFA Football, Minesweeper, etc.

- **Some other categories of application software**

There are a few more small categories such as:

1. Media Players like windows media player, VLC, etc.
2. Document Readers like Adobe Reader, DocX Viewer, etc.
3. Cloud Storage like Google Drive etc.
4. Photo Editing like Adobe Photoshop etc.
5. Virtual Assistants like Siri, Google Assistant, etc.

2. Customized Software

Sometimes people give the order to create certain special software according to their own specific requirements. Programmers generally develop such software on special demands. This software excludes the extra features of application software. Therefore, only such features are present which the user actually requires for his purpose. This software is not available on the web. So, one cannot download or use them directly. Moreover, once the programmer creates the software, he gives it to the client with certain terms and rights. Due to these features, we can also name this software as **tailor-made software**.

For example, a beauty salon’s owner needs software to keep track of the bookings. Further, he requires to fix appointments or keep track of his products, etc.

Difference Between Application Software and System Software

Sr. no.	Application Software	System Software
1.	They are software that handles specific tasks. Moreover, they can be general-purpose or customized.	They help only in the internal working of the computer system. They can utility software, operating system, drivers, etc.
2.	Examples: MS-Word, PowerPoint, Google Chrome, etc.	Examples: Android, Microsoft Windows, Win RAR, etc.

Functions of Application Software

In conclusion, we can list the functions of application software as follows:

1. Organize files
2. Calculate and analyze data
3. Store, access, manipulate or delete specific data
4. Design graphics and animations
5. Make slideshows
6. Browse the internet
7. Play games
8. Edit pictures and videos
9. Maintain attendance records
10. Manage records of school, library, railway, etc.

Data Storage and Internal Representation of Data

Data refers to the symbols that represent people, events, things, and ideas. Data can be a name, a number, the colors in a photograph, or the notes in a musical composition.

Data Storage refers to magnetic, optical or mechanical media that records and preserves digital information for ongoing or future operations. There are two types of digital information: input and output data. Users provide the input data. Computers provide output data.

Data Representation refers to the form in which data is stored, processed, and transmitted.

Data cannot be entered and processed directly into computers using human language. Any type of data be it numbers, letters, special symbols, sound or pictures must first be converted into machine-readable form i.e. binary form. Computers store data in digital formats that can be handled by electronic circuitry.

The 0s and 1s used to represent digital data are referred to as binary digits —from this term we get the word *bit* that stands for *bi*nary digi*t*. A bit is a 0 or 1 used in the digital representation of data.

Week 5: BITS AND CHARACTER REPRESENTATION CONCEPT OF DATA

Bits, bytes, nibble and word

The terms bits, bytes, nibble and word are used widely in reference to computer memory and data size.

- **Bits:** can be defined as either a binary, which can be 0, or 1.It is the basic unit of data or information in digital computers.
- **Byte:** a group of bits (8 bits) used to represent a character. A byte is considered as the basic unit of measuring memory size in computer.
- **A nibble**: is half a byte, which is usually a grouping of 4 bytes.
- **Word:** two or more bits make a word. The term **word length** is used as the measure of the number of bits in each word. For example, a word can have a length of 16 bits, 32 bits, 64 bits etc.

Bites and Bytes

All of the data stored and transmitted by digital devices is encoded as ***bits***. Terminology related to bits and bytes is extensively used to describe storage capacity and network access speed. The word **bit**, an abbreviation for **bi*nary digi***_t_, can be further abbreviated as a lowercase ***b***. A group of eight bits is called a ***byte*** and is usually abbreviated as an uppercase ***B***.

Kilo, ***mega***, ***giga***, ***tera***, and similar terms are used to quantify digital data.

- Bit - One binary digit
- Byte - 8 bits
- Kilobit - 1,024 or 2^{10} bits
- Kilobyte - 1,024 or 2^{10} bytes
- Megabit - 1,048,576 or 2^{20} bits
- Megabyte - 1,048,576 or 2^{20} bytes
- Gigabit - 2^{30} bits
- Gigabyte - 2^{30} bytes
- Terabyte - 2^{40} bytes
- Petabyte - 2^{50} bytes
- Exabyte - 2^{60} bytes

Use bits for data rates, such as Internet connection speeds, and movie download speeds. Use bytes for file sizes and storage capacities.

1024 KB: Kilobyte (KB or Kbyte) is often used when referring to the size of small computer files.

56 Kbps: Kilobit (Kb or Kbit) can be used for slow data rates, such as a 56 Kbps (kilobits per second) dial-up connection.

50 Mbps: Megabit (Mb or Mbit) is used for faster data rates, such as a 50 Mbps (megabits per second) Internet connection.

3.2 MB: Megabyte (MB or MByte) is typically used when referring to the size of files containing photos and videos.

100 Gbit: Gigabit (Gb or Gbit) is used for really fast network speeds.

16 GB: Gigabyte (GB or GByte) is commonly used to refer to storage capacity

- **Representing Numbers**

Numeric data consists of numbers that can be used in arithmetic operations. Digital devices represent numeric data using the binary number system, also called base 2. The **binary number system** only has two digits: 0 and 1. No numeral like 2 exists in the system, so the number “two” is represented in binary as 10 (pronounced “one zero”).

- **Representing Text**

Character data is composed of letters, symbols, and numerals that are not used in calculations. Examples of character data include your name, address, and hair color. Character data is commonly referred to as “text.”

Digital devices employ several types of codes to represent character data, including ASCII, Unicode, and their variants. **ASCII** (American Standard Code for Information Interchange, pronounced “ASKee”) requires seven bits for each character. The ASCII code for an uppercase **A** is **1000001**.

Extended ASCII is a superset of ASCII that uses eight bits for each character. For example, Extended ASCII represents the uppercase letter **A** as **01000001**. Using eight bits instead of seven bits allows Extended ASCII to provide codes for **256** characters.

Unicode (pronounced “YOU ni code”) uses sixteen bits and provides codes or 65,000 characters. This is a bonus for representing the alphabets of multiple languages. **UTF-8** is a variable-length coding scheme that uses seven bits for common ASCII characters but uses sixteen-bit Unicode as necessary.

ASCII codes are used for numerals, such as Social Security numbers and phone numbers. Plain, unformatted text is sometimes called *ASCII text* and is stored in a so-called text file with a name ending in .txt. On Apple devices these files are labeled "***Plain Text***."

In Windows, these files are labeled "***Text Document***". ASCII text files contain no formatting. To create documents with styles and formats, formatting codes have to be embedded in the text. Microsoft Word produces formatted text and creates documents in **DOCX** format.

Apple Pages produces documents in **PAGES** format. Adobe Acrobat produces documents in **PDF** format. HTML markup language used for Web pages produces documents in **HTML** format.

Data Compression

To reduce file size and transmission times, digital data can be compressed.

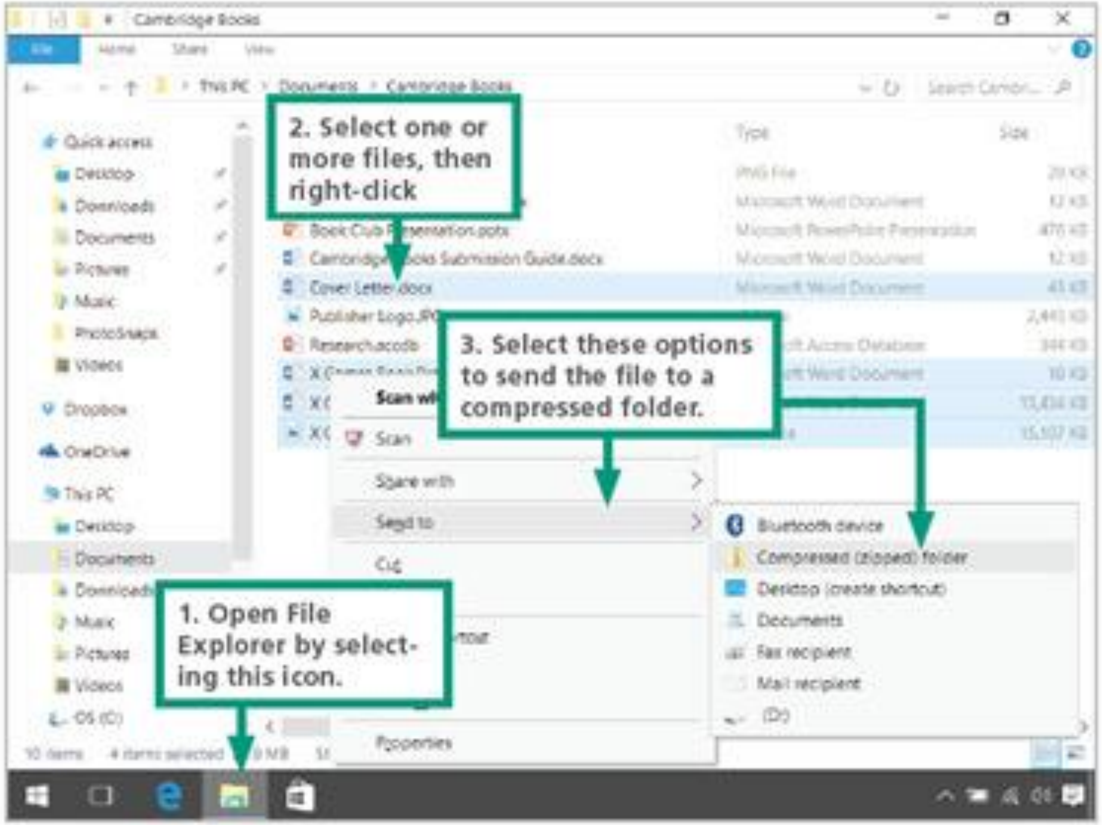
Data compression refers to any technique that recodes the data in a file so that it contains fewer bits. Compression is commonly referred to as “zipping.”

Compression techniques divided into two categories: **lossless** and **lossy.**

- Lossless compression provides a way to compress data and reconstitute it into its original state; uncompressed data stays exactly the same as the original data.
- Lossy compression throws away some of the original data during the compression process; uncompressed data is not exactly the same as the original.

The software for compressing data is sometimes referred to as a compression utility or a zip tool.

On laptops and desktop computers, the compression utility is accessed from the same screen used to manage files.



1. Open File Explorer by selecting this icon.

2. Select one or more files, then right-click

3. Select these options to send the file to a compressed folder.

Compressing files using File Explorer on a PC

The process of reconstituting files is called extracting or unzipping. Compressed files may end with a .zip, .gz, .pkg, or .tar.gz.

Records and Files

A **Record** is a collection of related data contained in one or more files or a database. For example: records are the rows in a table.

Several related fields can be used to compose a record. In a payroll system, for example, the record for an employee might consist of the following fields (possible types for these fields are shown in parentheses):

- Employee identification number (a whole number).
- Name (a string of characters).
- Address (a string of characters).
- Hourly pay rate (a number with a decimal point).
- Year-to-date earnings (a number with a decimal point).
- Amount of taxes withheld (a number with a decimal point).

Thus, a record is a group of related fields. All the fields listed above belong to the same employee. A company might have many employees and a payroll record for each.

A **File** is a group of related records. More generally, a file contains arbitrary data in arbitrary formats. In some operating systems, a file is viewed simply as a *sequence of bytes*—any organization of the bytes in a file, such as organizing the data into records, is a view created by the application programmer.

It’s not unusual for an organization to have many files, some containing billions, or even trillions, of characters of information.

Type of files

- **Master files** : They are made up of sets of records containing information that can be updated by addition, deletion, or changing of data. It is also called dynamic file
- **Update files**: They consists of set of changes to master file fields or records in a master file may be changed added or deleted using an update file. These files are often retained for a period of time for security reasons. They are called change file.
- **Reference files**-Price lists, actuary tables etc with less alteration
- **Historical Files**- When a system has been redesigned so that a master file no longer required.

File Organization

- **Random File Organization**: If there is no need to read data from the disk in any particular sequence, and the data is to be used for file enquiry.
- **Sequential file organization:** When master files are to be stored and updated by transaction files, and when there is little need for the enquiry, it pays to organise data sequentially onto the disk in a way which mimics organization on magnetic tape
- **Index-Sequential file organization:** This involves writing data onto the disk as a sequential file but in addition, some sectors of the disk are reserved to record disk addresses of data records

Basic Models of Files Processing

File Processing

In earlier days, data was stored manually, using pen and paper but after computer was discovered, the same task could be done by using files. There are various formats in which data can be stored. e.g. Text files can be stored in .txt format while pictures can be stored in .png format etc.

In case of computer files, data about data (metadata) can be stored in different lines, separated by spaces, commas or tab to resemble tables. Each file is placed in relevant folders for the ease of access.

In Computer Science, File Processing System (FPS) is a way of storing, retrieving and manipulating data which is present in various files. Files are used to store various documents. All files are grouped based on their categories. The file names are very related to each other and arranged properly to easily access the files. In file processing system, if one needs to insert, delete, modify, store or update data, one must know the entire hierarchy of the files.

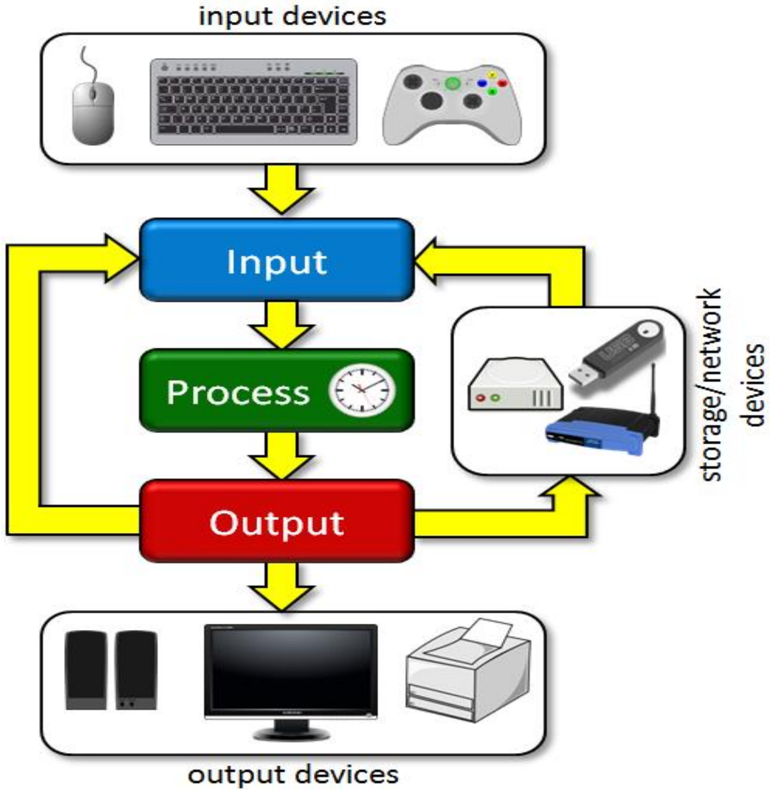
Advantages of File Processing System

- **Cost friendly –** There is a very minimal to no set up and usage fee for File Processing System. (In most cases, free tools are inbuilt in computers.)
- **Easy to use –** File systems require very basic learning and understanding, hence, can be easily used.
- **High scalability –** One can very easily switch from smaller to larger files as per his needs.

Week 6: PROBLEM SOLVING STRATEGIES

Problem Solving Strategies

Problem solving plays a critical role in computer science. Regardless of the area of study, computer science is all about solving problems with computers. The problems that we want to solve can come from any real-world problem or perhaps even from the abstract world. We need to have a standard systematic approach to solving problems. Since we will be using computers to solve problems, it is important to first understand the computer’s information processing model. The model shown in the diagram below assumes a single CPU (Central Processing Unit).



Many computers today have multiple CPUs, so you can imagine the above model duplicated multiple times within the computer.

Problems are solved using a computer by obtaining some kind of user input (e.g., keyboard/mouse information or game control movements), then processing the input and producing some kind of output (e.g., images, test, sound).

Problem Solving is the sequential process of analyzing information related to a given situation and generating appropriate response options.

There are 7 steps that you should follow in order to solve a problem:

1. Identify the Problem
2. Understand the Problem
3. Determine how to Solve the Problem (Formulate a Model)
4. Develop a Method to achieve the Solution (Develop an Algorithm)
5. Write the Program
6. Test the Program
7. Evaluate the Solution

Algorithm

An algorithm is a ” A set of finite rules or instructions to be followed in calculations or other problem-solving operations ” Or ” A procedure for solving a mathematical problem in a finite number of steps that frequently involves recursive operations”. It is a precise sequence of finite instructions for solving a problem.

Algorithms play a crucial role in various fields and have many applications. Some of the key areas where algorithms are used include: Computer Science, Mathematics, Operations Research, Data Science and so on.

Algorithms can be simple and complex depending on what you want to achieve.

Characteristics of Algorithm

The following are the characteristics of a good algorithm:

- **Clear and Unambiguous**: The algorithm should be clear and unambiguous. Each of its steps should be clear in all aspects and must lead to only one meaning.
- **Well-Defined Inputs**: If an algorithm says to take inputs, it should be well-defined inputs. It may or may not take input.
- **Well-Defined Outputs:** The algorithm must clearly define what output will be yielded and it should be well-defined as well. It should produce at least 1 output.
- **Finite-ness:** The algorithm must be finite, i.e. it should terminate after a finite time.

- **Feasible:** The algorithm must be simple, generic, and practical, such that it can be executed with the available resources. It must not contain some future technology or anything.
- **Language Independent:** The Algorithm designed must be language-independent, i.e. it must be just plain instructions that can be implemented in any language, and yet the output will be the same, as expected.
- **Input**: An algorithm has zero or more inputs. Each that contains a fundamental operator must accept zero or more inputs.
- **Output**: An algorithm produces at least one output.Every instruction that contains a fundamental operator must accept zero or more inputs.
- **Definiteness:** All instructions in an algorithm must be unambiguous, precise, and easy to interpret. By referring to any of the instructions in an algorithm one can clearly understand what is to be done. Every fundamental operator in instruction must be defined without any ambiguity.
- **Finiteness:** An algorithm must terminate after a finite number of steps in all test cases. Every instruction which contains a fundamental operator must be terminated within a finite amount of time. Infinite loops or recursive functions without base conditions do not possess finiteness.
- **Effectiveness:** An algorithm must be developed by using very basic, simple, and feasible operations so that one can trace it out by using just paper and pencil.

Properties of Algorithm:

- It should terminate after a finite time.
- It should produce at least one output.
- It should take zero or more input.
- It should be deterministic means giving the same output for the same input case.
- Every step in the algorithm must be effective i.e. every step should do some work.

How to express an Algorithm?

1. Flow Chart:- Here we express the Algorithm by making graphical/pictorial representation of it.
2. Pseudo Code:- Here we express the Algorithm in the form of annotations and informative text written in plain English which is very much similar to the real code but as it has no syntax like any of the programming language, it can’t be compiled or interpreted by the computer. It is the best way to express an algorithm because it can be understood by even a layman with some school level programming knowledge.

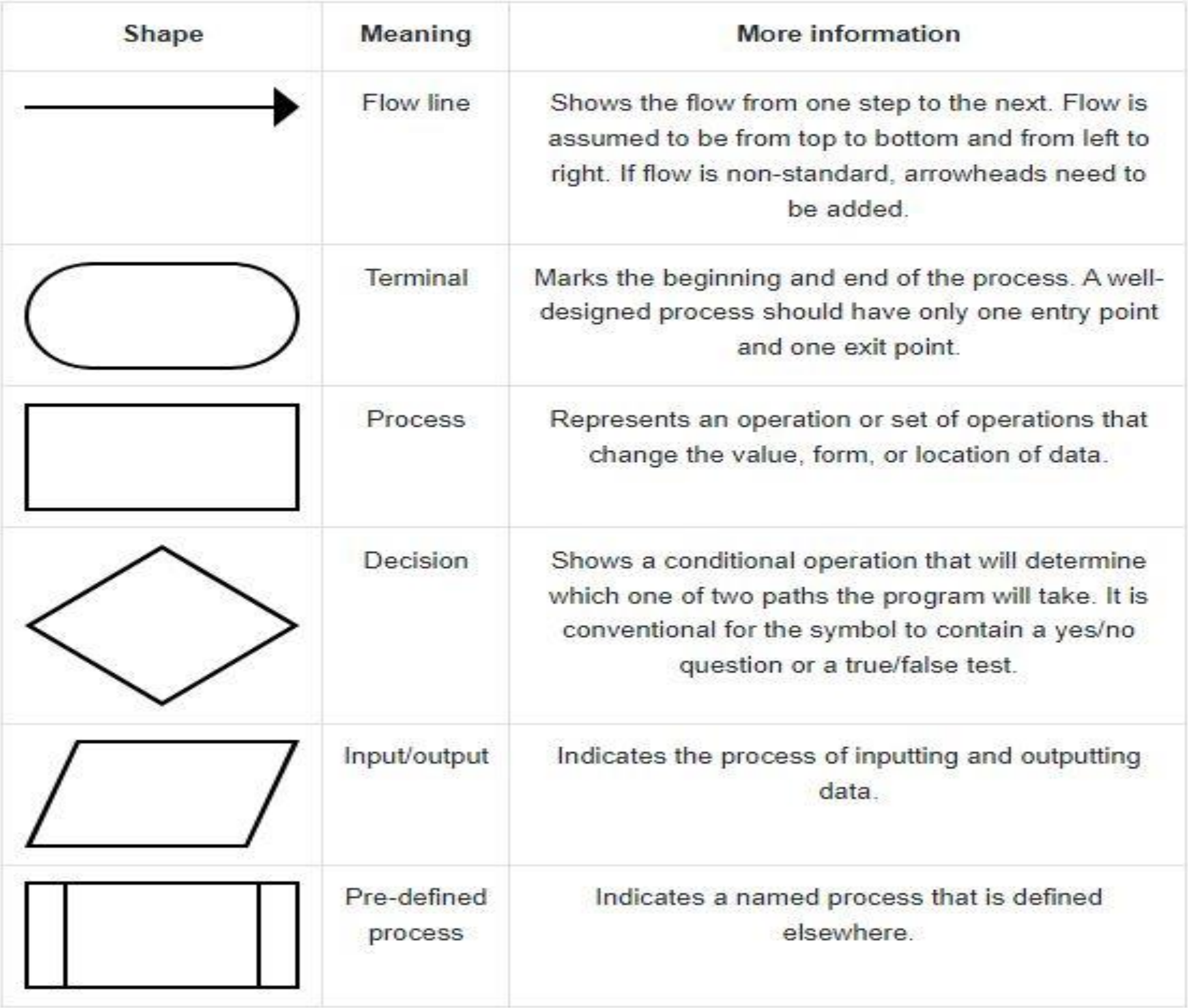
Flowchart

A **flowchart** is a diagram used to illustrate the steps of an algorithm. Flowcharts are made up of symbols, each containing a single step of the algorithm. The shape of the symbol represents the type of process that the symbol contains. Arrows are used to show the flow of execution, meaning that flowcharts can represent all the core concepts of programming, namely sequence, selection, and iteration.

Rules For Creating Flowchart :

A flowchart is a graphical representation of an algorithm.it should follow some rules while creating a flowchart
Rule 1: Flowchart opening statement must be ‘start’ keyword.
Rule 2: Flowchart ending statement must be ‘end’ keyword.
Rule 3: All symbols in the flowchart must be connected with an arrow line.
Rule 4: The decision symbol in the flowchart is associated with the arrow line.

There is a generally accepted standard for the symbols used in flowcharts.
The table shows the most common ones as defined by ISO (International Organization for Standardization).



Shape	Meaning	More information
	Flow line	Shows the flow from one step to the next. Flow is assumed to be from top to bottom and from left to right. If flow is non-standard, arrowheads need to be added.
	Terminal	Marks the beginning and end of the process. A well-designed process should have only one entry point and one exit point.
	Process	Represents an operation or set of operations that change the value, form, or location of data.
	Decision	Shows a conditional operation that will determine which one of two paths the program will take. It is conventional for the symbol to contain a yes/no question or a true/false test.
	Input/output	Indicates the process of inputting and outputting data.
	Pre-defined process	Indicates a named process that is defined elsewhere.

Pseudocode

Pseudocode literally means ‘fake code’. It is an **informal** and **contrived** way of representing a sequence of actions and instructions (algorithms) in a form that humans can easily understand.

How to write a Pseudo-code?

1. Arrange the sequence of tasks and write the pseudocode accordingly.
2. Start with the statement of a pseudo code which establishes the main goal or the aim.
3. Indent the statements as it helps to comprehend the decision control and execution mechanism. They also improve the readability to a great extent.
4. Use appropriate naming conventions.
5. Use appropriate sentence casings, such as CamelCase for methods, upper case for constants and lower case for variables.
6. Elaborate everything which is going to happen in the actual code. Don’t make the pseudo code abstract.
7. Use standard programming structures such as ‘if-then’, ‘for’, ‘while’, ‘cases’ the way we use it in programming.
8. Check whether all the sections of a pseudo code is complete, finite and clear to understand and comprehend.
9. Don’t write the pseudo code in a complete programmatic manner. It is necessary to be simple to understand even for a layman or client, hence don’t incorporate too many technical terms.

Concept and Role of Algorithms in Problem Solving

Algorithms give computers step-by-step instructions to accomplish specific tasks and make decisions. In programming, there are many ways to solve a problem. However, the effectiveness of the available methods varies. Some methods are much better than others at giving accurate answers. Algorithms are used to find the best possible way to solve a problem, based on data storage, sorting and processing, and machine learning. In doing so, they improve the efficiency of a program.

Algorithms are used in all areas of computing because it is a fantastic way of automating computer decisions.

Most importantly, algorithms can be expressed in different languages, including natural languages, pseudocodes, flowcharts, drakon-charts, programming languages etc.

Advantages of Algorithms

- It is easy to understand.
- An algorithm is a step-wise representation of a solution to a given problem.
- In Algorithm the problem is broken down into smaller pieces or steps hence, it is easier for the programmer to convert it into an actual program.
- Algorithms provide a systematic approach to solving problems and performing tasks efficiently.
- Algorithms can be optimized to improve the performance of software applications and systems.
- Algorithms can be reused in different applications and systems, which can save time and resources.

Algorithms are widely used in various industrial areas to improve efficiency, accuracy, and decision-making. Some of the key applications include:

- **Manufacturing:** Algorithms are used to optimize production processes and supply chain management, reducing waste and increasing efficiency.
- **Finance:** Algorithms are used to analyze financial data and make predictions, enabling traders and investors to make informed decisions.
- **Healthcare:** Algorithms are used to process and analyze medical images, assist in diagnosing diseases, and optimize treatment plans.4Retail: Algorithms are used for customer relationship management, personalized product recommendations, and pricing optimization.
- **Transportation:** Algorithms are used to optimize routes for delivery and transportation, reducing fuel consumption and increasing delivery speed.
- **Energy:** Algorithms are used to optimize energy generation, distribution, and consumption, reducing waste and increasing efficiency.
- **Security:** Algorithms are used to detect and prevent security threats, such as hacking, fraud, and cyber-attacks.
- In these and many other industries, algorithms play a crucial role in automating tasks, improving decision-making, and enhancing overall performance and efficiency.