Covered Topics Under UNIT-1 of "PPS-PROGRAMMING FOR PROBLEM SOLVING (BCS101 / BCS201)"

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Class Notes

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PPS: UNIT-1

Introduction to Components of a Computer System

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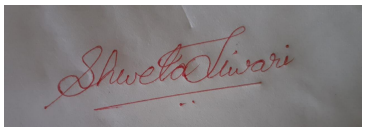

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TOPIC On : UNIT-1: What is Operating Systems (OS) - Types, Functions, and Examples

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Under On: Introduction to Components of a Computer System

PREPARED FOR
Engineering Students
All Engineering College

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TOPIC On : UNIT-1: What is Operating Systems (OS) - Types, Functions, and Examples

What is an Operating System?

An operating system (OS) is software that runs on your computer. It is responsible for managing software applications programs and computer hardware resources. It acts as a bridge between hardware, software, and the user for easy interaction to complete the task effectively. It allows you to communicate with the computer without knowing the machine language.

In the last three decades, computers have been one of the most successful inventions that help in solving problems in human life. Computing devices and their uses have grown rapidly and widely throughout the world. The applications and influence of computing devices can be seen in various sectors, including education, healthcare, transportation, and communication sector. In this modern world, it is difficult to survive a business without adopting computer usage either directly or indirectly.

History of Operating System

Generation	Description
The First Generation (1940's to early 1950s)	• Electronic computers were first introduced in the 1940s without any operating systems. • Computers in this generation were generally used to solve simple math calculations.
The Second Generation (1955-1965)	• The first operating system was introduced in the early 1950s. • It was called GMOS and was created by General Motors for IBM's machine the 701. • In the 1950s OSes were called single-stream batch processing systems.
The Third Generation (1965-1980)	• In the late 1960s, operating system designers developed a new operating system that could perform multiple tasks simultaneously in a single computer program called multiprogramming.

	• In the late 1960s, the first version of the Unix OS was developed. • This generation also saw the phenomenal growth of minicomputers, starting with the DEC PDP-1 in 1961.
The Fourth Generation (1980-Present Day)	• The fourth generation of operating systems saw the development of the personal computer. • The first OS built by Microsoft was DOS. It was built in 1981. • Apple's operating system was built in the 1980s. • The present-day Windows OS first came into existence in 1985. It was developed when a GUI was created and paired with MS-DOS.

Applications of Operating System

- **Desktop Operating systems:** These are designed for use on personal computers. They contain all the utilities and applications that the users might need. They are usually updated with the latest software versions to provide a better user experience.
- **Mobile Operating systems:** These are designed for use on cellular phones and other portable devices. They contain only the essential software and minimalistic utilities. The advantage of using a mobile OS is that it is easier to update and maintain.
- **Server Operating systems** are updated with the latest software versions, versioning to support multiple users, and security features. They run applications such as email servers, file sharing servers, and web servers.

Why use an Operating System?

- Operating systems provide a platform on which the users can carry out their various activities.
- Operating systems are essential for the security and stability of the computer. They contain the latest security patches and updates to protect the computer from malicious threats.
- For executing the programs
- Without an operating system, you can't access hardware.
- Error Detection and Handling
- Keeping account of the functionality happening in the computer system.

What does an Operating System do?

The operating system of a computing device helps it run different applications. Many times, several different programs run simultaneously on your device and they all need to access your computer's central processing unit (CPU), memory, and storage. The operating system coordinates all of this to make sure each program runs properly.

Functions of an Operating System

- User Interface – Gives you a User Interface (UI) to communicate with the computer and its peripheral devices.
- Booting – Turns on and powers up the system.
- Memory management – Controls the computer applications while allocating space for programs.
- Process Management – Allocates resources to different computer processes, enables the processes to share information, and synchronizes them. Logs all the processes running on a computer.
- Loading and Execution – Loads, starts, and executes the program.
- Security – Operating systems have in-built security features to protect a computer against malware and unauthorized access.
- Disk management – Manages all the drives installed in a computer, such as hard drives, optical disk drives, and flash drives.
- Device Management – Manages all the devices connected to the computer, such as the network interface card and peripherals (keyboard and mouse).

Types of Operating Systems (OS)

The table below lists the different types of operating systems that are commonly used.

Operating System	Description
What is a Batch operating system?	Jobs with similar types of needs are batched together and run as a group on a computer without manual interventions.
What is a Time-sharing operating system?	Many users share the computer resources at the same time. The processor time (CPU) is shared among multiple users.
What is a Distributed operating system?	Uses many processors located in different machines to provide very fast computation.
What is a Network operating system?	Allows to connect and communicate with various autonomous computers over a network.
What is aReal-time operating system?	It is used for real-time applications that process data as it comes in, without buffer delay.

What is Mobile operating system?	Designed for smartphones, tablets, and wearables devices.

Examples of Operating Systems

- Microsoft Windows – GUI based OS for Personal Computers.
- Apple macOS – for Apple's personal computers and workstations.
- Google's Android OS – for smartphones/tablets/smartwatches.
- Apple iOS – for Apple's for iPhones, iPads, and iPods.
- Linux Operating System – for Personal Computers, Workstations.

Operating system projects

- Trying shell scripting and performing CRUD operations on data like.
    - Prepare a menu with options (for 1 do this, for 2 do this)
    - Fetch the whole data of a file.
    - Update a particular row in the file.
    - Delete a specific row, then change the id.
    - Fetch particular rows.
    - Insert at a particular location.

- Write a Device Driver for some device, e.g. something on an Arduino board.
- Write a File System
- Write a Web Server: which can be multithreaded. For example, one thread can always catch the server requests, creating other threads that process these requests.
- Creating mini wrapper applications for the already existing popular applications for Windows and macOS

Popular Tools to Develop your own Operating System

- **Fling-**It is an open-source CLI tool designed specifically for managing Windows installations. Fling helps in controlling the use of disk space.It helps in controlling the use of memory and CPU resources.
- **Cosmos-**It is a remote administration tool that allows administrators to manage servers from a remote location using commands on the client-side. It is used to monitor and control the activities of the users.
- **SharpOS-** It helps users identify file types and extract information from them without knowing or remembering how each program works. It helps control the activities of applications.
- **Singularity-**It helps in controlling the activities of files. These tools are used to manage the activities of the applications and the files in the system.
- **MOSA or Managed Operating System Alliance Project-**
  It is a collaborative project that was launched in 2015. The project aims to create a single management interface for various operating system tools. The project aims to make the task of system administrators easier.