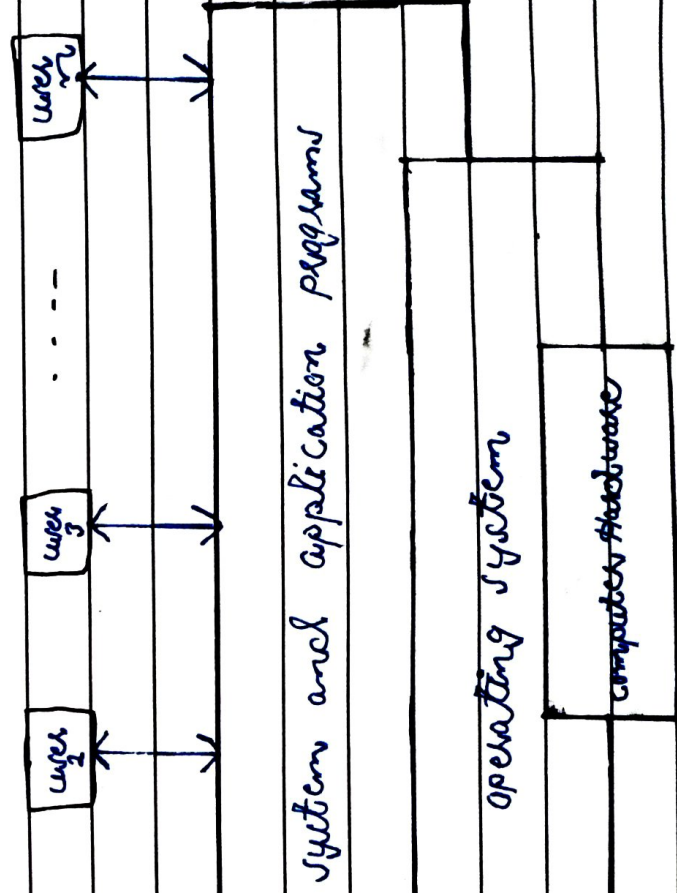# Operating system

*) **Definition :-** A program that acts as an intermediary between a user of a computer and computer's hardware.

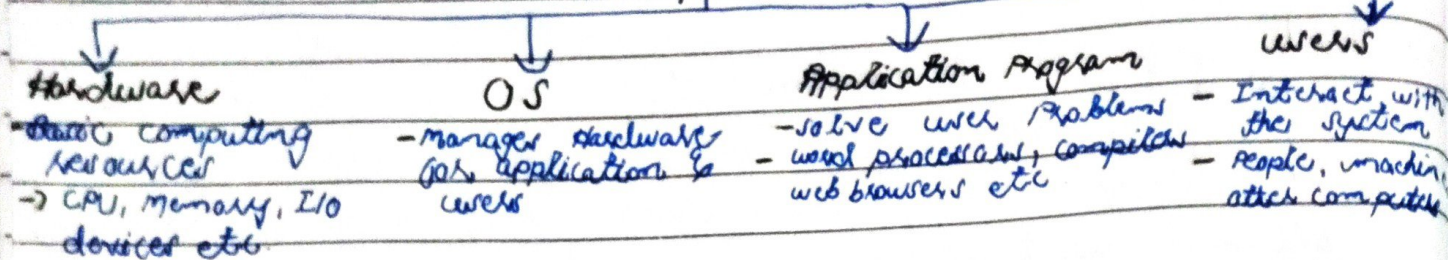→ It manages computer's hardware and software resources, allowing application programs to run on on top of it

→ **Objectives of OS**

(i) **convenience :-** make the computer convenient to use

(ii) **Efficiency :-** Allows computer resources to be used in an efficient manner.

(iii) **Ability to evolve :-** Due to Hardware upgrades

- For incorporating new features / enhancements

- Fixes for bugs and errors.

Computer System Architecture

user₁   user₂   user₃   . . . .   user_n

system and application programs

operating system

computer Hardware

Computer system

Hardware	OS	Application program	users
-basic computing resources	-manages hardware for application & users	-solve user problems	-Interact with the system
→ CPU, memory, I/o devices etc		-word processors, compiler web browsers etc	-People, machine other computers

⇒ what does OS do ?

Operating system perform basic tasks such as :

① Input recognition (keyboard, mouse, etc)
② Output display (screen, printer, etc)
③ File and directory management (storage drives)
④ Peripheral device control (printers, scanners, etc)

→ for large system, the OS has additional responsibilitie

① multitasking management (preventing program interference)
② security management (protecting against unauthorized acces)

→ The traffic cop analogy is a good way to describe the OS's role in managing multiple users and programs simultaneously!

Roles of an OS

① user Interface
★ Provides a interface b/w hardware and user
★ Offers services like :
- Program development (editors, debuggers, etc)
- Program execution
- Access to I/o devices
- controlled file system access
- Error detection and reporting
- Job accounting

② Resource manager
★ Manages and allocates system resources (Processors,

memories, I/O devices).
* Responsible for:
- Tracking resource usage
- Granting resource requests
- Mediating conflicting requests from programs.
- Protecting resources and data in shared systems.

Kernel

- core of operating system.
- complete control over system resources.
- critical code loaded into protected memory.
- consists of frequently used functions
- Also known as the nucleus.

Modes of operations

(i) Kernel mode
- unrestricted access to hardware
- can execute any CPU instruction and reference any memory address.
- Reserved for low-level, trusted O.S functions.

(ii) User mode
- No direct access to hardware or memory
- Must use system API's to access hardware or memory.
- crashes are recoverable due to isolation
- most code runs in user mode.

=> Important functions/services Elaborated of OS

④ Memory Management
- Tracks primary memory usage
- Allocates and deallocates memory for processes
- manages multiprogramming and memory requests

② Processor Management (Process scheduling)
- Tracks processor status and process status.
- Allocates and deallocates processor time for processes
- Manages process scheduling in multiprogramming environment

③ Device management
- Tracks device usage and availability.
- Allocates and deallocates devices for processes.
- Manage device communication via drivers.

④ File management
- Tracks file information, location, usage and status.
- Manages file system and directories
- Allocates and deallocates file resources

=) Other Important services:
- Security: Prevents unauthorized access via passwords and techniques.
- System Performance Control: Monitors system performance and response times.
- Job Accounting: Tracks time and resources used by jobs and users.
- Error Detecting Aids: Provides debugging tools and error messages.
- Coordination:- Manages software assignments and user coordination