Dr. RamManohar Lohia Avadh University, Ayodhya U.P.

Study and Evaluation Scheme

MCA (Master of Computer Applications)

(Effective From Session 2020-21)

Year – I Semester – I

MCA 104 – OPERATING SYSTEMS

Course Details

- **Paper No.: IV**
- **Course Code: MCA 104**
- **Course Title: OPERATING SYSTEMS (Theory)**
- **Marks Distribution: Internal = 50, External = 100, Total = 150**

🎯 **Goal**

Provide thorough knowledge of major functions of operating systems.

Outcomes:

- Explain OS structure and functions
- Implement process scheduling and synchronization
- Apply memory management techniques
- Illustrate file systems and disk I/O techniques

Objectives:

- Learn structure and functions of OS
- Understand process scheduling and deadlock handling
- Learn memory and device management
- Learn I/O management and file system organization

UNIT I — Introduction to Operating Systems

- Definition and types of OS: Batch, Multiprogramming, Time-sharing, Parallel, Distributed, Real-time
- OS structure, Components and Services
- System calls, System programs, Virtual machines

UNIT II — Process Management

- Process concept, Process scheduling, Cooperating processes
- Threads, Interprocess communication
- CPU scheduling: Criteria & Algorithms
- Multiprocessor & Real-time scheduling
- Algorithm evaluation

UNIT III — Process Synchronization & Deadlocks

- Critical-section problem, Synchronization hardware
- Semaphores, Classical problems of synchronization
- Critical regions, Monitors
- Deadlock: System model, Characterization
- Deadlock handling: Prevention, Avoidance, Detection, Recovery
- Combined approaches

UNIT IV — Memory & Storage Management

- Memory management: Logical & Physical address space, Swapping
- Contiguous allocation, Paging, Segmentation (MULTICS, Intel 386)
- Virtual memory: Demand paging, Page replacement, Allocation of frames, Thrashing
- Demand segmentation
- File systems: Concepts, Access methods, Directory implementation, Efficiency, Recovery
- Disk structure, Disk scheduling methods, Disk management, Swap-space management, Disk reliability

UNIT V — Security & Case Studies

- Protection & Security: Goals, Domain, Access matrix, Implementation, Revocation, Language-based protection
- Security: Authentication, One-time passwords, Program/System threats, Threat monitoring, Encryption
- Case Studies:
    - **Windows NT:** Design principles, System components, File system, Networking, Program interface
    - **Linux:** Design principles, Kernel modules, Process & Memory management, File systems, I/O, IPC, Network structure, Security