RAMAKRISHNA MISSION VIDYAMANDIRA

NEP Syllabus B.Sc. Computer Science Honours

Semester-IV

Course Code: 4CMSMJC2
Course Type: Major Course

Course Outcome:

i) To understand the theory behind operating systems.
ii) To be able to understand various process activities in a system through system software.
iii) Evaluate and optimize operating systems performance using algorithms for CPU scheduling, disk I/O and memory management.
iv) To understand the correlation between software and hardware resources of a computer.
v) To be able to write system programs, interrupt handler on the RTOS platform.
vi) Apply operating system principles to solve real world problems and analyze tradeoffs in different designs.

4CMSMJC2: Operating Systems

Credit: 3 **Marks: 50**

Operating Systems: Introduction to OS; User mode, Kernel mode, Mode Switching, Multiprogramming, Multitasking OS, Concepts of processes, Files, Shell,
System Calls; Structures: Monolithic, Layered, Virtual, Client Server and Distributed Model. [7 L]

Process Management: Basic Concepts; Preemptive And Non-Preemptive Scheduling; Scheduling Criteria; FCFS, SJF, SRTF, Priority, Round Robin, Multilevel Feedback Queue Scheduling Algorithms; Gantt Chart Representation of Scheduling, Calculation of Waiting and Turnaround Time. [8 L]

Concepts of Synchronization: Inter Process Communication Mechanism; Concurrent Processing; Critical Section Problem and Solution; Semaphores; Monitors; Classical Problem of Synchronization (Bounded Buffer, Reader Writer, Dining Philosopher) and Semaphore Solution; Monitors. [6 L]

Deadlock: System Model, Necessary Conditions; Resource Allocation Graph; Deadlock Prevention; Deadlock Avoidance, Safe State, Resource Allocation Graph Algorithm, Banker's Algorithm; Deadlock Detection; Recovery from Deadlock. [3 L]

Memory Management: Concepts Address Binding; Logical and Physical Address Space; Overlays, Swapping; Contiguous Memory Allocation Concepts, Fragmentation and Compaction; Basic Method of Paging and H/W Support, Memory Protection, Structure of Page Table, Shared Pages; Segmentation, Segmentation with Paging. [8 L]

Virtual Memory: Concepts of Virtual Memory; Demand Paging; Page Replacement Basic Schemes: FIFO, Optimal, LRU Page Replacement Techniques, Belady's Anomaly; LRU Approximation, Global and Local Allocation of Frames; Thrashing; [5 L]

I/O and File System Management: Device and Device Controllers, Interrupt Handlers and Device drivers, Disk scheduling strategies. Files and Directories, File Servers, Security and Protection. [3 L]

Introduction to Real Time OS (RTOS): Characteristics, Modelling Timing Constraints, RTOS Scheduling: Table Driven Scheduler, Cyclic Scheduler, EDF, RMA. [5 L]

4CMSMJC2 (Practical): Operating Systems Laboratory

Credit: 1 **Marks: 25**

Basics of System Administration using Linux: Installation, User management, Repository, Package installation and un-installation;

Introduction to UNIX Shells, commands, shell programming, shell variables, pipes and filters; UNIX Shell Programming

System programming using basic systems calls, Interrupt handling in RTOS.

Implementation of process scheduling algorithms using C.

[30 L]

Recommended Books:

1. Operating System Concepts by A. Silberschatz, Peter B. Galvin, G. Gagne; 9th Edition; John Wiley & Sons.
2. Modern Operating System by Andrew S. Tanenbaum; 3rd Edition; Pearson.
3. Real-Time Systems: Theory and Practice by Rajib Mall; Pearson.
4. Operating System by Deitel, Deitel, Choffnes; 3rd Edition; Pearson.
5. Operating Systems-Internals and Design Principles by Stallings; 9th Edition; Pearson.
6. Systems Programming & Operating Systems by Dhamdhere; 2nd Edition; TMH.
7. Unix concepts and Applications by Sumitava Das, 4th Edition, McGraw Hill.

8. The Design of the UNIX Operating System by Maurice J. Bach, 1st Edition, PHI Learning.
9. Linux System Programming by Robert Love, 2nd Edition, O'Reilly.