Operating Systems with Linux

Course Code: **MCA 105** **L T C**

Course Name: **Operating Systems with Linux** **3 1 4**

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. There should be 10 questions of short answer type of 2.5 marks each, having at least 2 questions from each unit.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions to evaluate analytical/technical skills of candidate. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks, including its subparts, if any.
3. Examiners are requested to go through the Course Outcomes (CO) of this course and prepare the question paper accordingly, using Bloom's Taxonomy (BT), in such a way that every question be mapped to some or other CO and all the questions, put together, must be able to achieve the mapping to all the CO(s), in balanced way.

LEARNING OBJECTIVES:

In this course, the learners will be able to develop expertise related to the following:-

1. Understand the basic components of Operating Systems and their interactions.
2. Select the policies for Process Management, Memory Management and Deadlock Management.
3. Understand the basics of File, Device and Disk Storage Management.

PRE-REQUISITES:

1. Fundamentals of Computer Systems
2. Introduction to Programming

For basic understanding of computer systems and programming, the students are advised to study the courses/material available on following websites:

- Pre-requisite based Study Material available on Course Website (www.bvicam.in)
- Spoken Tutorial on C and C++ Programming (https://spoken-tutorial.org/tutorial-search/?search_foss=C+and+Cpp&search_language=English-USA)

COURSE OUTCOMES:

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO	BT Level	Mapping to PO #
CO1	Explain the structure and functions of operating systems along with their components, types and working.	BTL2	PO1, PO2, PO5, PO6
CO2	Make use of appropriate Linux commands for memory management, file management and directory management.	BTL3	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Analyze the performance of different scheduling algorithms along with the policies for concurrency and deadlock management.	BTL4	PO1, PO2, PO3, PO4, PO5, PO6 PO7, PO8, PO9
CO4	Elaborate the system calls for process management and file management.	BTL6	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9

SYLLABUS:

UNIT - I

No. of Hours: 11 **Chapter/Book Reference:** TB1 [Chapter 1, 2, 3]; TB2 [Chapter 2, 3]; TB4 [Chapter 1]

Operating System: Concept, Components of Operating System, Operating System Operations, Protection and Security. Computing Environment. **Abstract View of OS**: User view, System View, Operating System Services, **System Calls**: Concept, Types of System Calls.

Computer System Architecture: Single-Processor Systems, Multiprocessor Systems. **Types of Operating Systems**: Batch Operating System, Multi-Programmed Operating System, Time-Shared Operating System, Real Time Operating System, Distributed Operating Systems.

Process Management: Process Concept, Operation on Processes, Cooperating Processes, Inter-Process Communication, Threads.

Linux Operating System: Introduction to Linux OS, Basic Commands of Linux OS.

UNIT - II

No. of Hours: 11 **Chapter/Book Reference:** TB1 [Chapter 5, 6]; TB2 [Chapter 9]; TB3 [Chapter-7, 15]

Process Synchronization: Introduction, The Critical-Section Problem with solution, Bakery Algorithm, Synchronization hardware, Semaphores, Semaphores Implementation, Classical Problems of Synchronization with algorithms, Critical Regions, Monitors.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling algorithms, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling.

Linux Operating System: Process Management Commands and System Calls.

UNIT - III

No. of Hours: 12 **Chapter/Book Reference:** TB1 [Chapter 7, 8, 9]; TB3 [Chapter 15]

Deadlock: System Models, Deadlock Characterization, Resource Allocation Graph, Deadlock Prevention, Avoidance, Detection and Recovery, Banker's algorithm.

Memory Management: Main Memory: Contiguous Memory Allocation, Fragmentation, Paging, And Segmentation. Virtual Memory: Demand Paging, Page Replacement, Page replacement algorithm, Allocation of frames, Thrashing.

Linux Operating System: Memory Management Commands and System Calls.

UNIT - IV

No. of Hours: 10 **Chapter/Book Reference:** TB1[Chapter 9, 10, 11, 12]; TB2 [Chapter 5, 11]; TB3[Chapter 3, 7]

File, Devices and Secondary Storage Management: **File-System Interface**: Concepts, Access Methods, Directory and Disk Structure. File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Devices: Types of devices, Channels and Control Unit, Multiple Paths, Block Multiplexing.

Secondary Storage: Mass-Storage Structure, Disk Structure, Disk Scheduling Algorithms, Disk Management, RAID structure of disk.

Linux Operating System: File Management Commands and System Calls.

TEXT BOOKS:

TB1. Silberschatz, Galvin, Greg, "Operating System Concepts", Wiley and Sons, 9th Edition, 2015.

TB2. Sumitabha Das, "Unix concept and Programming", McGraw Hill education, 4th Edition, 2015.

TB3. W. Richard Stevens Stephen A. Rago" Advanced Programming in the UNIX® Environment", Addison-Wesley, 3rd Edition, 2013.

TB4. Milan Milenkovic, "Operating Systems Concepts and Design", Tata McGraw-Hill, 2nd Edition, 1995.

REFERENCE BOOKS:

RB1. Godbole, Achyut, "Operating System", McGraw-Hill Education, 2nd Edition, 2005.

RB2. William Stallings, "Operating System: Internals and Design Principles", Person, 9th Edition, 2018.

RB3. A. S. Tanenbaum, "Modern Operating Systems ", Pearson, 3rd Edition, 2007.

RB4. Kenneth H. Rosenet al, "UNIX: The Complete Reference", McGraw-Hill/Osborne, 6th Edition, 2017.

RB5. Dhanjay M. Dhamdhere, "Operating System A concept based approach", Tata McGraw-Hill, 2nd Edition, 2006.

RB6. Madnick E. and Donovan J., "Operating Systems", Tata McGraw Hill, 2001.

Operating Systems with Linux Lab.

Course Code: **MCA 163** **L T/P C**

Course Name: **Operating Systems with Linux Lab.** **0 2 1**

LEARNING OBJECTIVES:

In this course, the learners will be able to develop the working expertise of the following:-

1. Perform Linux Operating System Installation.
2. Implement the policies of Process Management, Inter process communication and Memory Management.
3. Apply the basics of File Management, Device and Disk Storage Management.

COURSE OUTCOMES:

After completion of this course, the learners will be able to:-

CO #	Detailed Statement of the CO	BT Level	Mapping to PO #
CO1	Build the Linux operating system and configure it.	BTL3	PO1, PO2, PO3, PO4, PO5
CO2	Discover Linux commands for working with Linux Environment.	BTL4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
CO3	Appraise the Process Management algorithms, Process Management system calls, Inter Process Communication and CPU Scheduling algorithms.	BTL5	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO9, PO10
CO4	Create programs using systems calls for memory management and File Management in C programming, also simulate Deadlock avoidance algorithm using C.	BTL6	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12