



University of Engineering & Management, Kolkata
University of Engineering & Management, Jaipur
Institute of Engineering & Management, Kolkata
Department of Computer Science

DETAILED SYLLABUS

Course Code- PCCCS503

Course Title –Operating Systems

Credit – 3

Category – Professional Core Course

Semester – V

L:T:P:S – 3:0:0:0

Pre-requisite – Basic knowledge of Data Structures and Computer Organization.

Course Outcomes:

CO1	Students will be able to understand the different services provided by Operating System and different scheduling algorithms at different level.
CO2	Students will be able to learn synchronization techniques to avoid deadlock.
CO3	Students will acquire a knowledge about different memory management techniques like paging, segmentation and demand paging etc.

CO4	Students will have a comprehensive understanding of I/O hardware and software principles, secondary-storage structures, file management, and disk management.
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Study Material	Coursera	NPTEL	LinkedIn Learning	Infosys Springboard
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Module No.	Topic	Sub-topics	Mapping with Industry and International Academia	Lecture Hours	Corresponding Lab Assignments	Textbook Mapping
1	Introduction	Generations & Concept of Operating Systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System. Processes: Definition, Process Relationship, Different states of a Process, Process State Transitions, Process Control Block (PCB), Context switching. Thread: Definition, Various states, Benefits of	International Academia: https://online.stanford.edu/courses/cs111-operating-systems-principles AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping <i>Linux, OSSim</i>	10	1. System program assignment using basic linux commands (cd, pwd, mkdir, ls, cp, mv, wc etc.), meta characters, grep commands, regular expression parameters, modifying file access privileges and string manipulation. 2. WAP to implement FCFS, preemptive and	Text Book 1: Chapters: 1, 2, 3, 4 and 5. Text Book 2: Chapters: 1, 2, 3 and 4.

		threads, Types of threads, Concept of multithreads. Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority. Multiprocessor scheduling.			non-preemptive SJF, Round Robin, preemptive and non-preemptive Priority scheduling algorithm (in programming language of your choice). 3. Simulate the above-mentioned scheduling algorithms using OSSim.	
2	Inter process Communication	Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Producer Consumer Problem, Dining Philosopher Problem.	International Academia: https://online.stanford.edu/courses/cs111-operating-systems-principles <i>AICTE-prescribed syllabus:</i> https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping	10	1. Create a program with two threads that increment and decrement a shared variable using semaphores to ensure proper synchronization. 2. Implement a solution to the classic producer consumer problem using semaphores. 3.	Text Book 1: Chapters: 6 and 7. Text Book 2: Chapters: 5 and 6.

		Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	<i>OSSim</i>		Simulate Banker's Algorithm using SimOS.	
3	Memory Management	Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation— Fixed and variable partition— Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation Disadvantages of paging. Virtual Memory: Basics of Virtual Memory –Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not Recently used (NRU) and Least Recently used (LRU).	<i>OSSim</i> International Academia: https://online.stanford.edu/courses/cs111-operating-systems-principles AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping <i>OSSim</i>	10	1. Compare and contrast different memory allocation algorithms such as first-fit, best-fit, and worst-fit. Implement these algorithms and evaluate their performance in terms of fragmentation, throughput, and average waiting time for allocation requests using OSSim.	Text Book 1: Chapters: 8 and 9. Text Book 2: Chapters: 7 and 8.

4	I/O Hardware, File and Disk Management	I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software Disk Management: Disk structure, Disk scheduling: FCFS, SSTF, SCAN, C SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks	International Academia: https://online.stanford.edu/courses/cs111-operating-systems-principles AICTE-prescribed syllabus: https://www.aicte-india.org/sites/default/files/Model_Curriculum/AICTE%20-%20UG%20CSE.pdf Industry Mapping OSSim	6	1. Simulate the Disk scheduling algorithms using OSSim. 2. Design and implement a bootstrap loader for a simple operating system.	Text Book 1: Chapters: 11, 12 and 13. Text Book 2: Chapters: 11 and 12.
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Textbooks:

1. Operating System Concepts Essentials, 9th Edition by Abraham Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Reference books:

1. Operating System Concepts, Ekta Walia, Khanna Publishing House (AICTE Recommended Textbook – 2018).
2. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing.