

**Maulana Abul Kalam Azad University of Technology, West Bengal**  
**(Formerly West Bengal University of Technology)**  
**Syllabus for B. Tech in CSE (Artificial Intelligence and Machine Learning)**  
**(Applicable from the academic session 2020-2021)**

**Operating Systems**  
**Code: PCC- CS502**  
**Contacts: 3L**

Name of the Subject:		<b>Operating Systems</b>		
Course Code: PCC-CS502		Semester: V		
Duration: 6 months		Maximum Marks:100		
<b>Teaching Scheme</b>		<b>Examination Scheme</b>		
Theory:3 hrs./week		Mid Semester exam: 15		
Tutorial: NIL		Assignment and Quiz: 10 marks		
		Attendance : 5 marks		
Practical: hrs./week		End Semester Exam :70 Marks		
Credit Points:		3		
Unit	Content	Hrs/Unit	Marks/Unit	
1	<b>Introduction:</b> Concept of Operating Systems, Generations of Operating systems, Types of	3		
	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.			
2	<b>Processes:</b> Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching <b>Thread:</b> Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, <b>Process Scheduling:</b> 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; Multiprocessor scheduling: Real Time scheduling: RM and EDF.	10		
3.	<b>Inter-process Communication:</b> 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, Dining Philosopher Problem etc.	5		
4.	<b>Deadlocks:</b> Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	5		

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5.	<p><b>Memory Management:</b> 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 Hardware support for paging, Protection and sharing, Disadvantages of paging.</p> <p><b>Virtual Memory:</b> Basics of Virtual Memory – Hardware and control structures – 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).</p>	8	
6.	<p>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, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms</p> <p>File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.</p> <p>Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks</p>	6	

**Text book and Reference books:**

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia StudentEdition.
2. Operating Systems: Internals and Design Principles, 5th Edition,William Stallings, Prentice Hall of India.
3. Operating System Concepts, Ekta Walia, Khanna PublishingHouse (AICTE Recommended Textbook – 2018)
4. Operating System: A Design-oriented Approach, 1st Edition byCharles Crowley, Irwin Publishing
5. Operating Systems: A Modern Perspective, 2<sup>nd</sup> Edition by Gary J. Nutt,Addison- Wesley
6. Design of the Unix Operating Systems, 8<sup>th</sup> Edition by MauriceBach, Prentice-Hall of India
7. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet,Marco Cesati, O'Reilly and Associates