COURSE HANDOUT

OPERATING SYSTEM (COM-302)

B.E.-3RD SEMESTER

ACADEMIC YEAR (2024-25)

Dr. Bhagyalakshmi

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
COM-302	Operating System	PCC	**4**	**3**	**1**	0	50	100	150

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Demonstrate understanding of the concepts, structure and design of operating systems
CO2	Articulate the general architecture of modern computer operating systems including its impact on application design and performance
CO3	Understand and analyze complex design choices and implementation details of: processes, resource control with concurrency, physical and virtual memory, scheduling, I/O and files.
CO4	Develop understanding of inter-process communication and synchronization mechanisms.
CO5	Analyze the interplay and conflicts in resource usage in a multi-user, multi-tasking environment with an understanding of the trade-offs involved.

Unit 1: Introduction Concepts: Operating System functions and characteristics, Historical evolution of O.S., O.S. Services, User O.S. Interface, Computer System Architecture, O.S. Design, Implementation and structure, System calls, System Programs, Virtual Machines, Spooling. (4 Hrs)

Unit 2: Process Management: Study of state models, process Scheduling, Job Scheduling, Scheduling Criteria, Scheduling Algorithms, Multiple Process Scheduling. (6 Hrs)

Unit 3: Process Coordination: Synchronization: Race-Conditions, critical–Section problems, semaphores, Bounded-Buffer Problem, Readers-writers Problem, Dining –Philosophers Problem.
Deadlocks: Characteristics, Deadlock Prevention, Avoidance, Detection and Recovery. (12 Hrs)

Unit 4: Memory Management: Logical and Physical Address space, Contiguous and Non-Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Demand paged memory management, Page replacement, Allocation of Frames, Thrashing, Swapping and Overlays, Cache Memory. (12 Hrs)

Unit 5: File Systems and Disk Storage: Files: file concept, file structure, types, access methods, directory structure, allocation methods (contiguous, linked, and indexed), free-space management (bit vector, linked list, grouping), Disk Structure, Disk Scheduling, Disk Management, Disk Formatting, Swap Space Management, RAID Structure. (6 Hrs)

Text Books

S.No.	Name of the Books	Author	Publisher Name	Edition (Pub. yr.)
1	Operating System Concepts	Abraham Silberschatz, Peter B. Galvin, Gerg Gagne	Wiley	9th (2015)

Reference Books

S.No.	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Operating System Design and Implementation	Andrew S. Tanenbaum	Pearson	3rd (2007)
2	Operating Systems: Internals and Design Principles	William Stallings	McGraw Hill	1st (2019)
3	Operating System	H.M.Deitel	Pearson Education	3rd (2006)
4	Schaum's Outline of Operating Systems	J. Archer Harris	Pearson Education	9th (2018)

COURSE PLAN		
Unit-I Introduction Concepts		
S.No	**Topics**	**Recommended Books**
1	Operating system functions and characteristics	Book 1, Ch.1, Book 2 Ch.1
2	Historical Evolution of operating systems	Book 1, Ch.1, Book 2 Ch.1
3	Important OS Concepts	Book 1, Ch.1, Book 2 Ch.1
4	OS Implementation Architectures	Book 1, Ch.1, Book 2 Ch.1
5	System calls, system programs	Book 1, Ch.2, Book 2 Ch.1
6	Virtual Machines and Spooling	Book 1, Ch.1, Book 2 Ch.1
Unit-II Process Management		
7	Study of state models	Book 1, Ch.5, Book 3 Ch.8

8	Process scheduling	Book 2 Ch. 2, Book 3 Ch.8
9	Job scheduling	Book 1, Ch.4, Book 3 Ch.8
10	Scheduling criteria and algorithms	Book 1, Ch.5, Book 3 Ch.8
11	Multiple process scheduling	Book 1, Ch.5, Book 3 Ch.8
12	Introduction to Scheduling Algorithms	Book 2, Ch 2, Book 3 Ch 8
13	FCFS (First-Come, First-Served)	Book 1, Ch.5, Book 3 Ch.8
14	SJN/SJF and its examples	Book 1, Ch.5, Book 3 Ch.8
15	Round Robin (RR)	Book 1, Ch.5, Book 3 Ch.8
Unit- III Process Coordination		
16	Synchronization: Race conditions	Book 1, Ch.6, Book 2 Ch.2
17	Critical section problems	Book 1, Ch.6, Book 2 Ch.2
18	Producer Consumer Problem, Semaphores	Book 1, Ch.6, Book 2 Ch.2
19	Bounded-buffer problem	Book 1, Ch.6, Book 2 Ch.2
20	Readers-writers problem	Book 1, Ch.6, Book 2 Ch.2
21	Dinning-philosophers problem	Book 1, Ch 6, Book 2 Ch.2
Unit-IV Memory Management		
22	Deadlock characteristics	Book 1, Ch.7, Book 3 Ch.9
23	Deadlock prevention	Book 1, Ch.7, Book 3 Ch.9
24	Deadlock avoidance	Book 1, Ch.7, Book 3 Ch.9
25	Deadlock detection and recovery	Book 1, Ch.7, Book 3 Ch.9
26	Logical and physical address space	Book 1, Ch.7, Book 3 Ch.9
27	Contiguous & non-contiguous memory allocation	Book 1, Ch.8, Book 3 Ch.9
28	Paging & structure of page table	Book 1, Ch.8, Book 3 Ch.10
29	Segmentation	Book 1, Ch.9, Book 3 Ch.10
30	Demand-paged memory management	Book 1, Ch.9, Book 3 Ch.10

31	Page replacement	Book 1, Ch.9, Book 3 Ch.11
32	Thrashing, swapping and overlays	Book 1, Ch.9, Book 3 Ch.11
33	Cache memory	Book 1, Ch 1, Book 3 Ch.11
Unit-V File System & Disk storage		
34	Introduction to files: concept and structure	Book 2, Ch 1, Book 2 Ch.4
35	File types, access methods & directory structure	Book 2, Ch 1, Book 2 Ch.4
36	Allocation methods	Book 1, Ch.9, Book 2 Ch.4
37	Free space management	Book 1, Ch.11, Book 2 Ch.4
38	Disk structure, scheduling, management and formatting	Book 1, Ch.12, Book 2 Ch.4
39	Swap space management	Book 1, Ch.12, Book 2 Ch.4
40	RAID structure	Book 1, Ch.12, Book 2 Ch.4

ADDITIONAL WEB RESOURCES

1.	**NPTEL** – Operating Systems by Prof. Sorav Bansal (IIT Delhi) https://nptel.ac.in/courses/106/102/106102132/

GRADING AND ASSESSMENT

- **Sessional Test**: 20 marks
- **Assignment**: 20 marks
- **Attendance**: 10 marks
- **Final Examination**: 100 marks

COURSE POLICIES

- **Attendance**: Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity**: MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions**: Assignments and projects must be submitted by the specified timelines.

FACULTY INFORMATION

- **Office Hours**

  Monday (12:55 PM – 1:45 PM)
  Wednesday (12:55 PM – 1:45 PM)

- **Contact Information**

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