

15. Write a SQL query to find the average salary of all employees.
16. How do you use the LIKE operator in SQL? Provide an example.
17. Write a SQL query to retrieve the names of all employees whose names start with the letter 'A.'
18. Explain the concept of indexes in SQL databases.
19. Write a SQL query to find the maximum and minimum salary from the "Employees" table.
20. How do you use the BETWEEN operator in SQL? Provide an example.

Based on the curriculum as covered by the subject teacher

SUGGESTED READING:

1. "Database Management Systems" by Raghu Ramakrishnan, Johannes Gehrke - Publisher: McGraw-Hill Education
2. "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, S. Sudarshan - Publisher: McGraw-Hill Education
3. "Fundamentals of Database Systems" by Ramez Elmasri, Shamkant B. Navathe - Publisher: Pearson
4. "Database Management Systems: Designing and Building Business Applications" by Gerald V. Post - Publisher: Wiley
5. "Database Systems: The Complete Book" by Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom - Publisher: Pearson
6. "Principles of Database Management" by Wilfred Hansen - Publisher: Cengage Learning
7. "Database Management Systems" by Ivan Bayross - Publisher: BPB Publications

SUBJECT NAME: Operating System
SUBJECT CODE: BCAC402

Credit: 4 L (3L +1 T)

COURSE OBJECTIVE:

The course on Operating Systems is designed to provide students with a comprehensive understanding of the fundamental principles and functionalities underlying modern computer operating systems. Throughout the course, students will explore key concepts such as process management, memory management, file systems, and I/O management. They will learn about the role of the operating system in resource allocation, scheduling, and synchronization, gaining insights into how these mechanisms contribute to efficient and reliable system operation.

COURSE OUTCOME	
CO1	Understand the fundamental concepts and functionalities of operating systems, including process management, memory management, file systems, and I/O management.
CO2	Analyze and compare different types of operating systems, such as batch processing systems, time-sharing systems, real-time systems, and distributed systems, in terms of their design principles, advantages, and limitations.
CO3	Evaluate different I/O management strategies, including buffering, caching, and device drivers, to optimize the performance and reliability of I/O operations in the operating system.
CO4	Apply memory management techniques, such as paging, segmentation, and virtual memory, to efficiently utilize the system's memory resources and provide a logical abstraction of memory to processes.
CO5	Collaborate effectively in teams to analyze, design, and implement operating system components and solutions for real-world scenarios, demonstrating effective communication and problem-solving skills.

DETAILED SYLLABUS:

Module No:	NAME OF THE TOPIC	HOURS	L	T	MARKS
M1	Computer H/w review (Processors, Memory, devices, I/O bus), Operating system Basic concepts, Architecture of OS, Introduction of Different types of Operating System(Mainframe, server side OS Multiprocessor OS, Embedded OS, Real Time OS, Sensor node OS, Smart card OS), Virtualization, Free and Open Source Operating System	3	2	1	5
M2	Operating System Architecture (Monolithic System, Layered System, Microkernel, client Server model, System Calls, Linker and Loader, Booting of an Operating System	2	1	1	5
M3	Process Management: Process, Process State Diagram, Process Control Block, Process Scheduling criteria, Process scheduling algorithms, Types of schedulers, threads, types of thread, Thread Scheduling, Inter Process Communication , Race Condition, Critical region, use of Semaphore, mutex, and monitor, Classical problems on Synchronization	18	14	4	18

M4	Deadlock: Deadlock Characterization, Methods of handling Deadlock, Deadlock prevention and avoidance, deadlock detection and Recovery from deadlock	4	3	1	8
M5	Memory Management: Continuous Memory Allocation, Paging, Swapping, Virtual memory: Paging, Page table Structure, Page Table for large memory, Page replacement Algorithms, page Size, Page Fault Handling, Segmentation	14	10	4	15
M6	File management: File naming, File structures, File Types, Single Level and Hierarchical OS, Shared file, Disk managent and related algorithms	4	3	1	8
M7	Security and Protection: security Threats and Attackers, Controlling Access to Resources (Protection Domain, access Control List,) Exploiting Software (Buffer overflow attack, Integer Overflow attack, Dangling Pointer, Null Pointer Dereference Attack), Malware (Worm, virus and Trojan)	8	6	2	6
M8	Distributed Operating System: Goal of Distributed OS, Remoter Procedure call, Name resolution, Clock Synchronization	4	3	1	5
	INTERNAL EXAMINATION	3			30
	TOTAL	60	42	15	100

SUGGESTED READING:

1. "Operating System Concepts" by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne - Publisher: Wiley
2. "Modern Operating Systems" by Andrew S. Tanenbaum, Herbert Bos - Publisher: Pearson
3. "Operating Systems: Internals and Design Principles" by William Stallings - Publisher: Pearson
4. "Operating System Design and Implementation" by Andrew S. Tanenbaum, Albert S. Woodhull - Publisher: Pearson
5. "Operating Systems: Principles and Practice" by Thomas Anderson, Michael Dahlin - Publisher: Recursive Books
6. "Operating Systems: Three Easy Pieces" by Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau - Publisher: Arpaci-Dusseau Books
7. "Modern Operating Systems: Global Edition" by Andrew S. Tanenbaum, Herbert Bos - Publisher: Pearson