Uka Tarsadia University

B. Tech.

Semester IV

OPERATING SYSTEM

CE4016

EFFECTIVE FROM July-2022

Syllabus version: 1.00

Subject Code	Subject Title	Teaching Scheme			
		Hours		Credits	
		Theory	Practical	Theory	Practical
CE4016	Operating System	3	-	3	-

Subject Code	Subject Title	Theory Examination Marks		Practical Examination Marks	Total Marks
		Internal	External	CIE	
CE4016	Operating System	40	60	-	100

Objectives of the course:

- To impart fundamental understanding of the purpose, structure, and functions of operating system.
- To illustrate the design issues of operating systems and its solutions.
- To understand various Memory, I/O and File management techniques.

Course outcomes:

Upon completion of the course, the student shall be able to

CO1: Understand the foundation of operating system and its components.

CO2: Understand the concepts of process, threads, and scheduling and apply process management.

CO3: Understand and apply process synchronization and deadlock prevention.

CO4: Analyze several memory management techniques and evaluate performance of memory allocation and replacement policies.

CO5: Describe mass storage and I/O management.

CO6: Describe concepts of file management.

Sr. No.	Topics	Hours
	Unit – I	
1	**Introduction of Operating System and Structures:** Tasks of operating system, Computer system organization, Computer system architecture, Operating system structure, Operating system operations, Process management, Memory management, Storage management, Protection and Security, Distributed systems, Special purpose systems, Computing environment, Open – source operating system, Operating system services, User operating system interface, System calls, Types of system calls, Kernel – Layered, Monolithic and Microkernel.	6
	Unit –II	

2	**Process Management:** **Process:** Process concept, Process scheduling, Operations on processes, Inter – process communication, Communication in Client–Server systems. **Threads:** Types of threads, Concept of multithreading, Multi core processors and threads, Multithreading models, Threading issues. **Scheduling:** Introduction to scheduling, Scheduling criteria, Scheduling algorithms, Multiple process scheduling, Thread scheduling, Real-time CPU scheduling.	12
	Unit – III	
3	**Process Synchronization**: Overview, The critical–section problem, Peterson's solution, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization – The bounded buffer problem, The readers–writers problem, The Dining-philosophers' problem, Monitors. **Deadlocks**: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Banker's algorithm, Deadlock detection, Dining Philosopher's Problem, Recovery from deadlock.	12
	Unit – IV	
4	**Memory Management:** Introduction to memory management, Memory management requirements, Memory partitioning, Fixed partitioning, Dynamic partitioning, Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation. **Virtual memory management**: Introduction to virtual memory management, Demand paging, Copy–on–write, Page replacement, Allocation of frames, Thrashing, Memory–mapped files, Allocating kernel memory.	12
	Unit – V	
5	**Mass Storage:** Mass storage structure, Disk structure, Disk attachment, Disk scheduling, Disk management, Swap-space management, RAID structure. **I/O System:** I/O hardware, Application I/O interface, Kernel I/O subsystem management, Transforming I/O requests to hardware operations, Streams, Linux I/O.	12
	Unit – VI	
6	**File Management:** File system, File concept, Access methods, Directory structure, File system mounting, File sharing, Implementing file system, File system structure, File system implementation, Directory implementation, Allocation methods, Free space management, Recovery.	6

Text book:

1. Abraham Silberschatz, Peter B Galvin and Gerg Gagne– "Operating System Concepts"– 9th Edition, Wiley.

Reference books:

1. Andrew S. Tanenbaum – "Modern Operating Systems", Pearson.
2. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014.
3. Dhamdhere D. M. – "Operating Systems", TMH.
4. Behrouz A. Forouzan and Richard F. Gilberg – "UNIX and Shell Programming".
5. Sumitabha Das – "UNIX Concepts and Applications", TMH.
6. Sumithradevi K. A. and Banashree N. P. – "Operating Systems", SPD.
7. K. J. George – "Operating System Concepts and Principles", SPD.
8. Halder S. and Aravind A. – "Operating Systems", Pearson.

Course objectives and Course outcomes mapping:

- To impart fundamental understanding of the purpose, structure, and functions of operating system:C01, CO2.
- To illustrate the design issues of operating systems and its solutions:CO1, CO3.
- To understand various Memory, I/O and File management techniques:CO4, CO5, C06.

Course units and Course outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Introduction of Operating System and Structures	✓					
2	Process Management		✓				
3	Process Synchronization& Deadlock			✓			
4	Memory Management and Virtual Memory Management				✓		
5	Mass Storage and I/O Management					✓	
6	File management						✓

Programme outcomes:

PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.

PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.

PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.

PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.

PO 5: Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.

PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.

PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.

PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

PO 11: Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: A recognition of the need for, and an ability to engage in life-long learning

Programme outcomes and Course outcomes mapping:

Programme Outcomes	Course Outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1	✓	✓	✓	✓	✓	✓
PO2		✓		✓	✓	
PO3	✓				✓	✓
PO4	✓			✓		
PO5						
PO6						
PO7						
PO8						
PO9						
PO10						
PO11						
PO12						