GUJARAT TECHNOLOGICAL UNIVERSITY

Operating System Design
SUBJECT CODE:3710218

Type of course: Elective

Prerequisite: Data Structure, Algorithms and Operating system concepts

Rationale:. The objective of the course is to provide introduction to operating system design and concept of process, process lifecycle and scheduling approaches.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Unit 1:** Overview of Operating Systems, Operating system functions and design issues, Design approaches, Types of advanced operating systems.	5	10
2	**Unit 2:** Process abstraction, Process management, system calls, Threads, Symmetric multiprocessing and micro-kernels.	6	15
3	**Unit 3:** Scheduling: Uniprocessor, Multiprocessor and Real time systems, concurrency, classical problems, mechanisms for synchronization: Semaphores, monitors, Process deadlock and deadlock handling strategies.	7	15
4	**Unit 4:** Memory management, Virtual memory concept, Virtual machines, I/O Management, File and disk management,	7	15
5	**Unit 5:** Operating system security, Secure operating systems, Security goals, Trust model, Threat model, Access Control Fundamentals – Protection system – Lampson's Access Matrix, Mandatory protection systems, Reference monitor, Security in Ordinary OS – Unix, Windows	10	20
6	**Unit 6:** Distributed Operating system: Architecture, Design issues, Distributed mutual exclusion, Distributed deadlock detection, shared memory, Distributed scheduling. **Multiprocessor operating systems:** architecture, operating system design issues, threads, process synchronization, process scheduling, memory management, reliability and fault tolerance.	10	20
7	**Unit 7:** Recent trends in Operating system design and their applicability to HPC.	3	5

Reference Books:

1. Advanced concept in operating system: M. Singhal, N.G. Shivratri
2. Operating system internal and design principles: William Stallings
3. Operating System Security, Trent Jaeger, Morgan & Claypool Publishers, 2008.
4. The Design of the Unix Operating System, Maurice J Bach, PHI

Course Outcome:

After learning the course the students should be able to:

- Understanding advanced concepts in operating systems.
- Understand security issues in operating systems.
- Learning principles of Distributed and multiprocessor operating systems

List of Experiments

- Implement inter process communication using semaphore
- Implement inter process communication using monitor
- Implement inter process communication using shared memory
- Implement inter process communication using message queue
- Develop any client-server based program and demonstrate covert channel
- Case study – Windows, Linux kernel, Android