

Branch Name:	Information Technology
Program Code:	ET105
Course Title:	Operating System and Virtualization
Course Code:	2ET1050401T
Pre-requisite Course:	Fundamentals of Computer Organization & Architecture, basic UNIX commands, Data Structures and Algorithms

Course Objective:

1. This course enables to understand value of Operating System, its role to manage resources of Computer and Peripherals.
2. Student will gain knowledge of different aspect of OS like Process Management, Memory Management, File Management and I/O Management in detail with prominence given to Linux type of Open-Source Operating System
3. To introduce Virtualization, operating systems fundamental concepts and its technologies.
4. To provide the skills and knowledge necessary to implement, provisioning and administer server and desktop virtualization

Teaching and Examination Scheme:

Credit	Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-		3	24	60	16	60	-	-	-	-	100

Course Contents:

Sr. No	Topic	Total Hours	Weight (%)
1	Introduction: Objective of Operating Systems: Definition, Evolution of Operating systems, Types of Operating Systems, OS services, System Calls, Batch multiprogramming, Multitasking.	04	10
2	Process concept: Overview, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching, Threads, Concept of multi threads, Advantages and Type of threads.	04	10
3	Process Scheduling: Scheduling objectives, Types of Schedulers, Scheduling criteria, Scheduling algorithms, Multiprocessor scheduling, Thread Scheduling Performance Analysis of the scheduling.	04	10
4	Inter process Communication: Race Conditions, Critical Section, Mutual Exclusion, The Producer Consumer Problem, Semaphores, Reader's & Writer Problem, Dining Philosopher Problem. Deadlocks: Definition, Deadlock characteristics, Deadlock Prevention, Deadlock Avoidance, Deadlock detection and Recovery.	10	20
5	Memory Management: Background of Memory management, Swapping, Contiguous Memory allocation, Paging, Structure of Page Table, segmentation. Virtual Memory: Basics of Virtual Memory, Demand paging, Page Replacement policies: Optimal (OPT), First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	08	20
6	Storage Structure & I/O Management: Overview of Secondary Storage Structure, Disk structure, Disk scheduling algorithm, RAID Structure, Principles of I/O Hardware: I/O devices, Device controllers, Operating System Design issues, I/O Buffering, Direct memory access.	05	15
7	Virtualization Concepts: Virtual machines: supporting multiple operating systems simultaneously on a single hardware platform: running one operating system on top of another. True or pure virtualization.	05	15

List of References:

1. Operating System Concepts (8th Edition) by Silberschatz, Peter B. Galvin and Greg Gagne, Wiley Indian Edition (2010).
2. Modern Operating Systems (Third Edition) by Andrew S Tanenbaum, Prentice Hall India (2008).
3. Operating Systems (5th Ed) – Internals and Design Principles by William Stallings, Prentice Hall India, 2000
4. Matthew Portnoy, “Virtualization Essentials”, John Wiley Sons Inc; 2nd Edition Edition, 2016.
5. Smith, Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, 1st Edition, Morgan Kaufmann Publishers, 2005.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand the overall view of the computer system, operating system layers and kernel architectures.	1. Remember 2. Understanding
CLO2	Identify various scheduling algorithm and deadlock prevention and avoidance algorithm	2. Understanding 3. Applying
CLO3	Compare and contrast various memory management schemes and file system functionalities	2. Understanding 3. Applying
CLO4	Discuss the performance of the various page replacement algorithms and interpret the file system implementation, sharing and protection mechanisms.	2. Understanding 3. Applying
CLO5	Demonstrate administrative tasks on Linux servers and to be familiar with the basics of Mobile OS.	3. Applying
CLO6	Classify the light-weight virtual machines with dockers and containers and also develop programs related to the simulations of operating systems and virtualization concepts.	2. Understanding 3. Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M	L	L			M			H	L	M		M	M		
CLO2	M	L	L			M			H	L	M		M	M		
CLO3	M	L	L			M			H	L	M		M	M		
CLO4	M	L	L			M			H	L	M		M	M		
CLO5	H	M	M			H			H	L	M		M	M		
CLO6	H	M	M			H			H	L	M		M	H		

H: High, M: Medium, L: Low