Course Code	PIT21C102J	Course Name	Advanced Operating System	Course Category	C	Professional Core	L	T	P	C
							3	0	4	5

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Computer Science	Data Book / Codes/Standards		Nil	

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)															
		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	Utilize operating systems based on its features and utility																		
CLR-2 :	Utilize the Process Management functions of an Operating system																		
CLR-3 :	Utilize the features of Memory Management concepts of an Operating system																		
CLR-4 :	Analyze how Device Management part of an Operating system functions																		
CLR-5 :	Utilize the File Management functions of an Operating system																		
CLR-6 :	Analyze the practical operating systems and evaluate their utility																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design,	Modern Tool Usage	Society & Culture	Environment &	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO – 3
CLO-1 :	Identify functions of an operating system, analyze the process management functions	2	80	70	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M
CLO-2 :	Analyze CPU scheduling and synchronization process of an operating system	3	85	75	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M
CLO-3 :	Analyze the need of Memory management functions of an operating system	3	75	70	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M
CLO-4 :	Identify the significance of device management and file management's role of an operating system	3	85	80	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M
CLO-5 :	Identify the essentials of inter process communication in an operating system, evaluate hypervisors	3	85	75	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M
CLO-6 :	Analyze how operating systems are constructed, analyze the features and aspects of different operating environments	3	80	70	H	H	H	H	H	M	L	M	H	M	-	H	H	H	M

Duration (Hour)		21	21	21	21	21
S-1	SLO-1	Operating System Introduction, Structures - Simple Batch	Virtual Memory	Deadlocks –Introduction, Deadlocks - System Model, Dead locks Characterization	Operating System Security Issues	Introduction to Distributed systems
	SLO-2	Multi programmed structure, time-shared	Logical Address Space, Logical versus Physical Address Space	Methods for Handling Dead locks, Deadlock Prevention,	Software vulnerability,	Types of Distributed systems
S2	SLO-1	Parallel systems, Distributed Systems, Real-Time Systems	Swapping, Contiguous Allocation	Deadlock Avoidance	Physical Security	software Concepts,
	SLO-2	System components,	- Paging	Deadlock Detection, Methods	System Threats,	Elementary introduction to the terminologies within Modern Oss
S3	SLO-1	Operating-System services	Segmentation	Recovery from Deadlock methods	One Time Password	Parallel model
	SLO-2	System Calls,	Segmentation with Paging, Demand Paging	Process Management and Synchronization	Computer Security Classifications	Distributed model - Architectural model
S4 – S7	SLO-1	Laboratory 1: Virtual Machines,	Laboratory 4: Performance of Demanding Paging, Page Replacement	Laboratory 7: The Critical Section – Entry- exit, The Critical Section Problem, Rules	Laboratory 10: Introduction to the topic of Security in Operating Systems, System Access Threats, Intruders	Laboratory 13: Distributed model - Interaction model Distributed model-Fault models
	SLO-2	System Design and Implementation				
S8	SLO-1	Preliminaries of Operating System- managing users	Shell scripting shell syntax	Process - creating new process-	Process Synchronization	Signal
	SLO-2					
S9	SLO-1	Process and CPU Scheduling	Allocation of Frames, Thrashing	methods	Malicious Softwares, Counter measures,	Embedded model,
	SLO-2	Process concepts, Process concepts scheduling	File System Interface, File System Interface and Implementation	Solution to the Critical Section Problem	IDS Components, Firewalls	Real time systems
S10	SLO-1	Operation on processes, Cooperating Processes	Access methods,	Synchronization Hardware,	Principles of Information Security	Operating systems models for Cloud

	SLO-2	Threads, Threads, and Interposes Communication	Protection	Mutex Locks	File System Access control	Other Operating System Models
S11-14	SLO-1 SLO-2	Laboratory 2: Interposes Communication, Scheduling Algorithm	Laboratory 5: Allocation methods, Directory Management	Laboratory 8: Semaphore Solution, Classical Problems of Synchronization	Laboratory 11: Access control policies, Information Security Definition	Laboratory 14: Operating systems models for various Real time systems, handling threads and semaphores to achieve synchronization among processes using POSIX standard functions
S15	SLO-1	Multiple -Processor Scheduling	Efficiency and Performance	Critical Regions,	Information Security measures	executing shell scripts.
	SLO-2	Real-Time Scheduling	Directory Implementation	Monitors	Generalized Security Architectures	Mobile systems OS
S16	SLO-1 SLO-2	managing systems	executing shell scripts.	counting maximum number of processes a system can handle at a time, handling system calls	Handling threads and semaphores to achieve synchronization among processes using POSIX standard functions	some POSIX signals (SIGINT, SIGILL, SIGFPE, SIGKILL, SIGHUP, SIGALRM, SIGABRT)
S17	SLO-1	Scheduling Criteria	Directory Structure	Authentication	Bufferoverflow attacks	Operating system models for Embedded systems
	SLO-2	file managements,	Free-space Management	Malware	Distributed System hardware	Goals of distributed system
S18-21		Laboratory 3: Memory Management,	Laboratory 6: Deadlock Avoidance	Laboratory 9: Program Threats	Laboratory 12: Distributed system –design issues	Laboratory 15: File System

Learning Resources	2. Abraham Silberschatz, "Operating system concepts", 9th Edition.	1. Mukesh Singhal, Niranjan G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001 2. Pradeep K.Sinha, "Distributed operating system-Concepts and design", PHI, 2003. 3. Andrew S.Tanenbaum, "Modern operating system", PHI, 2003

Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
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