Course Code	PCS21C05J	Course Name	DISTRIBUTED 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 :	To strengthen the knowledge in Operating Systems.																		
CLR-2 :	To examine the fundamental principles of distributed systems.																		
CLR-3 :	To comprehend about the communication that takes place in Distributed systems.	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
CLR-4 :	To realize the necessity of synchronization, consistency and Fault tolerance in a Distributed System.																		
CLR-5 :	To provide students hands-on experience in developing distributed protocols.																		
CLR-6 :	To acquire apparent scheme regarding distributed object-oriented based systems.																		

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Categorize layered protocols and comprehend the communications in distributed systems.	2	80	70	H	H	H	H	H										
CLO-2 :	List the principles of distributed systems and describe the problems and challenges associated with these principles.	3	85	75	H	H	H	H	H										
CLO-3 :	Understand Distributed Computing techniques, Synchronous and Processes.	3	75	70	H	H	H	H	H										
CLO-4 :	Understand Distributed File Systems and Distributed Shared Memory.	3	85	80	H	H	H	H	H										
CLO-5 :	Apply Distributed web-based system.	3	85	75	H	H	H	H	H										
CLO-6 :	Understand the importance of security in distributed systems.	3	80	70	H	H	H	H	H										

Duration (Hour)		21	21	21	21	21
S-1	SLO-1	Introduction: Overview of operating system concepts	Synchronization in distributed systems	Distributed File Systems: Introduction	Resource Management in DOS	Distributed Web-based Systems
	SLO-2	Process management	Clock synchronization and related algorithms	Features and goal of distributed file system	Types of resources	Architecture, Processes
S2	SLO-1	Scheduling: CPU Scheduling	Events, Time in distributed systems	File models	Issues of resource sharing	Communication, Naming
	SLO-2	Disk Scheduling	Concurrency control mechanism in DOS	File sharing semantics	Task assignment	Synchronization
S3	SLO-1	Memory management	Mutual exclusion in distributed environment	File caching scheme	Types of Distributed Load Balancing Algorithms	Consistency and Replication
	SLO-2	Device and File management	Deadlock in distributed systems	File replication, Fault tolerance	Load estimation policy, Process transfer	Web Proxy Caching
S4 – S7	SLO-1	Laboratory 1:Virtual Machines, System Design And Implementation	Laboratory 4: Program to implement locking algorithm.	Laboratory 7: Implement Network File System	Laboratory 10: Implement Load Balancing Algorithm	Laboratory 13: Study of Web Service Programming
	SLO-2					
S8	SLO-1	Introduction to distributed Systems, Definition and goals	Transactions in distributed environment	Fault tolerance, Trends in Distributed File System	Location policy, State information exchange policy	Replication for Web Hosting Systems
	SLO-2					

Duration (Hour)		21	21	21	21	21
S9	SLO-1	Hardware and Software Concepts	Processes and processors in distributed systems:	Distributed Shared Memory: Introduction	Priority assignment policy	Replication of Web Applications
	SLO-2	Design Issues	Threads	General architecture of DSM	Process migration and case studies	Security in Distributed OS: Introduction
S10	SLO-1	Communication in Distributed System	System model	Advantages & challenges of DSM	Naming: Overview, Features	Importance of security
	SLO-2	Computer Network and Layered Protocols	Processor allocation	Design and implementation issues of DSM	Identifiers, Addresses, Name Resolution	Types of External attacks
S11-14	SLO-1	Laboratory 2: Program to implement Remote procedure call	Laboratory 5: Implement process strategies: creation of child, zombie, orphan process	Laboratory 8: Program to Increment a Counter in Shared Memory	Laboratory 11: Access control policies	Laboratory 14: Program to implement Chat Server
	SLO-2					
S15	SLO-1	Message passing and related issues	Scheduling in distributed systems	Advantages & challenges of DSM	System oriented names	Basic elements of Information System security and policy
	SLO-2	ATM Networks	Load balancing and sharing approach	Memory coherence	Object locating mechanisms	Trust Management
S16	SLO-1	Client Server model & its implementation	Fault tolerance	Granularity, structure of shared memory space	Issues in designing human oriented names	Access Control Models
	SLO-2					
S17	SLO-1	Remote Method Invocation	Real time distributed systems,	Replacement strategy	Name caches, Naming and security	Cryptography
	SLO-2	Case Studies: SUN RPC, DEC RPC	Process migration and related issues	Thrashing	DNS	Case Study: Sun Network File System, Andrew Network file system
S18-21	SLO-1	Laboratory 3: Basic calculator program using RMI	Laboratory 6: Program to implement token/non token based algorithm for Mutual Exclusion	Laboratory 9: Allocation methods, Directory Management	Laboratory 12: Study of Object Loading Mechanisms	Laboratory 15: Security in Operating Systems, System Access Threats, Intruders
	SLO-2					

Learning Resources	1. Pradeep K. Sinha, "Distributed Operating System Concepts and Design ", PHI, New Delhi, 2007. 2. Andrew S. Tanenbaum, "Distributed Operating Systems "Pearson Education, 2011.	3. "Distributed Systems: Concepts and Design", George Coulouris, Jean Dollimore, Tim Kindberg, Pearson, 5th Edition, 2012. 4. Mukesh Singhal, Niranjan G.Shivaratri, "Advance concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001. 5. 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
Mr. S. Karthik, Assistant Consultant, Tata Consultancy Services	Dr.S.Sasikala, Associate Professor and Head, Dept. of Computer Science, University of Madras	Dr.S.P.Angelin Claret Mr.Ramesh