

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Information and Communication Technology

SUBJECT NAME: DISTRIBUTED COMPUTING

SUBJECT CODE: 2173208

7th SEMESTER

Type of course: Elective

Prerequisite: Operating Systems

Rationale: Student has studied subject Operating Systems. The work of Operating System is different in the distributed environment. Student should understand Message passing, RPC, Synchronization, Load Balancing. Migration of processes, Deadlock management etc in distributed environment.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
3	0	2	5	70	20	10	20	10	20	150

Content

Sr NO	Course Contents	Teaching hours	Weightage
1	Concepts of Distributed Systems : Introduction, Distributed computing models, Software concepts, Design issues in distributed systems, Client-server model, WWW 1.0 and 2.0	2	5
2	Network Communication: LAN and WAN technologies, OSI Model and Internet protocols, ATM, Protocols for Distributed systems	4	10
3	Interprocess Communication: Message Passing and its features, IPC message format, IPC synchronization, Buffering, multi datagram messaging, process addressing techniques, failure handling, Formal Models for message passing systems, Broadcast and converge cast on a spanning tree, Flooding and building a spanning tree, Constructing a DFS spanning tree with and without a specified root	8	20

4	Remote Communication: Introduction, RPC basics, RPC implementation, RPC Communication and Other issues, Sun RPC, RMI basics, RMI Implementation, Java RMI	6	15
5	Synchronization: Clock synchronization, Logical clocks, Global state, Mutual exclusion, Election algorithms: Bully algorithm, Ring algorithm, Leader election in rings, anonymous rings, Asynchronous rings, synchronous rings, election in wireless networks, Deadlocks in Distributed systems, Deadlocks in Message communication	8	15
6	Distributed System Management: Resource management, Task management approach, Load balancing approach, Load sharing approach, Process Management, Process migration, threads, fault tolerance	6	15
7	Distributed Shared Memory: Concepts, Hardware DSM, Design issues in DSM systems, Implementation issues, Heterogeneous and other DSM systems,	4	10
8	Naming: Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS	4	10

Text Books:

1. Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University Press
2. Distributed Systems: Principles and Paradigms, Taunenbaum
3. Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, Pearson Education
4. Distributed Computing, Fundamentals, Simulations and Advanced topics, 2nd Edition, Hagit Attiya and Jennifer Welch, Wiley India

Course Outcome:

After learning the course the students should be able to

1. Understand distributed systems
2. Know various types of transparencies which Distributed OS should provide
3. Understand and analyse Message passing models
4. Understand RPC and implement it using manual or automatic stub generation
5. Know various synchronization issues
6. Know, analyse various election algorithms
7. Implement threads Understand distributed systems
8. Know various types of transparencies which Distributed OS should provide
9. Understand and analyse Message passing models
10. Understand RPC and implement it using manual or automatic stub generation
11. Know various synchronization issues
12. Know, analyse various election algorithms
13. Implement threads

14. Know File systems
15. Compare various Distributed OS

List of Experiments:

1. Implement concurrent client-server application in LINUX.
2. Study of rpcgen protocol compiler.
3. Write a program to subtract two numbers using rpcgen utility under LINUX using command-line arguments.
4. Write a program to find minimum of two numbers using rpcgen utility under LINUX using command-line arguments.
5. Write a program to find length of given string using rpcgen utility under LINUX using command-line arguments
6. Write a program to implement stateful server.
7. Write a program to implement state-less server.
8. Write a program of simple calculator using Java RMI.
9. Write a program in Java to create thread safe counter using synchronized class methods.
10. Implement concurrent client-server application in LINUX.
11. Study of rpcgen protocol compiler.
12. Write a program to subtract two numbers using rpcgen utility under LINUX using command-line arguments.
13. Write a program to find minimum of two numbers using rpcgen utility under LINUX using command-line arguments.
14. Write a program to find length of given string using rpcgen utility under LINUX using command-line arguments
15. Write a program to find average of given numbers using rpcgen utility under LINUX using command-line arguments
16. Write a program to convert Fahrenheit to Celsius conversion using rpcgen utility under LINUX using command-line arguments
17. Write a program to implement stateful server.
18. Write a program to implement state-less server.
19. Write a program of simple calculator using Java RMI.
20. Write a program in Java to create thread safe counter using synchronized class methods.

Major Equipments: Computer/LINUX OS/Unix OS

List of Open Source Software/learning website:

www.cdk3.net/rmi/ed2/sunrpc.pdf

en.wikipedia.org/wiki/message_passing

www.cs.rpi.edu/~hollingd/netprog/notes/rpc/rpc.ppt

<http://www.cs.rutgers.edu/~pxk/rutgers/notes/clocks/index.html>