

GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING (SYSTEMS AND NETWORK SECURITY)

(56)

DISTRIBUTED COMPUTING

SUBJECT CODE: 2725605

SEMESTER: II

Type of course: Major Elective-II

Prerequisite: Basic network concepts, Basic operating system concepts, Basic software engineering concepts, Knowledge of DNS, Unix Programming.

Rationale: This course content enables to understand importance of Distributed Computing, its functionalities to manage resources of Computer and Peripherals in Distributed Environment. Student will be made aware of Distributed systems' Management, Interprocess Communication as well as Security in distributed Environment. Students will also going to study about distributed Computing Paradigms, which will be useful to them for Large Application Development in engineering field with emphasis given to Distributed networking applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA(M)	ESE (V)		PA(I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

Course Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	Introduction: History of Distributed Computing; Forms of computing: Monolithic, Micro, distributed, parallel, Co-operative; Distributed System Models; Issues in designing DS.	3	10
2.	Synchronization in Distributed Computing Introduction; Clock Synchronization: Physical clock, Clock synchronization algorithms, use of synchronized clock; Logical clocks: event ordering, implementation of logical clocks, Lamport's Timestamps, Vector Timestamps; global state; Mutual Exclusion: Centralized algorithms, distributed algorithms, token ring algorithm; Election algorithms: bully algorithm, ring algorithm	7	20
3.	Interprocess Communication: Event synchronization, Timeout and Threading, Deadlock and timeouts, Data Encoding, Request Response Protocols, Event diagram, sequence diagram, Connection-oriented/connectionless IPC, Evolution of paradigms for IPC.	6	15
4.	Distributed Computing paradigms:	5	15

	Paradigms and Abstraction, an Example Application, Paradigms for Distributed Applications, Trade-Offs.		
5.	Distributed System Management: Resource management, Task management approach, Load balancing approach, Load sharing approach, Process Management, Process migration	7	15
6.	Naming in Distributed Systems: Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS	5	15
7.	Security in distributed Systems: Introduction, Cryptography, Secure Channels, Access Control, Security Management	4	10

Reference Books:

1. M.L. Liu, "Distributed Computing: Principles and Applications", Pearson.
2. Sunita Mahajan, Seema Shah "Distributed Computing" Oxford Publications
3. P.K.sinha, " Distributed Operating Systems Concepts and design", PHI.
4. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems Principles and Paradigms".

Course Outcome:

After successful completion of the course, student will be able to

- Have the core concepts and principles of Distributed programming techniques.
- Emerging concepts of Load Balancing, Load Sharing as well as concepts of synchronization would be clear.

List of Experiments:

1. Develop a concurrent server - client application using TCP Socket in "C". The client will send a number and a string to the server and server will print the string number times.
2. Develop an iterative server - client application using UDP Socket in "C". The client will send a filename the server and server will reply with the size of the file.
3. Develop a simple time server-client application using RPC. The server will reply with the current time (in seconds) to the client as soon as it gets connected. (no arguments).
4. Develop a simple time server-client application using RPC. The client will call the server with time in second, the server will reply with the formatted time. (Single argument).
5. Develop a simple time server-client application using RPC. The client will call the server with filename and a word and server will reply the number of occurrences of that word in the given filename. (Multiple argument).
6. Develop a simple time server-client application using RPC. The client will call the server with filename and two words, word1 and word2 and server will reply the file where word1 will be replaced by word2.
7. Implement Lamport's Time Stamp Algorithm.
8. Implement Vector clock algorithm.
9. Simulate Ring Election Algorithm.
10. Simulate Load Balancing in Distributed Systems.

Open Ended Problems:

1. Develop a simple client-server application using java RMI
2. Case Study : CORBA
3. Case Study : Distributed File System
4. Case Study : Distributed Database Management System
5. Case Study: Grid Computing and Cloud Computing

Major Equipments:

Desktop, Laptop

List of Open Source Software/Learning websites:

www.nptel.ac.in

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.