GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING (07) AND INFORMATION TECHNOLOGY (16)
DISTRIBUTED OPERATING SYSTEM
SUBJECT CODE: 2160710
B.E. 6thSEMESTER

Type of course: Elective

Prerequisite: Operating Systems, Distributed Network

Rationale: To examine the fundamental principles of distributed systems, and provide students hands-on experience in developing distributed protocols. While we still look at issues in distributed operating systems, this course will address distributed systems in a broader sense. Emphasis will be placed on communication, process, naming, synchronization, consistency and replication, and fault tolerance.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Introduction to distributed Systems:** Definition and goals, Hardware and Software concepts, Design issues	06 hours	15%
2	**Communication in Distributed System:** Computer Network and Layered protocols, Message passing and related issues, synchronization, Client Server model & its implementation, remote procedure call and implementation issues, Case Studies: SUN RPC, DEC RPC	02 hours	5%
3	**Synchronization in distributed systems:** Clock synchronization and related algorithms, mutual exclusion, Deadlock in distributed systems	04 hours	10%
4	**Processes and processors in distributed systems:** Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues	03 hours	10%
5	**Distributed File Systems:** Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study.	04 hours	10%
6	**Distributed Shared Memory:** Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing	05 hours	15%

7	**Naming** Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names, Name caches, Naming and security, DNS	04 hours	10%
8	**Distributed Web-based Systems** Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication: Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications	03	10%
9	**Security** Introduction of Security in Distributed OS, Overview of security techniques, features, Need, Access Control, Security Management	03	10%
10	**Case Study** Java RMI, Sun Network File System, Google case study	03	5%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**10**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore,Tim Kindberg, Pearson
3. Distributed Operating Systems by Andrew S Tannebaum, Pearson
4. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD
5. Distributed Systems: Principles and Paradigms by Andrew S Tanebaum, Maarten Van Steen, PHI
6. 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. List the principles of distributed systems and describe the problems and challenges associated with these principles.
2. Understand Distributed Computing techniques, Synchronous and Processes.
3. Apply Shared Data access and Files concepts.
4. Design a distributed system that fulfills requirements with regards to key distributed systems properties.
5. Understand Distributed File Systems and Distributed Shared Memory.
6. Apply Distributed web-based system.
7. Understand the importance of security in distributed systems

List of Experiments:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write the Programs for Remote Procedure call.
3. Write the Programs for Remote Method Invocation.
4. Write the Programs for Thread Programming in JAVA.
5. Implement CORBA file.
6. Write a Program to Increment a Counter in Shared Memory.
7. Implement Network File System (NFS).
8. Creation of a BPEL (Business Process Execution Language) Module and a Composite Application.
9. Study of Web Service Programming.
10. Study of Grid Services using various Tools.

Design based Problems (DP)/Open Ended Problem:

1. Discuss various Distributed Resource Management System Functions.
2. Compare Peer-to-Peer and Client-Server Networking
3. Discuss the various steps to configure Print Server in Windows Environment

List of Open Source Software/learning website:

- http://cquestionbank.blogspot.com
- www.intelligentedu.com/
- www.hermetic.ch/cfunlib.htm
- N.P.T.E.L. Video Lecture Series
- N.I.T.T.I. Instructional Resources Videos.
- www.cprogramming.com/
- www.c-program.com/

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.