

Distributed Computing System

Teaching Scheme:3
Lectures/week

Credits: 3

Examination Scheme:

In-Semester : 30 Marks

End-Semester: 70 Marks

Prerequisites:

1. Web Technology, Computer Network Technology and Operating System.

Course Objectives :

1. To understand the fundamentals and knowledge of the architectures of distributed systems.
2. To gain knowledge of working components and fault tolerance of distributed systems
3. To make students aware about security issues and protection mechanism for distributed environment.

Course Outcomes :

By the end of the course, students should be able to

1. Understand the principles and desired properties of distributed systems based on different application areas.
2. Understand and apply the basic theoretical concepts and algorithms of distributed systems in problem solving.
3. Recognize the inherent difficulties that arise due to distributed-ness of computing resources.
4. Identify the challenges in developing distributed applications

UNIT – I FUNDAMENTALS AND ARCHITECTURES:

6 Hrs

INTRODUCTION(Text. Book-1 and Text. Book-2): Characteristics and examples of distributed systems, Design goals, Types of distributed systems, Trends in distributed systems, Focus on Resource Sharing, Challenges.

ARCHITECTURES(Text. Book-1 and Text. Book-2): Architectural styles, middleware and middleware organization, system architectures, Example architectures.

Case Study: The World Wide Web(Reference. Book-1)::

UNIT – II COMMUNICATION AND COORDINATION

6 Hrs

COMMUNICATION Text. Book-1):: Introduction, Layered protocols , Types of communication, Inter-process Communication, Remote Procedure Call (RPC), Message oriented communication, Multicast Communication, Network Virtualization: Overlay Network

COORDINATION(Text. Book-1):: Clock Synchronization, Logical Clocks, Mutual Exclusion, Election algorithms, Distributed event matching, Gossip Based coordination

Case Study: IBM's Websphere Message-Queuing System(Text. Book-1)

UNIT - III REPLICATION AND FAULT TOLERANCE

6 Hrs

REPLICATION(Text. Book-1):: Reasons for replication, Replica management, Failure masking and replication, Consistency protocols, Catching and replication in web,

FAULT TOLERANCE (Text. Book-1): Introduction, Failure models, Fault systems with arbitrary failures, Reliable client server communication, Reliable group communication, Distributed commit, Recovery, Checkpoints.

Case Study: Catching and Replication in Web(Text. Book-2)

UNIT IV DISTRIBUTED FILES AND MULTIMEDIA SYSTEMS 6 Hrs

DISTRIBUTED FILE SYSTEMS(Reference. Book-1): Introduction, File System Architecture, Sun Network File System, and HDFS. Name Services: Introduction, Name Services and the Domain Name System, Directory Services.

Case Study: 1. The Global Name Service, 2. The X.500 Directory Service.

DISTRIBUTED MULTIMEDIA SYSTEMS(Reference. Book-1): Characteristics of Multimedia Data, Quality of Service Management, Resource management, Stream Adaptation.

Case Study: BitTorrent and End System Multicast(Reference. Book-1)

UNIT – V DISTRIBUTED WEB BASED SYSTEM (Text. Book-2): 5 Hrs

Architecture of Traditional Web-Based Systems, Apache Web Server, Web Server Clusters, Communication by Hypertext Transfer Protocol, Synchronization, Web Proxy Caching, Replication for Web Hosting Systems, Replication of Web Applications, Fault Tolerance in distributed web based systems, Security Concerns.

Case Study: HyperText Transfer Protocol (HTTP) (Text. Book-1)

UNIT – VI SECURITY IN DISTRIBUTED SYSTEMS 7 Hrs

Introduction to Security(**Text. Book-2**): Security Threats, Policies, and Mechanisms, Design Issues, Cryptography. SECURE CHANNELS: Authentication, Message Integrity and Confidentiality, Secure Group Communication

ACCESS CONTROL(Text. Book-1): General Issues in Access Control, Firewalls, Secure Mobile Code, Denial of Service(DOS). Security Management: Key Management, Secure Group Management, Authorization Management. Emerging Trends In Distributed Systems: Grid Computing, Service Oriented Architectures(SOA).

Case Study: Kerberos(Text. Book-1)

Text Books

| Sr. No. | Title | Author (s) | Publisher | Edition | Publication Year | ISBN No. | Price (Rs.) |
|---------|--|--|-----------|-----------------------------|------------------|--------------------------------|--------------------------------|
| 1 | Distributed Systems | Maarten van Steen , Andrew S. Tanenbaum | PHI | 3rd Edition Version 3.01 | 2017 | 978-15-430573-8-6 (Printed) | Digital version Free on net |
| 2 | Distributed Systems – Principles and Paradigms | Andrew S. Tanenbaum, Maarten van Steen | PHI | 2 nd Edition | 2013 | 978-0130888938 | Digital version free on Net |

Reference Books

| Sr. No. | Title | Author (s) | Publisher | Edition | Publication Year | ISBN No. | Price (Rs.) |
|---------|--|--|-------------------------|-------------------------|------------------|--|-------------|
| 1. | Distributed Systems: Concepts and Design | George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, | Pearson | 5 th edition | 2011 | ISBN-13: 978-0132143011 ISBN-10: 0132143011 | --- |
| 2. | Distributed System Security: Issues, Processes and solutions | Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnappalli, Niranjan Varadarajan, Srinivas Padmanabhuni, Srikanth Sunderrajan | Willey online Library | ----- | 2009 | ISBN: 978-0-470-51988-2 | ----- |
| 3. | Distributed Computing | Sunita Mahajan, Seema Shah, | Oxford University Press | 2nd Edition | 2013 | ISBN-13: 978-0198093480 | ---- |