



DEPARTMENT OF COMPUTER SCIENCE

Gopinath Bordoloi Nagar, Gauhati University

Guwahati-781014, Assam, India

LESSON PLAN

Subject Name : Distributed System
Paper Code : CSC3026/INF3026 **Session: 2022-2023**
Program Name : M.Sc. (CS/IT) **Semester: THIRD**
Faculty Name : Dwipen Laskar
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Detailed Lesson Plan

UNIT-I (Introduction to Distributed Systems)

Lecture No	Topics to be Covered
1	Definition of a distributed system. Characteristics of distributed and centralized systems
2	Design issue and challenges, Advantages and Disadvantages of Distributed System
3	Types of transparency issues, Concurrency Control, openness, and scalability.
4	Hardware concepts- multiprocessors, homogeneous & heterogeneous systems, middleware, issues in distributed Operating systems
5	Inherent limitations of distributed systems,
6	System models: Fundamental model
7	System models: Architectural model
8	System models: Interaction model
9	System architectures- The client-server model and its variations
10	Application layering, Client-Server architectures.

UNIT-II (Synchronization)

11	Needs of clock synchronization, External and Internal clock synchronization, Global Clock
12	Logical and Physical Clock Synchronization, Logical and vector clocks, Happened Before Relationship,
13	Lamport's logical clock synchronization algorithm, Limitations of Lamport's Clock
14	Vector clock synchronization, Partial Ordering of Events
15	Causal Order of messages, Birman-Schiper-Stephenson protocol

16	Schiper-Eggle-Sandoz protocol: Algorithm, Solutions with examples
17	Global state, Chandy Lamport snapshot algorithm
18	Termination detection, Huang's Termination Detection Algorithm

UNIT-III (Distributed Mutual Exclusions)

19	Definition of Distributed ME, Critical Section, Requirements of Mutual Exclusion algorithms
20	Performance measurement metrics for Distributed ME algorithms, Classification of mutual exclusion algorithm- Token based algorithms, Non-token based algorithm, Quorum Based
21	Central Server Algorithm, Complexities of CS Algorithm, Merits and Demerits
22	Lamport's timestamp algorithm, Complexities of CS Algorithm, Merits and Demerits
23	Ricart-Agrawala Algorithm, Complexities of CS Algorithm, Merits and Demerits
24	Maekawa's Voting algorithm, Complexities of CS Algorithm, Merits and Demerits
25	Ring based algorithms, Complexities of CS Algorithm, Merits and Demerits
26	Suzuki-Kasami's Broadcast algorithm, Complexities of CS Algorithm, Merits and Demerits
27	Raymond's Tree-based algorithm, Complexities of CS Algorithm, Merits and Demerits
28	Election algorithms- Bully algorithm, Ring algorithm, LeLange-Chang-Robert Algorithms

UNIT-IV (Distributed Scheduling and Deadlock detection)

30	Distributed scheduler, issues in distributed load distribution,
31	Components of load distribution algorithm, Stability, Task Migration
32	Basic conditions of deadlocks, Resource and communication deadlock, Strategies of deadlock handling, Necessary conditions of deadlock
33	Issues in deadlock detection and resolution, False Deadlock, Deadlock detection algorithms (Centralized, Distributed, Hierarchical)
34	Completely Centralized Algorithm, HO Ramamurthy (One and Two Phase Algorithm)
35	Distributed Deadlock Algorithm-Path Pushing Algorithm, Edge Chasing Algorithm, Diffusion Computation based and Global State detection algorithm

UNIT-V (Agreement Protocols and Inter-process Communication)

36	System models, classification of agreement problems (Byzantine, Consensus, Interactive), Relations among Agreement Protocols
37	Solutions to the Byzantine agreement problem-Upper bound on number of faulty processors, Treatment of Impossibility Results, Lamport's-Shostak-Pease Algorithm,
38	Dolev et al's algorithm, Applications of agreement algorithms
39	Inter-process Communications, API for UDP/TCP, Request Reply Protocol, Remote Procedure Call- basic RPC operation, parameter passing, examples.

40	Remote Object Invocation- distributed objects, integrating clients and objects, static versus dynamic RMI, parameter passing, examples and case study
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UNIT-VI (Naming)

41	Naming entities- names, identifiers & addresses, name resolution
42	Name space implementation, the Domain Name System.

UNIT-VII (Distributed Transaction Processing)

43	Distributed transactions- ACID properties, flat and nested transactions
44	Atomic commit protocols, concurrency control in distributed transactions
45	Introduction, reasons for replication, object replication, consistency models
46	Failure Recovery in Distributed System-Classification of failures, Backward and Forward Failure Recovery,
47	Backward Failure Recovery: Operation based recovery and State based recovery, State based approach
48	Recovery in Concurrent System: Orphan messages and Domino effects, Lost messages, Problem of Livelock
49	Consistent Set of Checkpoints, Synchronous Check pointing and Recovery, Koo and Toueg check pointing algorithm

UNIT-VIII (Distributed File Systems)

50	Introduction: characteristics of file systems, distributed file system requirements, File service architecture, Services provided by DFS
51	File accessing models, Architecture of DFS, Advantages and Disadvantages, detailed case study of Sun Network File System (NFS)
52	Distributed Shared Memory, Advantages and disadvantages of DSM, Algorithms for Implementing DSM
53	Central Server algorithm, Migration Algorithm, Read Replication algorithm, Full-Replication Algorithm
54	Security in distributed system, Types of threats, Types of attacks
55	Security policy and mechanisms, Design Issues for security in Distributed System
56	Introduction to cryptography, Symmetric and Asymmetric Key cryptography, RSA Algorithm

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