LESSON PLANS

FOR

ODD SEMESTER

(October, 2021)

EVEN SEMESTER

(February, 2021)

SESSIONS

2021-2022

DEPARTMENT OF COMPUTER SCIENCE

Gopinath Bordoloi Nagar, Gauhati University

Guwahati-781014, Assam, India

LESSON PLAN

Subject Name : **Distributed System**

Paper Code : **CSC3026/INF3026** **Session:** **2021-2022**

Program Name : **M.Sc. (CS/IT)** **Semester:** **THIRD**

Faculty Name : **Dwipen Laskar**

Date : **October, 2021**

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, Design issue and challenges, Advantages and Disadvantages of Distributed System
2	Types of transparency issues, Concurrency Control, openness, and scalability, Hardware concepts- multiprocessors, homogeneous & heterogeneous systems, middleware, issues in distributed Operating systems
3	Inherent limitations of distributed systems, System models: Fundamental model, Architectural model, Interaction model
4	System architectures- The client-server model and its variations, Application layering, Client-Server architectures.

UNIT-II (Synchronization)

5	Needs of clock synchronization, External and Internal clock synchronization, Global Clock
6	Logical and Physical Clock Synchronization, Logical and vector clocks, Happened Before Relationship,
7	Lamport's logical clock synchronization algorithm, Limitations of Lamport's Clock, Vector clock synchronization
8	Partial Ordering of Events , Causal Order of messages, Birman-Schiper-Stephension protocol
9	Global state, Chandy Lamport snapshot algorithm, Termination detection, Haung's Termination Detection Algorithm

UNIT-III (Distributed Mutual Exclusions)

10	Definition of Distributed ME, Critical Section, Requirements of Mutual Exclusion algorithms
11	Performance measurement metrics for Distributed ME algorithms, Classification of mutual exclusion algorithm- Token based algorithms, Non-token based algorithm, Quorum Based
12	Central Server Algorithm, Complexities of CS Algorithm, Lamport's timestamp algorithm

13	Ricart-Agrawala Algorithm, Maekawa's Voting algorithm, Complexities of CS Algorithm, Merits and Demerits
14	Election algorithms- Bully algorithm, Ring algorithm, Lelang-Chang-Robert Algorithms

UNIT-IV (Distributed Scheduling and Deadlock detection)

15	Distributed scheduler, issues in distributed load distribution,
16	Basic conditions of deadlocks, Resource and communication deadlock, Strategies of deadlock handling, Necessary conditions of deadlock
17	Deadlock detection algorithms (Centralized, Distributed , Hierarchical), HO Ramamurthy (One and Two Phase Algorithm)
18	Distributed Deadlock Algorithm-Path Pushing Algorithm, Edge Chasing Algorithm

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

19	System models, classification of agreement problems (Byzantine, Consensus, Interactive), Relations among Agreement Protocols
20	Solutions to the Byzantine agreement problem-Upper bound on number of faulty processors, Treatment of Impossibility Results, Lamport's-Shostak-Pease Algorith,
21	Inter-process Communications, Remote Object Invocation , Request Reply Protocol, Remote Procedure Call- basic RPC operation, parameter passing, examples.

UNIT-VI (Naming)

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

UNIT-VII (Distributed Transaction Processing)

23	Distributed transactions- ACID properties, flat and nested transactions, Failure Recovery in Distributed System-Classification of failures, Backward and Forward Failure Recovery
24	concurrency control in distributed transactions, Introduction, reasons for replication, object replication, consistency models
25	Backward Failure Recovery: Operation based recovery and State based recovery
26	Recovery in Concurrent System: Orphan messages and Domino effects, Lost messages, Problem of Livelock

UNIT-VIII (Distributed File Systems)

27	Introduction: characteristics of file systems, distributed file system requirements, File service architecture, Services provided by DFS
28	File accessing models, Architecture of DFS, Advantages and Disadvantages,
29	Distributed Shared Memory, Advantages and disadvantages of DSM, Algorithms for Implementing DSM
30	Central Server algorithm, Migration Algorithm, Read Replication algorithm, Full-Replication Algorithm

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LESSON PLAN

Subject Name : **Software Engineering**

Paper Code : **CSC2036/INF2036** **Session:** **2021-2022**

Program Name : **M.Sc. (CS/IT)** **Semester:** **Second**

Faculty Name : **Dwipen Laskar**

Date : **February, 2021**

Detailed Lesson Plan

UNIT-I (Software challenges and Software process)

Lecture No	Topics to be Covered
1	Problem domain: Software vs Program, Process vs Product, Exploratory Style of Programming
2	SE Challenges, Software Crisis, Software Process Model, SE approaches
3	Characteristics of SW process, Emergence of Software Engineering, Notable Changes in Software Development Practices
4	SW development process model: basic concepts, Build and Fix model, Waterfall model, Classical Waterfall Model
5	Iterative Waterfall Model, V-Model, Prototyping Model
6	Incremental Developmental Model, Evolutionary Model
7	Spiral Model, Agile Software Development, Comparison of Different Life Cycle Models

UNIT-II (Software requirement and specification)

13	SW requirement: Requirement Gathering and Analysis, Software Requirement Specification(SRS):-users of SRS, Characteristic of Good and bad SRS
14	Functional Specification: how to identify and Document, Functional Requirements, Traceability
15	Representation of complex logic in SRS, Decision Tree and Decision Table
16	Formal Technique
17	Axiomatic Specification, validation, matrices

UNIT-III (Software architecture views and cost estimation model)

18	Role of SW architecture, architecture view, component and connector view, style for C&C view.

19	Software Project Management Complexities, Responsibilities of SW Project Manager
20	Process planning, Software Planning, Sliding Window Planning
21	Software Size Estimation: LOC, Function Point Metric, Feature Point Metric
22	Empirical Estimation Techniques, Expert Judgment, Delphi Cost Estimations
23	Effort estimation,
24	Cost Estimation based on COCOMO: Basic, Intermediate and Complete COCOMO
25	Staffing Level Estimation: Norden's Work, Putnam's Work, Jensen's Model
26	Software Scheduling and staffing: Work Breakdown Structure, CPM,
27	Activity Network, PERT Charts, Gantt Chart
28	Organization Structure: Chief Programmer team, Democratic Team and Mix Team
29	Team Structure: Project Format, Functional Format, Matrix Format
30	Risk Management, Risk Identification, Types of Risks, Risk Abatement Policies
31	SW configuration management plan, Source Code Control System, RCS, Project monitoring plan.
32	Software Reliability, Hardware vs Software Reliability, Reliability Metrics
33	Reliability Growth Model, Statistical Testing, Quality plan: McCall's Quality factors, ISO9000
34	SEI Capability Maturity Model, Comparison of SEI/CMM and ISO 9000

UNIT-IV (Design principles and Methodology)

35	Design principle, Outcome of design process, classification of design activities and design methodologies
36	Characteristics of good design, Module level concept, Design notation and specification
37	Layered architecture of modules, Cohesion and Coupling
38	Overview of SA/SD, Structured Analysis (DFD)
39	Structured Analysis (DFD): Context Level Diagram, Types of DFDs, Notations of DFD, Data dictionary
40	Transformation of DFD into Structure Chart, Detailed Design
41	OO Analysis and OO Design: OO Design concept, Origin of UML, Evolution of UML, UML Diagrams
42	UML Diagrams: Use Case Diagram, Representation, Factoring, Use Case Packaging
43	UML Diagrams: Class Diagram, Object Diagram
44	UML Diagrams: Interactive Diagrams, State Chart Diagram, Deployment and Component Diagram

45	Programming principles and guidelines, coding process, Code Walkthrough, Code Inspection and Clean Room Testing, Software Documentation
46	Software Testing: basic concepts, Unit Testing, Integration and System Testing, Acceptance Testing
47	Black Box Testing-Equivalence Partitioning, Boundary Value Analysis
48	White Box Testing-Statement Coverage, Branch Coverage
49	Condition Coverage, Path Coverage, McCabe's Cyclomatic Complexity, Data Flow based Testing, Mutation Testing
50	Debugging Approaches, Guidelines, Program Analysis Tools: Static and Dynamic

UNIT-V (Detail Design and Testing fundamentals)

52	Detail design and Process Design Language (PDL)
53	Software Verification and Validation,
54	Code Refactoring concepts and Techniques
55	Integration Testing and System Testing: Smoke Testing, Performance Testing, Error Seeding
56	Software Maintenance: Reverse Engineering, Estimation of Maintenance Cost, CASE tools

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