

Course Title: Distributed and Object Oriented Database

Course no: CSC-457

Credit hours: 3

Full Marks: 60+20+20

Pass Marks: 24+8+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: Design and development of distributed and Object oriented database systems

Goal: This course introduces fundamental concept and implementation of object oriented and distributed database systems with focus on data distribution, query processing, transaction processing, concurrency control and recovery.

Course Contents:

Unit 1: **12 hrs.**

- 1.1 Introduction to Distributed Database:** Distributed Data Processing, Concept of Distributed Database. Distributed vs Centralized Database System; advantages and Application. Transparency, performance and reliability. Problem areas of Distributed Database. Integrity Constraints in Distributed Databases.
- 1.2 Distributed Database Architectures:** DBMS standardization. Architectural models for Distributed DBMS – autonomy, distribution and heterogeneity. Distributed Database architecture – Client/Server, Peer-to-Peer distributed systems, MDBS Architecture. Distributed Catalog management.
- 1.3 Distributed Database Design:** Design strategies and issues. Data Replication. Data Fragmentation – Horizontal, Vertical and Mixed. Resource allocation. Semantic Data Control in Distributed DBMS.

Unit 2: **17 hrs.**

- 2.1 Distributed Query Processing:** Query Decomposition and Data localization for distributed data, join ordering, semi-join strategy, Distributed Query optimization methods.
- 2.2 Distributed Transaction Management:** The concept and role of transaction. Properties of transactions-Atomicity, Consistency, Isolation and Durability. Architectural aspects of Distributed Transaction, Transaction Serialization.
- 2.3 Distributed Concurrency Control:** Lock-based and Timestamp-based Concurrency Control methods. Optimistic method for Concurrency Control. Deadlock management- prevention, avoidance detection, and resolution. Non-serializable schedule and nested distributed transaction.

- 2.4 Reliability of Distributed DBMS and Recovery:** Concept and measures of reliability, Failure analysis, types of failures. Distributed Reliability Protocols. Recovery techniques. Two Phase Commit , Presumed abort, Presumed commit. Three phase commit, Partitions, Scalability of Replication.

Unit 3: **16 hrs.**

- 3.1 Object Oriented Database Concept:** Data types and Object, Evolution of Object Oriented Concepts, Characteristics of Object Oriented Data Model. Object Hierarchies - Generalization, Specialization, Aggregation. Object Schema. Inter-object Relationships, Similarities and difference between Object Oriented Database model and Other Data models.
- 3.2 OODBMS Architecture Approach:** The Extended Relational Model Approach. Semantic Database Approach, Object Oriented Programming Language Extension Approach, DBMS Generator Approach, the Object Definition Language and the Object Query Language.
- 3.3** The Object Oriented DBMS Architecture, Performance Issue in Object Oriented DBMS, Application Selection for Object Oriented DBMS, the Database Design for an Object Relational DBMS. The Structured Typed and ADTs, Object identity, Extending the ER Model ,Storage and Access Methods, Query Processing Query Optimization, Data Access API(ODBC,DB Library, DAO,ADO,JDBC,OLEDB), Distributed Computing Concept in COM, COBRA.

Laboratory works: All distributed and OO database components mentioned in this course.

(Practical implementation in Oracle 9i or Oracle 10g covering both Distributed and Object Oriented Database Features)

Reference Book:

1. Principles of Distributed Database Systems; Ozsu, M. Tamer and Patrick Valduriez. Pearson Education.
2. Object Oriented Database System – Approaches and Architectures ; C.S.R. Prabhu, PHI
3. Silberschatz,Abraham, Henry F. Korth and S. Sudarshan: Database System Concepts; McGrawHill International Edition.
4. Gerald V. Post: Database Management System – McGraw Hill International Edition.
5. Peter Rob, Carlos Coronnel: Database Systems – Design, Implementation and Management; Course Technology.
6. R.Cattell: "Object Data management", (1993), Addison-Wesley

Prerequisite: Relational Database Management System, SQL, Computer Network ,
Object Oriented Programming Languages

Homework

Assignment: Assignment should be given throughout the semester.