

Database Management System

Course Title: Database Management System

Course No: BIT202

Nature of the Course: Theory + Lab

Semester: III

Full Marks: 60 + 20 + 20

Pass Marks: 24 + 8 + 8

Credit Hrs: 3

Course Description:

The course covers the basic concepts of databases, database system concepts and architecture, data modeling using ER diagram, relational model, SQL, relational algebra and calculus, normalization, transaction processing, concurrency control, and database recovery.

Course Objective:

The main objective of this course is to introduce the basic concepts of database, data modeling techniques using entity relationship diagram, relational algebra and calculus, basic and advanced features SQL, normalization, transaction processing, concurrency control, and recovery techniques.

Course Contents:

Unit 1: Database Concepts and Architecture (4 Hrs.)

Database, Database Management System, Database Users, and Benefits of Databases; Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; the Database System Environment; Centralized and Client/Server Architectures for DBMSs; Classification of Database Management Systems

Unit 2: Data Modeling Using the Entity-Relational Model (5 Hrs.)

Using High-Level Conceptual Data Models for Database Design; Entity Types, Entity Sets, Attributes, and Keys; Relationship Types, Relationship Sets, Roles, and Structural Constraints; Weak Entity Types; ER Diagrams, Naming Conventions, and Design Issues; Relationship Types of Degree Higher Than Two; Subclasses, Superclasses, and Inheritance; Specialization and Generalization; Constraints and Characteristics of Specialization and Generalization

Unit 3: The Relational Data Model and Relational Database Constraints (5 Hrs.)

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions, and Dealing with Constraint Violations; Basic Relational Algebra Operations

Unit 4: SQL (10 Hrs.)

Data Definition and Data Types; Specifying Constraints; Basic Retrieval Queries; Complex Retrieval Queries; INSERT, DELETE, and UPDATE Statements; Views

Unit 5: Relational Database Design (7 Hrs.)

Relational Database Design Using ER-to-Relational Mapping; Informal Design Guidelines for Relational Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Multivalued Dependency and Fourth Normal Form; Properties of Relational Decomposition

Unit 6: Transaction Processing and Concurrency Control, and Recovery (8 Hrs.)

Introduction to Transaction Processing; Transaction and System Concepts; Desirable Properties of Transactions; Serializable Schedule; Two-Phase Locking and Timestamp Ordering
Concurrency Control Techniques

Unit 7: Database Recovery Techniques (3 Hrs.)

Recovery Concepts; NO-UNDO/REDO Recovery Based on Deferred Update; Recovery Technique Based on Immediate Update; Shadow Paging; Database Backup and Recovery from Catastrophic Failures

Unit 8: NoSQL (3 Hrs.)

Structured and Unstructured Data, Introduction to NoSQL Databases, Discussion of basic architecture of Hbase, Cassandra and MongoDB.

Laboratory Works:

The laboratory work includes writing database programs to create and query databases using basic and advanced features of structured query language (SQL).

Text Books:

1. Fundamentals of Database Systems; Seventh Edition; RamezElmasri, Shamkant B. Navathe; Pearson Education
2. Database System Concepts; Sixth Edition; AviSilberschatz, Henry F Korth, S Sudarshan; McGraw-Hill
3. NoSQL for Dummies; Adam Fowler; John Wiley & Sons, Inc.

Reference Books:

1. Database Management Systems; Third Edition; Raghu Ramakrishnan, Johannes Gehrke; McGraw-Hill
2. A First Course in Database Systems; Jaffrey D. Ullman, Jennifer Widom; Third Edition; Pearson Education Limited