Database Management System

EG2201CT

Year: II **Total: 6 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 2 hours/week

Course description:

This course covers the core principles and techniques required in the design and implementation of database systems. It consists of relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present, Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery.

Course objectives:

The main objectives of this course are:

1. Explain the concepts of database and database management system.
2. Provide knowledge of database design using entity relationship diagram.
3. Perform on SQL statements, normalization, transaction processing, and database recovery.

Course Contents:

Theory

Unit 1. Introduction **[5 Hrs.]**

1.1. History, Database and its applications
1.2. Characteristics
1.3. Architecture
1.4. Data abstraction and Independence
1.5. Schemas and Instances
1.6. Classifications of DBMS
1.7. Introduction to DDL, DML, DCL

Unit 2. Data Models **[8 Hrs.]**

2.1. Introduction to Entity Relationship Model
2.2. Entities type
2.3. Entities set
2.4. Attributes and keys
2.5. Relationship types and sets
2.6. E-R diagrams

Unit 3. Normalization **[6 Hrs.]**

3.1. Importance of Normalization
3.2. Functional Dependencies
3.3. Integrity and Domain constraints
3.4. Normal forms (1NF, 2NF, 3NF, BCNF)

Unit 4. Relational Language **[8 Hrs.]**

4.1. Introduction to SQL
4.2. Features of SQL

4.3. Basic Retrieval queries
4.4. INSERT, UPDATE, DELETE queries
4.5. Join, Semi join and Sub queries
4.6. Views
4.7. Relational Algebra
    4.7.1. Select, Project
    4.7.2. Set Operations
    4.7.3. Cartesian Product
    4.7.4. Join

Unit 5. Query Processing **[6 Hrs.]**

5.1. Introduction to Query Processing
5.2. Query Cost estimation
5.3. Query Operations, Operator TREE
5.4. Evaluation of Expressions
5.5. Query Optimization
5.6. Performance Tuning

Unit 6. Transaction and Concurrency Control **[6 Hrs.]**

6.1. Introduction to Transaction
6.2. Serializability concept
6.3. Concurrent execution
6.4. Lock based Concurrency Control
6.5. 2PL and Strict 2PL
6.6. Timestamp concept

Unit 7. Recovery **[6 Hrs.]**

7.1. Failure Classifications
7.2. Recovery and Atomicity
7.3. IN PLACE and Out of Place Update
7.4. Log based Recovery
7.5. Shadow Paging
7.6. Local Recovery Manager
7.7. UNDO and REDO protocol

Practical: **[30 Hrs.]**

1. SQL Queries on CREATE, INSERT, DELETE, and UPDATE operations.
2. SQL query for SELECT operation.
3. SQL query for ALTER operations.
4. SQL queries on JOIN
5. SQL query using aggregate functions.
6. Apply SQL for specifying constraints.

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	5	8
2	Data Model	8	14
3	Normalization	6	11
4	Relational Language	8	14
5	Query Processing	6	11

6	Transaction and Concurrency Control	6	11
7	Recovery	6	11
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Silberschatz, H.F. Korth, and S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw Hill
2. Ramez Elmasri and Shamkant B. Navathe (2010), Fundamentals of Database Systems, 6 th Edition, Pearson Addison Wesley
3. Raghu Ramakrishnan, and Johannes Gehrke (2007), Database Management Systems, 3rd Edition, McGraw-Hill
4. Jaffrey D. Ullman, Jennifer Widom; A First Course in Database Systems; Third Edition; Pearson Education Limited