22CS851 - DATABASE SYSTEMS

Hours per week:

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Discrete Mathematical Structures

COURSE DESCRIPTION AND OBJECTIVES:

This course presents an introduction to database management systems with an emphasis on how to organize, maintain and retrieve data efficiently from a relational database. It also focuses on requirements gathering and conceptual, logical, physical database design. The objective of the course is to enable the student to understand database design, expressing queries using SQL, query optimization and transaction processing.

MODULE-1

UNIT-1 **8L+0T+4P=12 Hours**

DATABASE SYSTEM CONCEPTS:

Databases and Database Users: Introduction; Characteristics of the database approach; Actors on the scene; Advantages of using DBMS approach.

Database System Concepts and Architecture: 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 DBMS.

Conceptual Data Modeling and Database Design: Entity types, Entity sets, Attributes and keys; Relationship types, Relationship sets, Roles and structural constraints; Weak entity types; Relationship types.

UNIT-2 **8L+0T+12P=20 Hours**

RELATIONA DATABASE DESIGN:

Relational Database Design by Er-To-Relational Mapping: Relational Database design using ER-to-Relational mapping.

The Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and Relational database schemas.

SQL: SQL data definition and data types; specifying constraints in SQL, Basic retrieval queries in SQL; INSERT, DELETE, and UPDATE statements in SQL.

PRACTICES:

- Design ER Model for various real time database applications.
- Development of Relational Database schemas for Company/Student/Sailors/ using DDL constructs of SQL.
- Apply various DML Commands such as select, insert, update etc. of SQL on Relational Database.
- Design of Relational Database schemas by specifying different types of Constraints.
- Apply various Relational Database operators (Arithmetic, Logical &comparison) and string-matching constructs of SQL.
- Expressing queries using Aggregate Functions of SQL on Relational Database.
- Queries on Relational Database using GROUP BY, HAVING and ORDER BY clauses of SQL.

MODULE-2

UNIT–1 **8L+0T+12P=20 Hours**

NORMALIZATION

Complex Queries, Views: More complex SQL retrieval queries; Views (virtual tables) in SQL.

Basics Of Functional Dependencies and Normalization For Relational Databases: Informal design guidelines for relation schemas; Functional dependencies-inference rules, equivalence and minimal cover; Normal forms based on primary keys; Boyce-Codd normal form; Properties of relational decompositions, multivalued dependency, join dependencies.

UNIT–2 **8L+0T+4P=12 Hours**

TRANSACTION PROCESSING

Introduction To Transaction Processing Concepts and Theory: Introduction to transaction processing; Transaction and system concepts; Desirable properties of transactions; Characterizing schedules based on serializability.

Concurrency Control Techniques: Two-phase locking techniques for concurrency control, concurrency control based on timestamp ordering.

Database Recovery Techniques: Recovery concepts; Shadow paging; The ARIES recovery algorithm.

PRACTICES:

- Design and Development of company database and expressing Nested queries using SQL.
- Design and Development of student database and specifying queries using set operations.
- Design and Development of sailor's database and specifying queries using different types of JOINs.
- Creation and dropping of VIEWS.
- Relation R has eight attributes ABCDEFGH. Fields of R contain only atomic values. F = {CH -> G, A -> BC, B -> CFH, E -> A, F -> EG} is a set of functional dependencies (FDs) so that F+ is exactly the set of FDs that hold for R. How many candidate keys does the relation R have?
- Apply various DCL and TCL constructs of SQL on Relational Database.

SKILLS:

- Develop E-R model for real life applications.
- Design of relational databases for real world applications.
- Devise queries using relational algebra and SQL.
- Analyze transaction processing, concurrency control and recovery techniques.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Develop an E-R model for real life applications.	Apply	1	1,10
2	Express queries using database tools like Oracle, DB2, MYSQL.	Apply	2	5,10
3	Devise queries using Relational Algebra and SQL.	Analyze	2	2

4	Design and normalize databases for real time applications.	Create	1	1,3

TEXT BOOKS:

1. Ramez, Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems",7th edition, Pearson Education, 2016.
2. Raghu Rama Krishnan and Johannes Gehrke, "Database Management Systems",3rd edition, TataMcGraw Hill,2013.

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, "Database System Concepts",7th edition, Tata Mc Graw Hill,2019.
2. Allen G. Taylor "Database Development for Dummies", 1st Edition, 2011
3. C. J. Date "introduction to database systems", 7th edition, Addison Wesley, 2003.

Database Management System

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