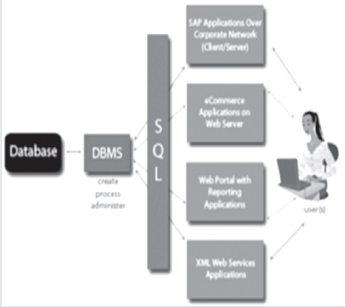
19CS203 DATABASE MANAGEMENT SYSTEMS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	CS	WA/RA	SSH	SA	S	BS
45	-	30	5	5	30	20	5	5



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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, exprssing queries using SQL, query optimization and transaction processing.

Course Outcomes:

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

COs	Course Outcomes	POs
1	Develop an E-R model for real life applications.	2,10
2	Design and normalize databases for real time applications.	1, 3
3	Devise queries using Relational Algebra, Relational Calculus and SQL.	1
4	Evaluate and optimize queries	4
5	Express queries using database tools like Oracle, DB2, MYSQL, Mongo DB.	5, 10

SKILLS:

- ✓ *Understand functional components of the DBMS.*
- ✓ *Devise q*ueries using Relational Algebra and SQL.
- ✓ *Develop E-R model for real life applications.*
- ✓ *Design of relational databases for real world applications.*
- ✓ *Evaluate and optimize queries.*
- ✓ *Understand transaction processing, Concurrency control and recovery techniques.*

UNIT– I **L- 8**

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 of degree higher than two.

ENHANCED ENTITY RELATIONSHIP (EER) MODEL: Subclasses, Superclasses and inheritance, Specialization and generalization, Constraints and characteristics of specialization and generalization hierarchies.

UNIT – II **L- 12**

RELATIONAL DATABASE DESIGN BY ER- AND EER-TO-RELATIONAL MAPPING: Relational database design using ER-to-Relational mapping; Mapping EER model constructs to relations.

THE RELATIONAL DATA MODEL AND RELATIONAL DATABASE CONSTRAINTS: Relational model concepts; Relational model constraints and Relational database schemas. **Basic SQL:** SQL data definition and data types; Specifying constraints in SQL, Basic retrieval queries in SQL; INSERT, DELETE, and UPDATE statements in SQL.

MORE SQL: COMPLEX QUERIES, TRIGGERS, VIEWS: More complex SQL retrieval queries; Specifying constraints as assertions and actions as triggers; Views (virtual tables) in SQL.

RELATIONAL ALGEBRA : Unary relational operations - SELECT and PROJECT; Relational algebra operations from set theory; Binary relational operations - JOIN and DIVISION.

UNIT – III **L- 9**

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; multivalued dependency and 4NF; Join dependencies and 5NF; Properties of relational decompositions.

QUERY PROCESSING AND OPTIMIZATION: Phases of query processing; Translating SQL Queries into Relational Algebra and other operators; Query trees and Heuristics for query optimization.

UNIT – IV **L- 10**

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.

UNIT - V **L- 6**

INDEXING STRUCTURES FOR FILES AND PHYSICAL DATABASE DESIGN: Single level and multi level indexing; Dynamic multi level indexing using B trees and B+ trees.

NOSQL DATABASES AND BIG DATA STORAGE SYSTEMS: Introduction to NoSQL systems; Document-based NoSQL systems and MongoDB.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS: 30**

1. Design Conceptual database schema using ER Modeling Software Tools.
2. Development of Relational Database schemas for Company/Student/Sailors/ using DDL constructs of SQL.
3. Specifying various DML Commands such as select, insert, update etc. of SQL on Relational Database.
4. Specifying various DCL and TCL constructs of SQL on Relational Database.
5. Development of Relational Database schemas by specifying different types of Constraints
6. Specifying queries using Relational Database operators (Arithmetic, Logical & comparison) and string matching constructs of SQL.
7. Expressing queries using Aggregate Functions of SQL on Relational Database.
8. Queries on Relational Database using GROUP BY, HAVING and ORDER BY clauses of SQL.
9. Design and Development of company database and expressing Nested queries using SQL.
10. Design and Development of sailors database and specifying queries using different types of JOINs.
11. Creation and dropping of VIEWS.
12. Implementation of PL/SQL programs with Control Structures.
13. Implementation of PL/SQL programs with Procedures.
14. Implementation of PL/SQL programs with Function.
15. Implementation of PL/SQL programs with Triggers.

TEXT BOOK:

1. Ramez, Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 7th edition, Pearson Education, 2016.

REFERENCE BOOKS:

1. Raghu Rama Krishnan and Johannes Gehrke, “Database Management Systems”, 3rd edition, Tata McGraw Hill, 2013.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, “Database System Concepts”, 6th edition, Tata McGraw Hill, 2010.