Semester: IV	
Programme : B.Sc. Computer Science (Hons)	
Course : DATABASE MANAGEMENT SYSTEM	
Paper code: C2CS230422T / C2CS230422P	**Credits: 4**
Hours/week : Theory: 3 / Practical 2	
Category: Core/MDC/SEC/VAC : Core	
Theory / Practical / Composite : Composite	
No of Modules : 1	

Course Overview: This course provides a comprehensive introduction to Database Management Systems, covering fundamental concepts including data abstraction, ER modeling, relational algebra and normalization techniques to ensure data integrity and minimize redundancy. Students will develop practical skills in conceptual database design, query formulation and performance optimization through file organization and indexing structures (B-trees, hashing), while gaining introduction to advanced topics such as transaction processing, concurrency control and distributed database architectures. Through integrated theoretical instruction and hands-on practice, learners acquire the analytical and design competencies needed to model real-world information systems and implement robust, scalable database solutions aligned with industry standards.

Course Outcome:

1. **Recall and explain** fundamental concepts of DBMS including data abstraction levels (physical, conceptual, external), data models, database languages, DBMS architecture, and roles of database users/administrators.
2. **Apply** Entity-Relationship modeling techniques to design conceptual schemas for real-world problems using ER diagrams with mapping constraints, keys, and extended features (specialization/generalization, aggregation).
3. **Analyze** relational database structures and formulate queries using relational algebra (fundamental & additional operations), relational calculus, and Structured Query Language (SQL) to retrieve and manipulate data effectively.
4. **Evaluate** database designs by applying domain constraints, referential integrity, functional dependencies, and normalization techniques (1NF, 2NF, 3NF, BCNF) to ensure data integrity and minimize redundancy.
5. **Design** efficient file organization and indexing structures (sequential files, primary/secondary/ clustering indexes, B-trees, B+ trees, hashing) to optimize data storage and retrieval operations.
6. **Create** solutions for advanced database scenarios by integrating transaction processing concepts (ACID properties, concurrency control) and distributed database architectures (DDBMS components).

SYLLABUS

UNIT/Module	CONTENT	HOURS	CO Mapping	COGNITIVE LEVEL
I.	Fundamental concepts of DBMS; Purpose of Database Systems; Data Abstraction: Physical, Conceptual and External Levels; Data Models; Database Languages; Database Users; Database Manager; Database Administrator; DBMS Structure.	5	CO1	K1, K2 (Remember/Understand)

II.	Entity Relationship Model: Entity Sets; Relationship Sets; Mapping Constraints; Keys; E-R Diagrams; Strong and Weak Entity Sets; Extended ER Features: Specialization/ Generalization, Aggregation.	6	CO2, CO3	K3, K4 (Apply/Analyse)
III.	Relational Model: Structure of Relational Databases; Database Schema; Query Languages: Relational Algebra (Fundamental & Additional Operations); Relational Calculus; Structured Query Language (SQL).	7	CO2, CO3	K3, K4 (Apply/Analyse)
IV.	Database Design: Constraints (Domain Constraints, Referential Integrity); Functional Dependencies; Normalization: 1NF, 2NF, 3NF and BCNF.	6	CO4	K4, K5 (Analyse/Evaluate)
V.	File Organization: Operations on files; Records (Fixed/Variable Length); Sequential File Organization; Indexing structures (Primary, Secondary, Clustering indexes); B and B+ trees; Hashing.	6	CO5	K5, K6 (Evaluate/Create)
VI.	Introduction to Transaction Processing: ACID properties; Concurrency Control fundamentals.	4	CO6	K5-K6 (Evaluate/Create)
VII.	Introduction to Distributed Databases; Comparison with traditional databases; DDBMS Components.	5	CO6	K1, K2, K6 (Remember/Understand / Create)

Text Books

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.

2. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.

3. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.

4. Distributed Databases: Principles and Systems; Stefano Ceri, Giuseppe Pelagatti, Tata McGraw Hill

Suggested readings

C. J. Date, An Introduction to Database Systems, 8th Edition, Pearson India

Web Resources

https://nptel.ac.in/courses/106105175		
Evaluation	Theory CIA: 12 Attendance: 3 Semester Exam: 45	Practical CA: 38 Attendance: 2
Paper Structure for Theory Semester Exam Module : Answer 3 out of 5 of 15 marks each		

Course outcomes (COs) and Cognitive Level Mapping

COs	CO Description	Cognitive levels
CO1	Recall and explain fundamental concepts of DBMS including data abstraction levels (physical, conceptual, external), data models, database languages, DBMS architecture, and roles of database users/administrators.	K1-K2 (Remember/Understand)
CO2	Apply Entity-Relationship modeling techniques to design conceptual schemas for real-world problems using ER diagrams with mapping constraints, keys, and extended features (specialization/generalization, aggregation).	K3 (Apply)
CO3	Analyze relational database structures and formulate queries using relational algebra (fundamental & additional operations), relational calculus, and Structured Query Language (SQL) to retrieve and manipulate data effectively.	K4 (Analyse)
CO4	Evaluate database designs by applying domain constraints, referential integrity, functional dependencies, and normalization techniques (1NF, 2NF, 3NF, BCNF) to ensure data integrity and minimize redundancy.	K5 (Evaluate)
CO5	Design efficient file organization and indexing structures (sequential files, primary/secondary/clustering indexes, B-trees, B+ trees, hashing) to optimize data storage and retrieval operations.	K6 (Create)
CO6	Create solutions for advanced database scenarios by integrating transaction processing concepts (ACID properties, concurrency control) and distributed database architectures (DDBMS components).	K6 (Create)