CSE2004	DATABASE MANAGEMENT SYSTEM	L	T	P	J	C
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Pre-requisite	**NIL**	**Syllabus version**				
		1.1				

Course Objectives:

1. To understand the concept of DBMS and ER Modeling.
2. To explain the normalization, Query optimization and relational algebra.
3. To apply the concurrency control, recovery, security and indexing for the real time data

Expected Course Outcome:

1. Explain the basic concept and role of DBMS in an organization.
2. Illustrate the design principles for database design, ER model and normalization.
3. Demonstrate the basics of query evaluation and heuristic query optimization techniques.
4. Apply Concurrency control and recovery mechanisms for the desirable database problem.
5. Compare the basic database storage structure and access techniques including B Tree, B+ Tress and hashing
6. Review the fundamental view on unstructured data and its management.
7. Design and implement the database system with the fundamental concepts of DBMS

Student Learning Outcomes (SLO):	**1, 5, 7**

Module:1	**Database Systems Concepts and Architecture**	**4 hours**

History and motivation for database systems -characteristics of database approach - Actors on the scene - Workers behind the scene - Advantages of using DBMS approach – Data Models, Schemas, and Instances – Three-Schema Architecture and Data Independence – The Database System Environment – Centralized and Client/Server Architectures for DBMSs – Classification of database management systems.

Module:2	**Data Modeling**	**6 hours**

Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity constraints

Module:3	**SCHEMA REFINEMENT**	**7 hours**

Guidelines for Relational Schema – Functional dependency; Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form; Join dependency and Fifth Normal form.

Module:4	**Physical Database Design**	**7 hours**

Indexing and Hashing: Single level indexing, multi-level indexing, dynamic multilevel Indexing, Ordered Indices – B+ tree Index Files – Static Hashing – Dynamic Hashing.

Module:5	**Query Processing**	**4 hours**

Translating SQL Queries into Relational Algebra - heuristic query optimization – cost based query optimization.

Module:6	**Transaction Processing**	**5 hours**

Introduction to Transaction Processing - Transaction and System concepts – Desirable properties of Transactions-Characterizing schedules based on recoverability - Characterizing schedules based on serializability.

Module:7	**Concurrency Control and Recovery Techniques, NOSQL Management**	**10 hours**

Two-Phase Locking Techniques for Concurrency Control – Concurrency Control based on timestamp – Recovery Concepts – Recovery based on deferred update – Recovery techniques based on immediate update - Shadow Paging.

Introduction to NoSQL, CAP Theorem, NoSQL data models: Key-value stores, Column families, Document databases.

Module:8	Recent Trends	2 hours
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019.
2.	RamezElmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
Reference Books	
1.	Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Fourth Edition, Tata McGraw Hill, 2014.
2.	Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6thEdition, Pearson,2015
3.	Meier, Andreas, Kaufmann, Michael, "SQL & NoSQL Databases - Models, Languages, Consistency Options and Architectures for Big Data Management", Springer, 2019
4.	C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006
5.	Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2012.

Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar

List of Experiments		
1.	SQL tool, Data types in SQL, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables	3 hours
2.	Practice Queries using Aggregate Functions (COUNT, SUM, AVG, MAX, MIN) and GROUP BY, HAVING, VIEWS Creation and Dropping.	3 hours
3.	Practicing Sub queries Joins (Inner, Outer and Equi) and (Nested, Correlated)	3 hours
4.	Practicing Queries using Constraints	3 hours
5.	Practicing Queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, CONSTRAINTS etc.	3 hours
6.	While looping in sql server	3 hours
7.	Creation of Stored Procedures, Execution of Procedure, and Modification of Procedure	3 hours
8.	Declaring Cursor, Opening Cursor, Fetching the data, closing the cursor	2 hours
9.	Practicing Trigger Creation, Insertion, Deletion and Updation.	2 hours
10	Practicing User Defined Exception and System Defined Exception.	2 hours
11.	Database Application development	3 hours
	Total Laboratory Hours	**30 hours**

Mode of Evaluation: Project/Activity

Recommended by Board of Studies	09-09-2020		
Approved by Academic Council	No. 59	Date	24-09-2020