DATABASE MANAGEMENT SYSTEMS

IV Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACSB08	Core	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the role of database management system in an organization and learn the database Concepts.
II. Design databases using data modeling and Logical database design techniques.
III. Construct database queries using relational algebra and calculus and SQL.
IV. Understand the concept of a database transaction and related concurrent, recovery facilities.
V. Learn how to evaluate a set of queries in query processing.

COURSE OUTCOMES (COs):

1. Describe Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Various Components of overall DBS architecture, Various Concepts of ER Model, Basics of Relational Model.
2. Determine Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus: Tuple relational calculus, Domain relational calculus, expressive power of algebra and calculus.
3. Understand SQL – Data Definition commands, Queries with various options, Mata manipulation commands, Views, Joins, views, integrity and security; Relational database design: Pitfalls of RDBD, Lossless join decomposition, Functional dependencies , Armstrong Axioms, Normalization for relational databases 1st , 2nd and 3rd normal forms, Basic definitions of MVDs and JDs, 4th and 5th normal forms.
4. Explore the concept of Transaction, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability. Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities, Multiversion Schemes, Deadlock Handling. Recovery: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Shadow Paging, Recovery with Concurrent Transactions Buffer Management.
5. Knowledge the Physical Storage Media, Magnetic Disks, Storage Access, File Organization, Organization of Records in Files. Indexing and Hashing: Basic Concepts: Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing. Query Processing: Overview, Measures of Query Cost.

COURSE LEARNING OUTCOMES (CLOs):

1. Define the terminology, features, and characteristics of database system.
2. Differentiate database systems from file systems by enumerating various features provided by database systems.
3. Describe Data Models, Schemas, Instances, Three Schema Architecture and DBMS Component Modules.
4. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.
5. Model the real world database systems using Entity Relationship Diagrams (ERD) from the requirements specification.
6. Describe basics of the relational data model.

7. Define and illustrate the Relational Data Model, Constraints and Schemas.
8. Transform an information model into a relational database schema and implement schema using data definition language and/or utilities.
9. Formulate solutions to a broad range of query problems using relational algebra.
10. Apply relational calculus to solve broad range of query problems.
11. Illustrate the Functional Dependencies, Inference Rules, Minimal Sets of FDs.
12. Understand normalization theory and criticize a database design and improve the design by normalization.
13. Explain various Normal Forms and Apply to normalize a database.
14. Understand the SQL Data definition statements to formulate solutions to a broad range of query and data update problems.
15. Use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
16. Use SQL queries for data aggregation, calculations, views, sub-queries, embedded queries, manipulation, and report generation.
17. Demonstrate PL/SQL including stored procedures, stored functions, cursors, packages.
18. Gain knowledge on transaction processing to maintain consistency and integrity of data in database systems.
19. Describe concurrency control techniques to implement data integrity in database systems.
20. Illustrate various backup and recovery techniques for database systems.
21. Analyze transaction processing , concurrency control, Database recovery techniques..
22. Define disk storage devices, files of records, unordered files, ordered files and hashed files and organizations.
23. Familiar with basic database storage structures and access techniques- file and page organizations, indexing methods.
24. Illustrate various operations in implementing data indices using various hashing techniques.
25. Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.

MODULE-I	CONCEPTUAL MODELING INTRODUCTION
Introduction to Data bases: Purpose of Database Systems, View of Data, Data Models, Database Languages, Database Users, Various Components of overall DBS architecture, Various Concepts of ER Model, Basics of Relational Model	
MODULE-II	**RELATIONAL APPROACH**
Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus: Tuple relational calculus, Domain relational calculus, expressive power of algebra and calculus.	
MODULE-III	**SQL QUERY - BASICS , RDBMS - NORMALIZATION**
SQL – Data Definition commands, Queries with various options, Mata manipulation commands, Views, Joins, views, integrity and security; Relational database design: Pitfalls of RDBD, Lossless join decomposition, Functional dependencies , Armstrong Axioms, Normalization for relational databases 1st , 2 nd and 3rd normal forms, Basic definitions of MVDs and JDs, 4th and 5th normal forms.	
MODULE-IV	**TRANSACTION MANAGEMENT**
Transaction processing: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability. Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Multiversion Schemes, Deadlock Handling. Recovery: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Shadow Paging, Recovery With Concurrent Transactions Buffer Management.	
MODULE-V	**DATA STORAGE AND QUERY PROCESSING**
Data storage: Overview of Physical Storage Media, Magnetic Disks, Storage Access, File Organization, Organization of Records in Files. Indexing and Hashing: Basic Concepts: Ordered Indices, B+-Tree Index Files, B-Tree Index Files, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing. Query Processing: Overview, Measures of Query Cost.	

Text Books:
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 6 th Edition, 2017.
Reference Books:
1. Michael H.Goldwasser, David Letscher, “Object Oriented Programming in Python”, Prentice Hall, 1st Edition, 2007. 2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2007. 3. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000. 4. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003.
Web References:
1. https://www.youtube.com/results?search_query=DBMS+onluine+classes 2. http://www.w3schools.in/dbms/ 3. http://beginnersbook.com/2015/04/dbms-tutorial