	Advanced Database Management Systems	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Data structures and algorithms, programming knowledge				
Co-requisites					

Course Objectives

1. To understand the architecture and functioning of database management systems as well as associated tools and techniques.
2. To understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization.
3. To acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications.
4. To be familiar with the contemporary database models like OO Databases, Distributed Databases etc.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain the terminologies, features and models of database systems.

CO2. Analyze various disk storage, Indexing and hashing techniques for data storage.

CO3. Formulate SQL queries using relational algebra and relational calculus.

CO4. Apply normalization theory to database design.

CO5. Develop database applications using integrity constraints, transaction management and concurrent control algorithms.

CO6. Discuss database models like Object Oriented Databases, Distributed Database.

Catalog Description

A Database management system allows users to define, store, retrieve and update the information contained in the database on demand. Information can be anything that is of significance to an individual or organization. In this course, the focus will be on: Relational model, query writing and

procession, Integrity constraints ER, EER Model, storage structures of database systems, transactional database systems & the techniques of concurrency control and recovery, contemporary databases. Students are encouraged to play an active role in the construction of their own knowledge and in the design of their own learning strategies.

Course Content

UNIT I:

Overview Of Databases and Data Modelling 08 Lecture Hours

Database & Database users and basics of SQL, characteristics and advantages of the database, Database systems, concepts and architecture, Data models, schemas & instances, Codd's Rule ,Three-Schema architecture & data independence, database languages & interfaces, Centralized and Client/Server Architecture of DBMS, Classification of DBMS. ER Diagrams, EER Diagrams, Mapping of Er and EER Model to Relations.

UNIT II:

Relational Algebra and Normalization 06 Lecture Hours

Relational model Concepts, Relational model constraint & relational database schemas, transactions, and dealing with constraint Violation, DBMS Keys, Relational Algebra, Unary relational operation, Binary relational operations and ,relational algebra operations from set Theory, Relational Calculus; and implementation in SQL, Informal Design guideline for relational Schemas, Functional Dependencies, Normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition, Multivalued dependencies (4NF, 5NF), domain key normal form.

UNIT III:

DBMS Architecture, Query Processing and Optimization 08 Lecture Hours

DBMS Instance, DBMS Internal Memory Structure, Background Processes, Data Types, Roles & Privileges, Introduction to Query Processing, Translating SQL Queries into Relational Algebra, , Algorithms for External Sorting, Algorithms for SELECT and JOIN Operations , Algorithms for PROJECT and SET Operations, Implementing Aggregate Operations and Outer Joins.

UNIT IV:

Disk Storage, Basic File Structures, Hashing and Indexing 08 Lecture Hours

Introduction, Secondary Storage Devices, Buffering of Blocks and Placing File Records on Disk, Operations on Files, Heap Files, Sorted Files, Hashing Techniques, Parallelizing Disk Access using RAID Technology, Secondary Access Paths, Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees, Indexes on Multiple Keys.

UNIT V:

Transaction Management, Concurrency Control and Recovery Techniques 12 Lecture Hours

Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules based on Recoverability, Characterizing Schedules based on Serializability. Introduction to Concurrency Control, Two Phase Locking Techniques, Concurrency Control on Timestamp Ordering, Validation Concurrency Control Techniques, Granularity of Data items and Multiple Granularity Locking, Recovery Concepts, Recovery Techniques Based on Deferred and Immediate Update, Shadow Paging.

UNIT VI:

OODB and Distributed Database 06 Lecture Hours

Overview of Object-Oriented Concepts, Object Model of ODMG, Object Definition Language, Object Query Language, Object Database Conceptual Design, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques for Distributed Design, Types of Distributed Database Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and recovery techniques in Distributed Databases

Text Books

1. Fundamentals of Database Systems by RamezElmasri and Shamkant B. Navathe, Pearson India

Reference Books

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw-Hill
2. Database Systems-The Complete Book by Jeffrey D. Ullmam, Pearson India

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	MSE	Assignment/ Test/Quiz etc	ESE
Weightage (%)	20%	30%	50%

Relationship between the Course Outcomes (COs), Program Outcomes (POs) and Program Specific Objectives(PSOs)

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3	2	2									2	3	
CO2		3	2	2									2	3	
CO3		3	2	3									2	3	
CO4		3	2	3									2	3	
CO5		3	2	2									2	2	
CO6		2	1	1									2	1	
Average		2.8	1.8	2.16									2	2.5	

1=weak 2= moderate 3=strong