DATABASE MANAGEMENT SYSTEM

SUBJECT CODE: CE 305

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme		Mid Sem Exam	CIA	Pract.	Total
L	T	P	Total		Theory					
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
03	00	02	05	04	03	70	30	20	30	150

Learning Objectives:

The educational Objectives of this Course are:

- To learn the fundamentals of data models and to conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To understand the internal storage structures which will help in physical DB design.
- To know the fundamental concepts of transaction processing- concurrency controltechniques and recovery procedure.
- To have an introductory knowledge about the Storage and Query processing techniques

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Database Management System – Concepts and Architectures	6
2	Database Storage Structures	3
3	Data Models	6
4	Relational Database design	5
5	Transaction Management	8
6	Backup and Recovery Techniques	6
7	Query Processing and Evaluation	5
8	Database Security and Authorization	6
9	SQL/PL	Covered in Lab
10	Emerging Databases and Case Studies	

Total hours (Theory): 45

Total hours (Lab): 30

Total hours: 75

Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weightage %

1	**Chapter 1. Database Management System – Concepts and Architectures**
	• Introduction and Purpose
	• Database Architectures
	  o Centralised
	  o Client-Server
	  o Server system
	    ▪ Transaction servers
	    ▪ Data servers
	    ▪ Cloud based servers
	  o Parallel
	  o Distributed
	  o Web based system
	    ▪ Web architecture (2 tier , 3 tier, N-tier Architecture)
	    ▪ Web services – SOAP
		6	10

2	**Chapter 2. Database Storage Structures** • Introduction • Database - Tablespace, Segment, Extent, Block, Data File • Indexing, Hashing, Clusters • Data Dictionary and Dictionary Views	3	5
3	**Chapter 3. Data Models** • Introduction to various data models – Record based & Object based • Cardinality Ratio & Relationships • Representation of entities, attributes, relationship attributes, relationship set, Generalization, aggregation • Structure of relational Database and different types of keys • Codd's rules and Relational data model & relational algebra	6	5
4	**Chapter 4. Relational Database design** • Basic System Development Life Cycle • Database Design – ER to Relational • Functional dependencies • Normalization • Normal forms based on primary keys (1NF, 2NF, 3NF, BCNF, 4NF, 5NF) • Loss less joins and dependency preserving decomposition	5	10
5	**Chapter 5. Transaction Management**	8	20

	• Introduction
	• What is a Transaction?
	  o Transaction Properties
	  o Transaction Management with SQL
	  o The Transaction Log
	• Concurrency Control
	  o Concurrency control with Locking Methods
	  o Types of Locks
	  o Two-Phase Locking to Ensure Serializablility
	  o Deadlocks
	• Concurrency Control Methods		

6	**Chapter 6. Backup and Recovery Techniques** • Introduction • User Managed Backups • Recovery Manager Backups - RMAN • Transaction Recovery • System Recovery • Media Recovery	6	10

7	**Chapter 7. Query Processing and Evaluation**
	• Introduction
	• Query Interpretation
	• Equivalence of Expressions
	  o Selection Operation
	  o Natural Join Operations
	  o Projection Operations
	  o Three-Way Join
	• Estimation of Query-Processing Costs
	• Estimation of Costs of Access Using Indices
	• Structure of Query Optimizer
		5	10

8	**Chapter 8. Database Security and Authorization** • Introduction • Security and Integrity Violations • Managing Users • Authorization-Privileges and Roles • Views • Integrity Constraints • Database Auditing	6	10
9	**Chapter 9. PL/SQL and RMAN** **SQL:** • DDL(Data Definition Language) • DML(Data Manipulation Language) • DRL(Data Retrieval Language) • DCL(Data Control Language) • TCL(Transaction Control Language) • SQL Functions and Aggregate Functions • Join Operations • Views	Covered in Lab Sessions	20

	• Audit Trails • Plan Table **PL:** • PL/SQL Block • Control Structures • Cursor, Trigger • Procedure • Functions **RMAN Recovery Scenarios**		
10	**Chapter 10. Emerging Databases and Case Studies** • Limitations of Conventional Databases • Multimedia Database, • Temporal Databases, • Spatial Databases • Cloud Databases • Google Big Table • No SQL • SQLite	Part of Lab	NA
	TOTAL	**45**	**100**

Instructional Method and Pedagogy:
- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

On successful completion of the course, the student will:

- Identify and define the information that is needed to design a database management system for a business information problem.
- Create conceptual and logical database designs for a business information problem.
- Build a database management system that satisfies relational theory and provides users with business queries.
- Understand the core terms, concepts, and tools of relational database management systems.
- Create and maintain databases and tables..

- Manipulate data in a database using SQL.
- Manage transactions and locks to ensure data concurrency and recoverability.
- Manage users, privileges and resources
- Start up and shut down an Oracle instance and database
- Study fundamentals of Recent and Emerging Database Systems in Market.

Reference Books:
1. Principles of Distributed Database Systems by M. TAMER OZSU, Patrick Valduriez, S. Sridhar (Pearson Publication)
2. Database system concepts', 6th Edition –Abraham Silberschatz, Henry Korth, S, Sudarshan, (McGraw Hill International)

List of experiments:

Sr. No.	Practical Aim
1	Creating and Manipulating Database objects and Applying Constraints (DDL)
2	Manipulating Data with Database Objects (DML)
3	Retrieving, Restricting and Sorting Data (DRL)
4	SQL Single Row Functions
5	SQL Multiple Row Functions (Aggregate Function)
6	Displaying Data from Multiple Tables (Join)
7	Using Commit and Rollback show Transaction ACID Property.
8	Securing data using Views and Controlling User Access (DCL)
9	Write a join query based on two tables and analyse the query using action plan and Audit Trails.
10	PL/SQL Block Syntax and DML Operation through PL/SQL Block
11	Control Structures in PL/SQL
12	Working with Cursor
13	Creating Procedures and Functions in PL/SQL
14	Creating Database Triggers
15	Database Recovery Scenarios using Recovery Manager(RMAN)