Course Code	Course Title	L	T	P	C
PMCA503L	Database Systems	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives:

1. To understand, analyze and design databases.
2. To emphasize on the understanding of data models, architecture and administration.
3. To appreciate the internal functioning of database management systems.

Course Outcomes:

1. Identify the basic concepts of database and various data models used in DB design
2. Design conceptual models to represent simple database application scenarios
3. Convert high-level conceptual model to relational data model and to improve a database design by normalization
4. Populate and query a database using SQL and PL/SQL. Also apply Query processing and indexing techniques to optimize the database system performance
5. Apply and relate the concept of transaction, concurrency control and recovery on data

Module:1	Fundamentals of DBMS	6 hours

Introduction to Databases - Database Environment - Database Architectures - Data Models, Entity - Relationship Modeling, Enhanced Entity-Relationship Modeling

Module:2	Relational Model	6 hours

The Relational Model - Terminology, Integrity Constraints, Logical Database Design, ER and EER to Relational Mapping, Relational Algebra - Binary, Unary Operators, Aggregate and GROUP BY

Module:3	Design using Normalization Theory	6 hours

Data Redundancy and Update Anomalies, Functional Dependencies, Process of Normalization - 1NF - 2NF - 3NF - Functional Dependencies - Inference Rules, Minimal sets of Functional Dependencies - BCNF - 4NF - 5NF, Lossless-Join algorithms of Normal Forms

Module:4	SQL and PL/SQL	7 hours

SQL - Data Definition, Views, Data Manipulation and Transaction Control Languages, Advanced SQL - Declarations, Control Statements, Exception, Cursor, Subprograms, Triggers and ADT

Module:5	Query processing and Physical database design	6 hours

Query processing - Query Decomposition, Heuristical Approach to Query Optimization, Indexing - Sparse and Dense, BTree Vs Hash, Tuning Physical Design - Index and Query Rewriting

Module:6	Transaction Management	6 hours

Properties of Transaction, Concurrency Control - The Need for Concurrency Control, Serializability and Recoverability, Locking and Timestamp Methods, Multiversion Techniques, Recovery - Need, Techniques		
Module:7	**Advanced Database Models**	**6 hours**
Temporal Database Concepts - Spatial Database Concepts - Distributed Database Concepts - NoSQL Databases - Introduction to MongoDB - Datamodels, CRUD Operations and Sharding.		
Module:8	**Contemporary Issues**	**2 hours**
Guest Lecture from Industry and R & D Organizations		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	RamezElmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", 2016, 7th Edition, Pearson Education, Delhi.
2.	Thomas Connolly, Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation, and Management", 2015, 6th Edition, Pearson Education, USA.

Reference Books	
1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", 2020, 7th Edition, McGraw Hill, Delhi.
2.	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 2007, 3rd Edition, McGraw Hill, Delhi.
3.	Shannon Bradshaw, Eoin Brazil, Kristina Chodorow, "MongoDB: The Definitive Guide: Powerful and Scalable Data Storage", 2019, 3rd Edition, O'Reilly.

Mode of Evaluation: CAT, Written Assignment, Quiz, FAT and Seminar			
Recommended by Board of Studies	04-05-2023		
Approved by Academic Council	No. 70	Date	24-06-2023