Course code	Course Title	L	T	P	C
BITE302L	Database Systems	3	0	0	3
Pre-requisite	BITE201L, BITE201P	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 security control in data

Module:1	Basics of databases	5 hours

Introduction to Database - Purpose and Applications - Data Models - Data Abstraction - Instance and Schemas - Database Languages - Database Users and User Interfaces - Database Architecture - Classification

Module:2	Conceptual database design	5 hours

High-Level Conceptual Data Models for Database Design - Entity Types - Entity Sets - Attributes and Keys - Relationship Types - Relationship Sets - Roles and Structural Constraints - Weak Entity Types - ER Diagrams - Naming Conventions and Design Issues - Relationship Types of Degree Higher than Two - EER diagrams

Module:3	Relational database design	7 hours

Relational Model Constraints - Update Operations - Dealing with Constraint Violations - Relational Algebra - Unary and Binary Relational Operations - Additional Relational Operations - Database Design Using ER - EER-to-Relational Mapping

Module:4	Design using Normalization Theory	6 hours

Informal Design Guidelines for Relation Schemas - Functional Dependencies - Inference Rules - Equivalence and Minimal Cover - Properties of Relational Decompositions - Algorithms for Relational Database Schema Design - Normal Forms Based on Primary Keys - Boyce-Codd Normal Form - 4NF - 5NF

Module:5	SQL and PL/SQL	7 hours

Data Definition and Data Types - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL - Virtual Tables - In-built functions - Complex Queries-nested – Correlated - PL/SQL block – Cursor – Function – Procedure – Trigger

Module:6	Query Processing and Indexing	6 hours

Query Execution plan - Basic algorithms for query execution - Heuristic Query Optimization technique - Sparse and Dense Index - Primary, Secondary and Clustered Index - B Tree Vs. Hash Index

Module:7	Transaction Processing, Concurrency Control and Recovery	7 hours

Introduction to Transaction Processing - Desirable Properties of Transactions - Characterizing Schedules Based on Serializability – Concurrency - Two-Phase Locking Techniques for Concurrency Control - Multi-version Techniques - Recovery Concepts - NO-UNDO/REDO Recovery Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging - ARIES Recovery Algorithm.		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book	
1.	Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, 2016, 7th Edition, Pearson Education, Delhi.
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.

Mode of Evaluation: Continuous Assessment Tests, Assignment, Quiz, Final Assessment Test			
Recommended by Board of Studies	20-05-2022		
Approved by Academic Council	No. 66	Date	16-06-2022