Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
TEITC504	Advanced Database Management Systems	4	-	-	4	-	-	4
		Examination Scheme						
		ISE	MSE		ESE			
		10	30		100 (60%Weightage)			

Pre-requisite Course Codes		IT43 (Database management System)
After successful completion of the course, student will be able to:		
Course Outcomes	CO1	Construct complex queries using SQL to retrieve and manipulate information in a database.
	CO2	Design and implement real life applications integrated with database systems
	CO3	Apply Security controls to avoid any type of security incidents on vital database systems.
	CO4	Describe Distributed databases concepts and Object oriented database concepts.
	CO5	Correlate the importance of enterprise data and be able to organize data to perform analysis on the data and take strategic decisions.

Module No.	Topics	Ref.	Hrs.
1	**Introduction** Reviewing basic concepts of a relational database, Basic SQL	2,5	1
2	**Advanced SQL** Complex Retrieval Queries using Group By, Recursive Queries, nested Queries ; Specifying Constraints as Assertions; Event Condition Action (ECA) model (Triggers) in SQL; Creating and working with Views in SQL; Database Programming: Embedded SQL, Dynamic SQL and SQLJ, Database Programming with Function Calls: JDBC; Stored Procedures in SQL, Embedded SQL, Dynamic SQL.	1,2	6
3	**Advanced Transaction Processing & Recovery** Review of ACID properties and Serializability ; Multiversion Concurrency Control Techniques; Granularity of Data Items and Multiple Granularity Locking ; Advanced Database Recovery techniques like Write Ahead Logging (WAL), ARIES, Checkpoints.	1,2	6

4	**Data Security** Introduction to Database Security Issues; Discretionary Access Control Based on Granting and Revoking Privileges; Mandatory Access Control and Role-Based Access Control for Multilevel Security; SQL Injection; Introduction to Statistical Database Security Introduction to Flow Control	1,2,6	4
5	**Storage and Indexing** Operation on Files; hashing Techniques; Types of Single-Level Ordered Indexes; Multilevel Indexes; Dynamic Multilevel Indexes Using B-Trees and B+-Trees; Indexes on Multiple Keys.	1,2	4
6	**Distributed Databases** Types of Distributed Database Systems; Distributed Database Architectures; Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design; Query Processing and Optimization in Distributed Databases; Overview of Transaction Management in Distributed Databases; Overview of Concurrency Control and Recovery in Distributed Databases.	1,8	6
7	**Object Based Databases** Overview of Object Database. Concepts; Object-Relational Features; Object Database Extensions to SQL; The Object Definition Language ODL; Object Database Conceptual Design; The Object Query. Language OQL.	1,2	5
8	**Introduction to Data warehousing** The Need for Data Warehousing; Increasing Demand for Strategic Information; Inability of Past Decision Support System; Operational Vs Decisional Support System; 1.3 Data Warehouse Defined; Benefits of Data Warehousing ; Features of a Data Warehouse; The Information Flow Mechanism; Role of Metadata; Classification of Metadata; Data Warehouse Architecture; Different Types of Architecture; Data Warehouse and Data Marts; Data Warehousing Design Strategies.	3,4,7	2
9	**Dimensional Modeling** Data Warehouse Modeling Vs Operational Database Modeling; Dimensional Model Vs ER Model; Features of a Good Dimensional Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables. The Fact less Fact Table; Updates To Dimension Tables: Slowly Changing Dimensions, Type 1 Changes, Type 2 Changes, Type 3 Changes, Large Dimension Tables, Rapidly Changing or Large Slowly Changing Dimensions, Junk Dimensions, Keys in the Data Warehouse Schema, Primary Keys, Surrogate Keys & Foreign Keys; Aggregate Tables; Fact Constellation Schema or Families of Star.	3,4,7	6

10	**ETL Process** Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Extracting Data: Immediate Data Extraction, Deferred Data Extraction; Data Transformation: Tasks Involved in Data Transformation, Data Loading: Techniques of Data Loading, Loading the Fact Tables and Dimension Tables Data Quality; Issues in Data Cleansing.	3,4,7	4
11	**Online Analytical Processing (OLAP)** Need for Online Analytical Processing; OLTP vs OLAP; OLAP and Multidimensional Analysis; Hypercubes; OLAP Operations in Multidimensional Data Model; OLAP Models: MOLAP, ROLAP, HOLAP, DOLAP;	3,4,7	4
	Total		48

References:

1. Elmasri and Navathe, "*Fundamentals of Database Systems*", 6th Edition, PEARSON Education.
2. Korth, Slberchatz, Sudarshan, "*Database System Concepts*", 6th Edition, McGraw – Hill
3. Theraja Reema, "*Data Warehousing*", Oxford University Press, 2009.
4. Paulraj Ponniah, "*Data Warehousing: Fundamentals for IT Professionals*", Wiley India.
5. C. J. Date, A. Kannan, S. Swamynathan "*An Introduction To Database Systems*", 8th Edition ,Pearson Education.
6. Raghu Ramakrishnan and Johannes Gehrke, "*Database Management Systems*" 3rd Edition - McGraw Hill
7. Ralph Kimball, Margy Ross, "*The Data Warehouse Toolkit: The Definitive Guide To Dimensional Modeling*", 3rd Edition. Wiley India.