Savitribai Phule Pune University, Pune
First year of MCA (2020 Course)
310912: Database Management System

Teaching Scheme:	Credit	Examination Scheme:
TH: 03 Hours/Week	03	Internal: 30 Marks External : 70 Marks

Prerequisite courses, if any: Discrete Mathematics, Data Structures

Companion Course, if any: Database Management System Lab

Course Objectives:

- To understand the fundamental concepts of database management. These concepts include aspects of database design, database languages, and database-system implementation.
- To provide a strong formal foundation in database concepts, technology and practice.
- To give systematic database design approaches covering conceptual design, logical design and an overview of physical design.
- Be familiar with the basic issues of transaction processing and concurrency control.
- To learn and understand various Database Architectures and Applications.
- To learn a powerful, flexible and scalable general purpose database to handle big data.

Course Outcomes:

On completion of the course, learner will be able to–

CO1: Design E-R Model for given requirements and convert the same into database tables.
CO2: Use database techniques such as SQL & PL/SQL.
CO3: Use modern database techniques such as NOSQL.
CO4: Explain transaction Management in relational database System.
CO5: Describe different database architecture and analyses the use of appropriate architecture in real time environment.
CO6: Students will be able to use advanced database Programming concepts Big Data – HADOOP

Course Contents

Unit I	Introduction	07 Hours

Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, View of Data, Database Languages, Database System Structure, Data Models, Database Design and ER Model: Entity, Attributes, Relationships, Constraints, Keys, Design Process, Entity Relationship Model, ER Diagram, Design Issues, Extended E-R Features, converting E-R & EER diagram into tables.

Unit II	SQL AND PL/SQL	07 Hours

SQL: Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updating using Views, Indexes, SQL DML Queries: SELECT Query and clauses, Set Operations, Predicates and Joins, Set membership, Tuple Variables, Set comparison, Ordering of Tuples, Aggregate Functions, Nested Queries, Database Modification using SQL Insert, Update and Delete Queries. PL/SQL: concept of Stored Procedures & Functions, Cursors, Triggers, Assertions, roles and privileges , Embedded SQL, Dynamic SQL.

Unit III	Relational Database Design	07 Hours

Relational Model: Basic concepts, Attributes and Domains, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional

Dependencies, Algorithms for Decomposition, 2NF, 3NF, BCNF.

Unit IV	Database Transactions and Query Processing	07 Hours

Basic concept of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Timestamping Methods, Recovery methods : Shadow-Paging and Log-Based Recovery, Checkpoints, Query Processing, Query Optimization, Performance Tuning.

Unit V	Parallel and Distributed Databases	07Hours

Introduction to Database Architectures: Multi-user DBMS Architectures, Parallel Databases: Speedup and Scale up, Architectures of Parallel Databases.
Distributed Databases: Architecture of Distributed Databases, Distributed Database Design, Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.

Unit VI	NoSQL Database	07 Hours

Introduction to NoSQL Database, Types and examples of NoSQL Database- Key value store, document store, graph, Performance, Structured verses unstructured data, Distributed Database Model, CAP theorem and BASE Properties, Comparative study of SQL and NoSQL, NoSQL Data Models, Case Study-unstructured data from social media. Introduction to Big Data, HADOOP: HDFS, MapReduce.

Learning Resources:

Text Books:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", McGraw Hill Publishers, ISBN 0-07-120413-X, 6th edition
2. Connally T, Begg C., "Database Systems", Pearson Education, ISBN 81-7808-861-4
3. Pramod J. Sadalage and Martin Fowler, ―NoSQL Distilled‖, Addison Wesley, ISBN10: 0321826620, ISBN-13: 978-0321826626

Reference Books:

1. C J Date, ―An Introduction to Database Systems‖, Addison-Wesley, ISBN: 0201144719
2. S.K.Singh, ―Database Systems : Concepts, Design and Application‖, Pearson, Education, ISBN 978-81-317-6092-5
3. Kristina Chodorow, Michael Dirolf, ―MangoDB: The Definitive Guide‖ ,O'Reilly Publications, ISBN: 978-1-449-34468-9.
4. Adam Fowler, ―NoSQL For Dummies‖, John Wiley & Sons, ISBN-1118905628
5. Kevin Roebuck, ―Storing and Managing Big Data - NoSQL, HADOOP and More‖, Emereopty Limited, ISBN: 1743045743, 9781743045749
6. Joy A. Kreibich, ―Using Sqlite‖, O'REILLY, ISBN: 13:978-93-5110-934-1
7. Garrett Grolemund, ―Hands-on Programming with R‖, O'REILLY, ISBN : 13:978-93- 5110-728-6

e-Books: <web links>

1. http://www.freebookcentre.net/database-books-download/Introduction-to-Database-Systems.html

MOOC Courses: <web links>

1. https://www.coursera.org/courses?query=database
2. https://cs.stanford.edu/people/widom/DB-mooc.html
3. www.edx.org