DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - DATA SCIENCE

COURSE MODULE FOR THE SESSION 2025-2026 (EVEN SEMESTER)

Course Syllabi with COs

Academic Year: 2025 – 2026							Faculty Name : Dr. Vinod Kumar P

Department: Computer Science and Engineering (Data Science)

Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BCS403	Database Management System	Core	-	3	-	2	40 + 16

Objectives	This course will enable students to: 1. To Provide a strong foundation in database concepts, technology, and practice. 2. To Practice SQL programming through a variety of database problems. 3. To Understand the relational database design principles. 4. To Demonstrate the use of concurrency and transactions in database. 5. To Design and build database applications for real world problems. 6. To become familiar with database storage structures and access techniques.

Topics Covered as Per Syllabus

Module 1:

Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications.

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment.

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets and structural constraints, Weak entity types, ER diagrams, Specialization and Generalization.

Textbook 1: Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10   **RBT:** L1, L2, L3

Module-2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations.

Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.

Mapping Conceptual Design into a Logical Design: Relational Database Design using ER-to-Relational mapping.

Textbook 1: Ch 5.1 to 5.3, Ch 8.1 to 8.5; Ch 9.1 to 9.2 Textbook 2: 3.5   **RBT:** L1, L2, L3

Module-3

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

SQL: SQL data definition and data types, Schema change statements in SQL, specifying constraints in SQL,

0821-2954081
0821-2954011
info@atme.edu.in
www.atme.edu.in
13th Kilometer, Mysore -Kanakapura -Bengaluru Road, Mysore - 570 028

retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL
Textbook 1: Ch 14.1 to 14.7, Ch 6.1 to 6.5   **RBT:** L1, L2, L3

Module-4
SQL: Advanced Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL.

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL.
Textbook 1: Ch 7.1 to 7.3, Ch 20.1 to 20.6   **RBT:** L1, L2, L3

Module-5

Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multiversion Concurrency control techniques, Validation Concurrency control techniques, Granularity of Data items and Multiple Granularity Locking.

NOSQL Databases and Big Data Storage Systems: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores, Column-Based or Wide Column NOSQL Systems, NOSQL Graph Databases and Neo4j
Textbook 1: Chapter 21.1 to 21.5, Chapter 24.1 to 24.6   **RBT:** L1, L2, L3

Lab Components

1) Create a table called Employee & execute the following.
Employee(EMPNO,ENAME,JOB, MANAGER_NO, SAL, COMMISSION)
1. Create a user and grant all permissions to the user.
2. Insert the any three records in the employee table contains attributes   EMPNO,ENAME JOB, MANAGER_NO, SAL, COMMISSION and use rollback. Check the result.
3. Add primary key constraint and not null constraint to the employee table.
4. Insert null values to the employee table and verify the result.

2) Create a table called Employee that contain attributes EMPNO,ENAME,JOB, MGR,SAL & execute the following.
1. Add a column commission with domain to the Employeetable.
2. Insert any five records into the table.
3. Update the column details of job
4. Rename the column of Employ table using alter command.
5. Delete the employee whose Empno is 105.

3) Queries using aggregate functions(COUNT,AVG,MIN,MAX,SUM),Group by,Orderby.
Employee(E_id, E_name, Age, Salary)
1. Create Employee table containing all Records E_id, E_name, Age, Salary.
2. Count number of employee names from employeetable
3. Find the Maximum age from employee table.
4. Find the Minimum age from employeetable.
5. Find salaries of employee in Ascending Order.
6. Find grouped salaries of employees.

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4) Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old & new Salary. **CUSTOMERS(ID,NAME,AGE,ADDRESS,SALARY**
5) Create cursor for Employee table & extract the values from the table. Declare the variables ,Open the cursor & extrct the values from the cursor. Close the cursor. **Employee(E_id, E_name, Age, Salary)**
6) Write a PL/SQL block of code using parameterized Cursor, that will merge the data available in the newly created table N_RollCall with the data available in the table O_RollCall. If the data in the first table already exist in the second table then that data should be skipped.
7) Install an Open Source NoSQL Data base MangoDB & perform basic CRUD(Create, Read, Update & Delete) operations. Execute MangoDB basic Queries using CRUD operations.

List of Text Books
1. Fundamentals of Data Base Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Data Base Management Systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill.

Course Outcomes	The student will be able to: **CO1: Describe** the basic elements of a relational database management system **CO2**: **Design** entity relationship for the given scenario. **CO3: Apply** various Structured Query Language (SQL) statements for database manipulation. **CO4: Analyse** various normalization forms for the given application. **CO5**: **Develop** database applications for the given real world problem. **CO6: Understand** the concepts related to NoSQL databases.

Additional URL and learning Materials:
- **https://nptel.ac.in/courses/106106093**
- **https://nptel.ac.in/courses/106105175**
- **https://cs145-fa19.github.io/**
- **https://www.postgresql.org/docs/**
- **https://dev.mysql.com/doc/**

Assessment Summary (CIE & SEE):
CIE and SEE each carry 50% weightage. A student must secure minimum 40% in CIE (20/50), 35% in SEE (18/50), and overall 40% (40/100) to pass; IPCC includes 25 marks theory + 25 marks practical under CIE, while SEE (50 marks) is conducted for theory only.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's) & PSO's

Course Name and Code : Database Management System- BCS403														
Faculty Name: Dr. Vinod Kumar P														
Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	1	1	-	-	-	-	-	2	-	-	2	2	-	-
CO-2	3	1	2	1	-	-	-	-	2	-	-	2	2	-	-
CO-3	3	1	1	2	2	-	-	-	2	-	-	2	2	-	-
CO-4	3	1	1	2	2	-	-	-	2	-	-	2	2	-	-
CO-5	3	2	1	-	1	-	-	-	2	-	-	2	2	-	-
CO-6	3	-	1	-	-	-	-	1	2	-	-	2	2	-	-

Note: 3 = Strong Contribution, 2 = Average Contribution, 1 = Weak Contribution, - = No Contribution

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