Course Syllabus
Gyanmanjari Institute of Technology
Semester-4 (B.Tech.)

Subject: Database Management System-BETCE14306

Type of course: Major (Core)

Prerequisite: Prior knowledge in computer science fundamentals, including programming.

Rationale:

DBMS studies are crucial for understanding efficient data storage, retrieval, and management. These subject covers principles, architectures, and technologies necessary for organizing data, optimizing queries, managing transactions, and ensuring security. Proficiency in DBMS is essential for designing robust databases, vital in software engineering, data analytics, and business intelligence fields.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No	Course content	Hrs.	% Weightage
1	**Introduction to Database Management Concept:** Introduction, Data and Information, Metadata, Data dictionary, Database, Data items, fields, records and files, purpose of database system, file-oriented v/s Database system, Applications of DBMS, Database administrator (DBA) – Role and Responsibilities.	03	08%

2	**Database System Architecture:** Schemas, Sub-schemas and Instances, Three level ANSI SPARC database architecture – Internal Level, Conceptual Level, External Level, Advantages of Three schema Architecture, Data Independence – Logical data independence and Physical data independence, Types of database system – Centralized and Distributed.	03	07%
3	**Relational Algebra and E-R Model:** Relational Algebra – Algebra, Queries, Domain, Relations, Operators and Syntax, Armstrong axioms, E-R Model – Basic concept of E-R, Entity, Relationship, Attributes, Keys, Design issues, weak entity and E- R diagram.	06	15%
4	**Interactive and Advanced SQL:** What is SQL, Data types, Commands – DDL, DML, DCL, DQL DDL- Create, Alter, Truncate, Drop, DML- Insert, Select, Update, Delete, DCL & DQL, Functions and Operators – Single row, Date, Numeric, Character, Conversion, Aggregate. Clauses – group by, order by, having, Joins.	10	25%
5	**Ensuring Data Integrity:** Understanding and Implementing Constraints: Concept of constraints, need of constraints, Domain Integrity Constraints – Not NULL, Check, Entity Integrity- Unique, Primary Key, Referential – Foreign key, Reference key, concept of Sub Queries.	05	10%
6	**Relational Database Design:** Functional dependencies, Introduction and Importance of Normalization – 1NF, 2NF, 3NF, BCNF, comparison of 3NF and BCNF.	07	15%
7	**Transaction Processing:** ACID, Serializability of scheduling, concurrency control mechanisms, Locking protocols and deadlock handling, Database recovery, Recovery techniques: logging and checkpoints.	07	15%
8	**Database Security and Advanced Concepts of SQL:** Authentication, Authorization and Access control, DAC, MAC, RBAC, SQL injection, Cursor static - Implicit and Explicit, procedure and functions, fundamental of database Triggers – creating Triggers and types of Triggers.	04	05%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Open-Source vs. Commercial Database Comparison:** In this activity, students will conduct a comparative analysis between open-source and commercial database software. They will select popular options from each category, such as MySQL (open-source) and Microsoft SQL Server (commercial), or PostgreSQL (open-source) and Oracle Database(commercial). Students will research and compare various aspects of these databases, including features, performance, scalability, licensing models, support options, community engagement, security measures, and ecosystem integrations. They will compile their findings into a comprehensive report and highlighting the advantages and limitations of each type of databases of aware and recommending suitable Options for different parameters and upload it on GMIU portal.	10
2	**Interactive Digital Tools:** In this activity Students use online tools or software like Lucid chart or DB Designer to experiment with creating normalized tables. They can test functional dependencies and visualize how normalization changes the database design and upload it on GMIU portal.	10
3	**Interactive Trigger Simulation**: In this activity Students using tools like MySQL Workbench and simulate the impact of triggers by creating a table, inserting data, and observing the automatic execution of their triggers. students are note and explain the trigger execution order and upload it on GMIU portal.	10
	Total	30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	**Remembrance (R)**	**Understanding (U)**	**Application (A)**	**Analyze (N)**	**Evaluate (E)**	**Create (C)**
Weightage %	25%	35%	20%	10%	05%	05%

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand Core DBMS Concepts and its Architecture.
CO2	Apply Relational Algebra and E-R Modeling.
CO3	Apply SQL commands (DDL, DML, DCL, DQL) to effectively create, manage, and manipulate relational database systems.
CO4	Analyze functional dependencies within a relational database and apply normalization techniques.
CO5	Implement Transaction Reliability through ACID and Concurrency Control.
CO6	Design and utilize database cursors, procedures, functions, and triggers to automate and optimize database operations effectively.

List of Practical:

Sr. No	Description	Unit No	Hrs.
1	Draw E-R Diagram of the given problem statement.	3	2
2	Create Two tables' Students and Employees with 5 fields and stored actual data into the table using create and insert command.	4	2
3	Implement SQL Queries to perform DDL Commands (Create 5 tables and perform all the DDL operations upon them).	4	2
4	Implement SQL Queries to perform DML Commands (Insert Minimum 10 records and perform modification operations upon them).	4	2
5	Retrieve data using SELECT command.	4	2
6	Practice using SQL UPDATE and DELETE statements to modify data.	4	2
7	Implement SQL queries using Date functions like add-months, months-between, round, next day, truncate, etc.	4	2
8	Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt, etc.	4	2
9	Implement SQL queries and String Functions like initcap, lower, upper, rtrim, replace, substring, instr, etc.	4	2
10	Implement SQL queries using Conversion function like to-char, to-date, to-number.	4	2
11	Implement SQL queries using Group function like Avg, Min, Max, Sum, Count, Decode, etc.	4	2

12	Add constraints like Primary key, NOT NULL and UNIQUE to your tables.	5	2
13	Use foreign keys to establish relationships between tables.	5	2
14	Implement practical 1 again with referential constraint.	5	2
15	Retrieve data from multiple tables using sub queries (multiple, correlated).	5	2
		Total	30

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Database system concepts", 6th Edition by Abraham silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
[2] Database Management System by Ramakrishnan, Gehrke, Tata McGraw-Hill.
[3] SQL-PL/SQL, Ivan bayross.
[4] Introduction to Database Management System,by Aditya Mittal is a beginner.
[5] Database System Concepts - 6th edition - Avi Silberschatz.