



**Gyanmanjari**  
Innovative University

Syllabus  
Gyanmanjari Institute of Technology  
Semester-3 (B. Tech.)

**Subject:** Database Management System: Organizing, Querying, and Managing Data – BET2CS13305

**Type of course:** Professional Core

**Prerequisite:** Students should have basic knowledge of computer fundamentals, programming concepts, data organization, and logical problem-solving.

**Rationale:**

This course provides a comprehensive introduction to Database Management Systems (DBMS) with a focus on Oracle SQL and PL/SQL. It covers fundamental concepts such as data, information, and database structures, and explores the architecture and components of modern DBMS. Students will learn SQL basics, advanced queries, normalization, transaction management, and data integrity through constraints. The course also includes hands-on experience with PL/SQL programming, stored procedures, triggers, user management, and security measures. By the end, learners will understand database design, implementation, and administration using Oracle/MySQL tools, ensuring both theoretical knowledge and practical skills for real-world applications.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   | Credits | Examination Marks |     | Total Marks |
|-----------------|---|---|---------|-------------------|-----|-------------|
| CI              | T | P | C       | SEE               | CCE |             |
| 4               | 0 | 2 | 5       | 100               | 50  | 150         |

*Legends: CI-Class Room Instructions; T– Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; CCE-Continuous and Comprehensive Evaluation.*



**Course Content:**

| Sr. No | Course Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Hrs. | % Weightage |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|
| 1      | <p><b>Introduction to Database Management Concept and SQL Basics:</b></p> <p><u>Theory Topics:</u><br/>Introduction, Data, Information, Data Items, Fields, Records, Files, Data Dictionary, Metadata, Database, Database Systems, Database management system: Introduction, Purpose, Applications, Introduction to Oracle Database &amp; RDBMS Architecture, Open source and Commercial DBMS (MYSQL, ORACLE, DB2, SQL server) Basics of SQL: Data Types in Oracle, SQL Categories: Data Definition Language (DDL) Commands: CREATE, ALTER, DROP, Data Manipulation Language (DML) Commands: INSERT, UPDATE, DELETE, Data Query Language (DQL) Command: SELECT, Clauses: WHERE, ORDER BY, GROUP BY, HAVING, Use of Data Dictionary in Oracle (e.g., USER_TABLES, ALL_TABLES).</p> <p><u>Practical:</u></p> <ol style="list-style-type: none"> <li>1. Implement SQL queries for Creating and describing tables (CREATE, DESC)</li> <li>2. Implement SQL queries for Modifying tables using ALTER</li> <li>3. Implement SQL queries for Deleting tables using DROP</li> <li>4. Implement SQL queries for creating tables and insert sample data in tables.</li> <li>5. Implement SQL queries for Inserting and updating records using INSERT, UPDATE, DELETE</li> <li>6. Implement SQL queries for retrieving data using SELECT, WHERE, ORDER BY.</li> <li>7. Implement SQL queries using aggregate functions with GROUP BY and HAVING</li> <li>8. Create two tables' Students and Employees with 5 fields and stored actual data into the table using create and insert command.</li> <li>9. Create student tables with a few columns representing common data types (integer, text, date etc.) using DDL commands.</li> <li>10. Implement SQL Queries to perform DDL Commands (Create 5 tables and perform all the DDL operations upon them).</li> <li>11. Insert sample data into your tables using SQL INSERT statements. Verify the data has been inserted correctly.</li> <li>12. Implement SQL Queries to perform DML Commands (Insert Minimum 10 records and perform modification operations upon them).</li> <li>13. Practice DDL-create and DML-insert commands.</li> <li>14. Retrieve data using the SELECT command from tables.</li> <li>15. Practice using SQL UPDATE and DELETE statements to modify data.</li> </ol> | 18   | 20%         |



|              | <p>16. Implement SQL queries for Understanding and browsing data dictionary: USER_TABLES, ALL_TABLES</p> <p><b>Evaluation Method:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td><b>Scenario-Based Case Simulation:</b> Students will design a logical database schema, create and populate tables, and execute queries based on a given real-life scenario.</td><td>20</td><td>-</td></tr> <tr> <td>2</td><td><b>Active Learning Activity (ALA): DBMS Vocabulary Crossword:</b> Students will complete a crossword puzzle based on DBMS terminology and upload the solved copy to the GMIU Web Portal.</td><td>-</td><td>10</td></tr> <tr> <td colspan="2"><b>Total</b></td><td>20</td><td>10</td></tr> </tbody> </table> <p><b>Examination Style:</b></p> <ol style="list-style-type: none"> <li><b>Scenario-Based Case Simulation (20 Marks)</b> <ul style="list-style-type: none"> <li>Students will be given a real-life case, such as designing a clinic database to manage doctor and patient information. They must design tables using DDL, populate records using DML, execute DQL queries using clauses such as WHERE and GROUP BY, and retrieve database metadata using commands such as USER_TABLES. This task will assess logical schema design, query-building skills, and understanding of data relationships.</li> </ul> </li> <li><b>Active Learning Activity (ALA): DBMS Vocabulary Crossword (10 Marks):</b> <ul style="list-style-type: none"> <li>Students will individually complete a crossword puzzle prepared by the faculty based on DBMS concepts and terminology. The solved crossword must be uploaded to the GMIU Web Portal within the specified timeline.</li> </ul> </li> </ol> | Sr. No. | Evaluation Methods | SEE | CCE | 1 | <b>Scenario-Based Case Simulation:</b> Students will design a logical database schema, create and populate tables, and execute queries based on a given real-life scenario. | 20 | - | 2 | <b>Active Learning Activity (ALA): DBMS Vocabulary Crossword:</b> Students will complete a crossword puzzle based on DBMS terminology and upload the solved copy to the GMIU Web Portal. | - | 10 | <b>Total</b> |  | 20 | 10 |  |  |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------|-----|-----|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|--------------|--|----|----|--|--|
| Sr. No.      | Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | SEE     | CCE                |     |     |   |                                                                                                                                                                             |    |   |   |                                                                                                                                                                                          |   |    |              |  |    |    |  |  |
| 1            | <b>Scenario-Based Case Simulation:</b> Students will design a logical database schema, create and populate tables, and execute queries based on a given real-life scenario.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20      | -                  |     |     |   |                                                                                                                                                                             |    |   |   |                                                                                                                                                                                          |   |    |              |  |    |    |  |  |
| 2            | <b>Active Learning Activity (ALA): DBMS Vocabulary Crossword:</b> Students will complete a crossword puzzle based on DBMS terminology and upload the solved copy to the GMIU Web Portal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -       | 10                 |     |     |   |                                                                                                                                                                             |    |   |   |                                                                                                                                                                                          |   |    |              |  |    |    |  |  |
| <b>Total</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 20      | 10                 |     |     |   |                                                                                                                                                                             |    |   |   |                                                                                                                                                                                          |   |    |              |  |    |    |  |  |
| 2            | <p><b>Database System Architecture and Ensuring Data Integrity:</b></p> <p><u>Theory Topics:</u></p> <p>Architecture of Oracle: Instance and Database, Components of DBMS (SGA, PGA, Background Processes, Data Files, Control Files), Database administrator (DBA) – Role and Responsibilities. Database system architecture: Data Abstraction, Data Independence (Logical &amp; Physical), Types of DBMS – Centralized and Distributed. <b>Data Integrity and Constraints:</b> Concept and Need of Constraints, Domain Constraints: NOT NULL, CHECK, Entity Constraints: UNIQUE, PRIMARY KEY, Referential Constraints: FOREIGN KEY, IN</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 18      | 20%                |     |     |   |                                                                                                                                                                             |    |   |   |                                                                                                                                                                                          |   |    |              |  |    |    |  |  |



Operator, LIKE, BETWEEN, Aggregate Functions, Inbuilt Functions: Numeric, Date, String.

**Practical:**

17. Apply primary keys and Not NULL constraints.
18. Implementing NOT NULL, CHECK, UNIQUE.
19. Using IN operator in queries.
20. Perform queries involving predicates LIKE, BETWEEN, IN etc.
21. Practice with numeric, date, and string inbuilt functions.
22. Add constraints like Primary key, NOT NULL and UNIQUE to your tables.
23. Use foreign keys to establish relationships between tables.
24. Implement practical 1 again with referential constraint.
25. Implement SQL queries using Date functions like add-months, months-between, round, next day, truncate, etc.
26. Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt, etc.
27. Implement SQL queries and String Functions like initcap, lower, upper, rtrim, replace, substring, instr, etc.
28. Implement SQL queries using Conversion functions like to-char, to-date, to-number.
29. Implement SQL queries using Group functions like Avg, Min, Max, Sum, Count, etc.

**Evaluation Method:**

| Sr. No. | Evaluation Methods                                                                                                                                                                                 | SEE | CCE |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|
| 1       | <b>Design and Justify Challenge:</b><br>Students will design a Student Management System, apply suitable database constraints, and justify their importance.                                       | 20  | -   |
| 2       | <b>Active Learning Activity (ALA): Design Your Own Mini-Database:</b> Students will design a mini-database, write handwritten SQL queries, prepare a report, and upload it to the GMIU Web Portal. | -   | 10  |
|         | <b>Total</b>                                                                                                                                                                                       | 20  | 10  |

**Examination Style:**

**1. Design and Justify Challenge (20 Marks):**

- Students will design a Student Management System and explain the proposed database structure. They must select and apply at least three suitable constraints, explain where and why each constraint is required, and justify the possible consequences if the constraints are not applied.



|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |     |
|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----|
|   | <p><b>2. Active Learning Activity (ALA): Design Your Own Mini-Database (10 Marks):</b></p> <ul style="list-style-type: none"> <li>Students will select a real-world scenario such as a Library System, Online Store, or Hospital Database and design at least three related tables. They must define table names, fields, data types, constraints, primary keys, and foreign keys; create at least five sample records for each table; and write handwritten SQL queries using SELECT, WHERE, joins, and aggregate functions such as COUNT and AVG. The completed database design, SQL queries, and report must be uploaded to the GMIU Web Portal within the specified timeline.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |    |     |
| 3 | <p><b>Advanced SQL and Normalization:</b></p> <p><u><b>Theory Topics:</b></u><br/> Advanced Joins: Inner, Outer, Self Join, Subqueries, Nested Queries, Correlated Subqueries, Set Operations: UNION, INTERSECT, MINUS, Views, Indexes, Sequences, Synonyms SQL Queries: EXISTS, ANY, ALL, Transaction Control Commands: COMMIT, ROLLBACK, SAVEPOINT. Introduction to Database Design, Functional Dependency, Normalization: 1NF, 2NF, 3NF, BCNF, comparison of 3NF and BCNF, Multi valued Dependency: 4NF &amp; 5NF (Project Join NF), Transaction Processing: ACID property, Serializability of scheduling, Database Backup &amp; Recovery, ORACLE Utility – Import, Export.</p> <p><u><b>Practical:</b></u><br/> 30. To understand and implement various types of SQL joins — inner join, outer join (left, right, full), and self join.<br/> 31. To learn how to retrieve and display combined data from multiple relational database tables using different types of SQL joins, thereby understanding data relationships and improving data querying efficiency.<br/> 32. To practice the use of different types of subqueries — multiple-row, nested, and correlated — in SQL, enabling complex data extraction from multiple related tables based on dynamic or dependent conditions.<br/> 33. To develop the skill to solve complex SQL queries using subqueries, including single-row and multiple-row subqueries, thereby enhancing query logic and data manipulation capabilities.<br/> 34. To explore the usage of conditional operators EXISTS, ANY, and ALL in SQL for querying datasets with conditions involving comparisons against subquery results, supporting advanced decision-making in data retrieval.<br/> 35. To understand and implement set operators — UNION, INTERSECT, and MINUS — for combining the results of multiple SQL queries and refining output by eliminating duplicates or</p> | 18 | 20% |



|         | <p>performing comparisons between datasets.</p> <p>36. To demonstrate the creation and practical usage of database objects such as views (for virtual tables), indexes (for query performance optimization), and sequences (for auto-generating unique values), enhancing database design and efficiency.</p> <p>37. Demonstrating Transactions: COMMIT, ROLLBACK, SAVEPOINT</p> <p>38. To perform database backup and recovery operations using export and import utilities, ensuring data protection and availability by understanding the process of safeguarding data in case of failure or loss.</p> <p><b>Evaluation Method:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td><b>Operation Data Phoenix: Rebuild and Secure the Crashed System:</b><br/>Students will analyse, normalize, secure, validate, and recover a crashed hospital database based on the given examination scenario.</td><td>20</td><td>-</td></tr> <tr> <td>2</td><td><b>Active Learning Activity (ALA): Design a Mini Social Media Platform Database:</b><br/>Students will individually design a social media database, insert sample data, and write SQL queries for posts, likes, comments, and followers.</td><td>-</td><td>10</td></tr> <tr> <td colspan="2">Total</td><td>20</td><td>10</td></tr> </tbody> </table> <p><b>Examination Style:</b></p> <ol style="list-style-type: none"> <li><b>1. Operation Data Phoenix: Rebuild and Secure the Crashed System (20 Marks):</b> <ul style="list-style-type: none"> <li>Students will be given a case scenario of a crashed hospital database containing a partial backup, an unnormalized schema, and data-integrity or unauthorized-access issues. They will be required to reconstruct and normalize the schema, write advanced SQL queries, apply views, indexes, and synonyms, analyse transaction problems, verify serializability, and prepare an appropriate backup and recovery plan. Students will be evaluated based on database implementation, problem-solving skills, and analytical justification.</li> </ul> </li> <li><b>2. Active Learning Activity (ALA): Design a Mini Social Media Platform Database (10 Marks):</b> <ul style="list-style-type: none"> <li>Students will individually design a mini social media database, create suitable tables, insert sample records, and write SQL queries for managing posts, likes, comments,</li> </ul> </li> </ol> | Sr. No. | Evaluation Methods | SEE | CCE | 1 | <b>Operation Data Phoenix: Rebuild and Secure the Crashed System:</b><br>Students will analyse, normalize, secure, validate, and recover a crashed hospital database based on the given examination scenario. | 20 | - | 2 | <b>Active Learning Activity (ALA): Design a Mini Social Media Platform Database:</b><br>Students will individually design a social media database, insert sample data, and write SQL queries for posts, likes, comments, and followers. | - | 10 | Total |  | 20 | 10 |  |  |
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| Sr. No. | Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | SEE     | CCE                |     |     |   |                                                                                                                                                                                                               |    |   |   |                                                                                                                                                                                                                                         |   |    |       |  |    |    |  |  |
| 1       | <b>Operation Data Phoenix: Rebuild and Secure the Crashed System:</b><br>Students will analyse, normalize, secure, validate, and recover a crashed hospital database based on the given examination scenario.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20      | -                  |     |     |   |                                                                                                                                                                                                               |    |   |   |                                                                                                                                                                                                                                         |   |    |       |  |    |    |  |  |
| 2       | <b>Active Learning Activity (ALA): Design a Mini Social Media Platform Database:</b><br>Students will individually design a social media database, insert sample data, and write SQL queries for posts, likes, comments, and followers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -       | 10                 |     |     |   |                                                                                                                                                                                                               |    |   |   |                                                                                                                                                                                                                                         |   |    |       |  |    |    |  |  |
| Total   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20      | 10                 |     |     |   |                                                                                                                                                                                                               |    |   |   |                                                                                                                                                                                                                                         |   |    |       |  |    |    |  |  |



|              | and followers. The completed database design and SQL queries must be uploaded to the <b>GMIU Web Portal</b> within the specified timeline.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |                    |     |     |   |                                                                                                                                    |    |   |   |                                                                                                                                                                                                                               |   |    |              |  |    |    |    |     |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------------|-----|-----|---|------------------------------------------------------------------------------------------------------------------------------------|----|---|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----|--------------|--|----|----|----|-----|
| 4            | <p><b>PL/SQL and Database Security:</b></p> <p><u>Theory Topics:</u><br/>Introduction to PL/SQL, PL/SQL Block Structure, Variables, Control Structures: PL/SQL Block Structure, Advantages of PL/SQL, Cursors: Implicit &amp; Explicit, Cursor FOR Loop, Parameterized Cursor, Exception Handling: Predefined Exceptions, User-defined Exceptions, Handling Raised Exceptions, SQL vs PL/SQL, Database Security: Authentication, Authorization and Access control, DAC (Discretionary Access Control), MAC (Mandatory Access Control), SQL injection.</p> <p><u>Practical:</u><br/>39. Implement basic PL/SQL blocks.<br/>40. Implement PL/SQL programs using IF STATEMENT.<br/>41. Implement PL/SQL programs using WHILE LOOP.<br/>42. Implement PL/SQL programs using IF, CASE, and loops.<br/>43. Implement PL/SQL programs with Cursor implementation (all types).<br/>44. Implement PL/SQL programs using Exception handling examples.</p> <p><b>Evaluation Method:</b></p> <table border="1"> <thead> <tr> <th>Sr. No.</th><th>Evaluation Methods</th><th>SEE</th><th>CCE</th></tr> </thead> <tbody> <tr> <td>1</td><td> <b>Mini Project Sprint:</b><br/>Students will develop a real-world database project by applying the concepts covered in the module. </td><td>20</td><td>-</td></tr> <tr> <td>2</td><td> <b>Active Learning Activity (ALA): DBMS Error Hunt:</b><br/>Students will individually identify and correct errors in database design, SQL queries, or PL/SQL blocks and upload the completed activity to the GMIU Web Portal. </td><td>-</td><td>10</td></tr> <tr> <td colspan="2"><b>Total</b></td><td>20</td><td>10</td></tr> </tbody> </table> <p><u>Examination Style:</u><br/>1. <b>Mini Project Sprint (20 Marks):</b></p> <ul style="list-style-type: none"> <li>Students will be given a real-world project scenario, such as a College Enrolment System. They will be required to design a normalized database schema, write PL/SQL procedures, handle exceptions, implement suitable security features, and demonstrate transaction control and data-recovery operations.</li> </ul> | Sr. No. | Evaluation Methods | SEE | CCE | 1 | <b>Mini Project Sprint:</b><br>Students will develop a real-world database project by applying the concepts covered in the module. | 20 | - | 2 | <b>Active Learning Activity (ALA): DBMS Error Hunt:</b><br>Students will individually identify and correct errors in database design, SQL queries, or PL/SQL blocks and upload the completed activity to the GMIU Web Portal. | - | 10 | <b>Total</b> |  | 20 | 10 | 18 | 20% |
| Sr. No.      | Evaluation Methods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SEE     | CCE                |     |     |   |                                                                                                                                    |    |   |   |                                                                                                                                                                                                                               |   |    |              |  |    |    |    |     |
| 1            | <b>Mini Project Sprint:</b><br>Students will develop a real-world database project by applying the concepts covered in the module.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20      | -                  |     |     |   |                                                                                                                                    |    |   |   |                                                                                                                                                                                                                               |   |    |              |  |    |    |    |     |
| 2            | <b>Active Learning Activity (ALA): DBMS Error Hunt:</b><br>Students will individually identify and correct errors in database design, SQL queries, or PL/SQL blocks and upload the completed activity to the GMIU Web Portal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | -       | 10                 |     |     |   |                                                                                                                                    |    |   |   |                                                                                                                                                                                                                               |   |    |              |  |    |    |    |     |
| <b>Total</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 20      | 10                 |     |     |   |                                                                                                                                    |    |   |   |                                                                                                                                                                                                                               |   |    |              |  |    |    |    |     |



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|   | <p><b>2. Active Learning Activity (ALA): DBMS Error Hunt (10 Marks):</b></p> <ul style="list-style-type: none"> <li>Students will be provided with a faulty database design, SQL queries, or a PL/SQL block containing ten intentional errors. They must individually identify and correct issues such as redundant data, missing relationships, and incorrect SQL syntax or logic. The completed activity must be uploaded to the GMIU Web Portal within the specified timeline.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |     |
| 5 | <p><b>Advanced Concepts of SQL &amp; Access Control:</b></p> <p><u><b>Theory Topics:</b></u><br/>           Stored Procedures, Stored Functions, Packages, Triggers and types of Triggers, Users – Create &amp; Delete User, Data Control Language (DCL) Commands: Grant and Revoke, Transaction Processing Language (TPL): BEGIN TRANSACTION, COMMIT, ROLLBACK, SAVEPOINT, ROLLBACK TO SAVEPOINT, Locking Strategies: Implicit Locking and Explicit Locking, LOCK TABLE Command, ORACLE Database Privileges &amp; Roles: System &amp; Object Privileges, Assigning, Viewing, Revoking, Roles – Create, Grant, View &amp; Delete.</p> <p><u><b>Practical:</b></u><br/>           45. Creating stored procedures and functions<br/>           46. Creating and using packages<br/>           47. Implement Cursor<br/>           48. Implement Trigger<br/>           49. Writing and testing triggers: BEFORE, AFTER, INSTEAD OF (Row/Statement-level)<br/>           50. Creating and managing users: CREATE and DELETE USER<br/>           51. Using GRANT and REVOKE<br/>           52. Demonstrating transaction control with SAVEPOINT and rollback</p> | 18 | 20% |



| Evaluation Method:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                              |     |     |
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| Sr. No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Evaluation Methods                                                                                                                                                                                                                                                                           | SEE | CCE |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Code Optimization:</b><br>Students will optimize and refactor two suboptimal PL/SQL scripts to improve readability, maintainability, security, and performance without changing the expected output or behaviour.                                                                         | 20  | -   |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Active Learning Activity (ALA): Interactive Trigger Simulation Using MySQL Workbench:</b><br>Students will create and execute database triggers for INSERT, UPDATE, and DELETE operations, document the trigger execution flow, and upload the completed activity to the GMIU Web Portal. | -   | 10  |
| <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                              | 20  | 10  |
| <b>Examination Style:</b> <ol style="list-style-type: none"> <li><b>Code Optimization (20 Marks)</b> <ul style="list-style-type: none"> <li>Students will be provided with two suboptimal Oracle PL/SQL programs or scripts based on stored procedures, functions, packages, or triggers. They must optimize and refactor the given code to improve readability, maintainability, security, and performance without changing its final output or behaviour.</li> </ul> </li> <li><b>Active Learning Activity (ALA): Interactive Trigger Simulation Using MySQL Workbench (10 Marks):</b> <ul style="list-style-type: none"> <li>Students will use MySQL Workbench to create a table and implement triggers for INSERT, UPDATE, and DELETE operations. They must execute data manipulation commands, observe the automatic execution of triggers, and explain the trigger execution flow and order. The completed activity must be uploaded to the GMIU Web Portal within the specified timeline.</li> </ul> </li> </ol> |                                                                                                                                                                                                                                                                                              |     |     |

### Suggested Specification Table:

| Distribution of Marks<br>(Revised Bloom's Taxonomy) |                 |                   |                 |             |              |            |
|-----------------------------------------------------|-----------------|-------------------|-----------------|-------------|--------------|------------|
| Level                                               | Remembrance (R) | Understanding (U) | Application (A) | Analyze (N) | Evaluate (E) | Create (C) |
| Weightage %                                         | 10%             | 10%               | 20%             | 10%         | 10%          | 40%        |



**Course Outcome:**

| After learning the course, the students should be able to: |                                                                                                               |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| CO1                                                        | Design, query, and manage relational databases using foundational database concepts and Oracle SQL.           |
| CO2                                                        | Apply Oracle database architecture, constraints, functions, and design principles to maintain data integrity. |
| CO3                                                        | Use advanced SQL, normalization, and transaction control for efficient and reliable database management.      |
| CO4                                                        | Develop secure database applications using PL/SQL constructs, cursors, and exception handling.                |
| CO5                                                        | Implement stored procedures, triggers, transaction control, user management, and Oracle security privileges.  |

**Instructional Method:**

The course delivery method will depend upon the requirement of content and needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any 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 the Active Learning Assignment.

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

**Reference Books:**

- [1] Database system concepts, 6<sup>th</sup> Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
- [2] SQL-PL/SQL, Ivan Bayross, BPB Publication.
- [3] Oracle 8i, Jase A. Ramalho, BPB Publication.
- [4] An introduction to Database Systems, C J Date, Pearson.
- [5] Database Management System by Ramakrishnan, Gehrke, Tata McGraw-Hill.



## Suggested Assessment Guidelines:

### Module-1: Introduction to Database Management Concept and SQL Basics

| Scenario-Based Case Simulation (20 Marks)       |                                                                                                                                                 |       |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Criteria                                        | Description                                                                                                                                     | Marks |
| <b>Database Design (DDL)</b>                    | Creates appropriate tables with correct attributes, primary keys, foreign keys, and constraints.                                                | 5     |
| <b>Data Population (DML)</b>                    | Inserts relevant and consistent sample records into all tables.                                                                                 | 5     |
| <b>Query Development (DQL)</b>                  | Writes accurate SQL queries using clauses such as WHERE, GROUP BY, HAVING, JOIN, and ORDER BY to solve the given scenario.                      | 5     |
| <b>Metadata Retrieval &amp; Result Accuracy</b> | Correctly retrieves database metadata (e.g., USER_TABLES, USER_TAB_COLUMNS) and produces the expected output with proper logical understanding. | 5     |
| Total                                           |                                                                                                                                                 | 20    |

### Module-2: Database System Architecture and Ensuring Data Integrity

| "Design and Justify" Challenge (20 Marks)      |                                                                                                                             |       |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------|
| Criteria                                       | Description                                                                                                                 | Marks |
| <b>Database Design</b>                         | Creates a logical database schema with appropriate tables, attributes, and relationships for the Student Management System. | 5     |
| <b>Constraint Selection and Implementation</b> | Correctly identifies and applies at least three appropriate database constraints.                                           | 5     |
| <b>Justification of Constraints</b>            | Clearly explains the purpose of each constraint, where it is applied, and why it is important.                              | 5     |
| <b>Impact Analysis</b>                         | Explains the possible consequences or data integrity issues if the selected constraints are not implemented.                | 5     |
| Total                                          |                                                                                                                             | 20    |



**Module-3: Advanced SQL and Normalization**

| <b>Operation Data Phoenix: Rebuild &amp; Secure the Crashed System (20 Marks)</b> |                                                                                                                              |              |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Criteria</b>                                                                   | <b>Description</b>                                                                                                           | <b>Marks</b> |
| <b>Schema Reconstruction &amp; Normalization</b>                                  | Reconstructs the database schema, identifies design flaws, and applies appropriate normalization techniques.                 | 5            |
| <b>Advanced SQL &amp; Database Security</b>                                       | Develops correct SQL queries and implements security features using Views, Indexes, and Synonyms.                            | 5            |
| <b>Transaction &amp; Integrity Management</b>                                     | Demonstrates transaction control, concurrency concepts, and verifies data integrity through serializability analysis.        | 5            |
| <b>Backup, Recovery &amp; Analytical Justification</b>                            | Proposes a practical backup and recovery strategy and provides logical justification for all design decisions in the report. | 5            |
| <b>Total</b>                                                                      |                                                                                                                              | <b>20</b>    |

**Module-4: PL/SQL and Database Security**

| <b>Mini Project Sprint (20 Marks)</b>                |                                                                                                                                       |              |
|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Criteria</b>                                      | <b>Description</b>                                                                                                                    | <b>Marks</b> |
| <b>Database Design &amp; Normalization</b>           | Designs a well-structured, normalized database schema with appropriate relationships and constraints.                                 | 5            |
| <b>PL/SQL Programming &amp; Exception Handling</b>   | Develops PL/SQL procedures/functions/triggers and implements effective exception handling.                                            | 5            |
| <b>Security &amp; Transaction Management</b>         | Implements database security features, access control, and demonstrates transaction control using COMMIT, ROLLBACK, and SAVEPOINT.    | 5            |
| <b>Project Demonstration &amp; Recovery Strategy</b> | Successfully demonstrates the working project, explains implementation decisions, and presents an effective backup and recovery plan. | 5            |
| <b>Total</b>                                         |                                                                                                                                       | <b>20</b>    |



**Module-5: Advanced Concepts of SQL & Access Control**

| <b>Code Optimization (20 Marks)</b>               |                                                                                                                          |              |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Criteria</b>                                   | <b>Description</b>                                                                                                       | <b>Marks</b> |
| <b>Code Analysis &amp; Problem Identification</b> | Correctly identifies inefficiencies, redundant logic, and areas for improvement in the given PL/SQL code.                | 5            |
| <b>Code Optimization &amp; Refactoring</b>        | Optimizes the code by improving structure, readability, maintainability, and performance while preserving functionality. | 5            |
| <b>Security &amp; Exception Handling</b>          | Enhances the code by applying secure coding practices and appropriate exception handling techniques.                     | 5            |
| <b>Output Verification &amp; Justification</b>    | Produces the correct output and clearly justifies the optimization techniques and design decisions made.                 | 5            |
| Total                                             |                                                                                                                          | 20           |

