NIRMA UNIVERSITY

Institute:	Institute of Technology, School of Technology
Name of Programme:	BTech CSE, Integrated BTech (CSE)-MBA, BTech AI&ML
Course Code:	2CS505CC23
Course Title:	Database Management Systems
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical Component				C
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Course Learning Outcomes (CLO):

At the end of the course, the students will be able to –
1. explain aspects of the database models and integrity constraints (BL2)
2. apply the normalization concepts for relational database design (BL3)
3. apply various clauses and constructs of SQL to write queries (BL3)
4. analyse indexing techniques for various storage and retrieval operations. (BL4)

Unit	Contents	Teaching Hours (Total 30)
Unit-I	**Overview and Architecture of Database Systems:** Purpose of database, File System versus DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS: The Relational Model, Levels of Abstraction in a DBMS, Data Independence. Multi-level architecture, Client/Server architecture, Mapping, Database users and Administrators, Introduction to non-relational database	03
Unit-II	**Relational Database: Concepts and Design:** Relational Model, Database Schema, Schema Diagrams, Relational Query Languages, Relational Operations. Relational Data Integrity: Keys: Candidate Keys and Constraints: Candidate Keys, Primary Keys and Alternate Keys, Foreign Keys and rules, Null value concept, and other integrity constraints. Relational Operators: Relational Algebra: Closure, set operations, special relational operations, algebra for update operations, Relational Comparisons. Relational Calculus: Tuple and Domain-Oriented relational calculus. ER Diagram, ER to Relational Database Design	09
Unit-III	**SQL Concepts:** Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types. transaction control commands – Commit, Rollback, Savepoint	05
Unit-IV	**Normalization:** Functional Dependencies: Introduction, Basic definitions, Trivial and nontrivial dependencies, Closure of a set of dependencies, Closure of a set of attributes, Irreducible sets of dependencies. Introduction to normalization, non-loss decomposition and functional dependencies, Dependency preservation, first, second, and third forms, Boyce / Codd normal form, higher level normal forms	04

Unit-V	**Data Storage and Querying:** Storage and File Structure, Indexing and Hashing, Query Processing and Optimization	04
Unit-VI	**Transaction Management:** Transaction concepts, transaction model, transaction atomicity and durability, serializability, Introduction to Concurrency and Recovery.	05

Self-Study:
The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Suggested Readings/References:
1. Silberschatz, Korth, Sudarshan, Database System Concepts, McGraw-Hill computer science series
2. C J Date, An introduction to Database Systems, Addition-Wesley
3. Nilesh shah, Database System using Oracle, PHI.
4. RamezElmasri&Shamkant B. Navathe, Fundamentals of Database Systems, Addison-Wesley
5. Hector Gracia-Molina, Jeffrey D. Ullman, and Jennifer Widom, Database System Implementation, Pearson.
6. Ivan Bayross, SQL, PL/SQL, BPB Publications
7. Scott Urman, Oracle9i PL/SQL programming, McGraw-Hill

Suggested List of Experiments:

S. No.	Name of Experiments/Exercises	Hours

1	**Write and perform the SQL queries for the following:**
	Create the below tables as specified:
	salespeople (snum number (4) primary key,sname varchar2(20),City varchar2(15),comm number(5,2));
	customer (cnum number (4) primary key,cname varchar2(20),city varchar2(15),rating number(4),snum number(4) references salespeople);
	orders (onum number (4) primary key,amt number(6,2),odate date,cnum number(4) references customer,snum number(4) references salespeople);
	Insert the records as specified:
	SQL> insert into salespeople values(&snum,'&sname','&city',&comm);
	SQL> insert into customer values (&cnum,'&cname','&city', &rating, &snum);
	SQL> insert into orders values (&onum, &amt,'&odate',&cnum, &snum);
		04

2	**Design and perform SQL for bellow:** 1. Write a query that produces the salesperson table with the columns in the following order: city, sname, snum, comm. 2. Write a SELECT command that produces the order number, amount, and date for all rows in the order table 3. Write a query that produces all rows from the customer table for which the salesperson's number is 101. 4. Write a query to display the only salesman no from the orders table. 5. Write a query that will give you all orders for more than Rs. 100/-. 6. Write a query that produces all customers serviced by salespeople who is located in Belgaum with a commission above 10%. Output the salespeople's name and city. 7. Write a query on the Customers table whose output will exclude all customers with a rating <>1, they are not located in Ahmedabad.	02

8. Write a query that will produce all orders taken on October 14th feb 2004 or 15th feb 2005.
9. Write a query to select cname,sname from the customer and snum should be matched with both customer and salespeople table.
10. Write a query to select cname,sname from the customer and snum should be matched with both customer and salespeople table and sname should be from ('ABC','XYZ') only.

3   Write and perform the SQL queries for the bellow: 04
Select all records where the City column has the value "Ahmedabad".
1. Use the NOT keyword to select all records where City is NOT "Ahmedabad".
2. Select all records where the comm column has the value 11.11.
3. Select all records where the City column has the value 'Ahmedabad' and the comm column has the value 25.52.
4. Select all records where the City column has the value 'Ahmedabad' or 'Kosamba'.
5. Select all records from the salespeople table, and sort the result alphabetically by the column City.
6. Select all records from the salespeople table, and sort the result reversed alphabetically by the column City.
7. Select all records from the salespeople table, and sort the result alphabetically, first by the column CITY, then by the column comm.

4   Write and perform the SQL queries for the below: 02
1. Select all records from the salespeople where the CITY column is empty.
2. Select all records from the salespeople where the CITY column is NOT empty.
3. Update the City column of all records in the salespeople table.
4. Set the value of the city columns to 'Surat', but only the ones where the Comm column has the value 88.99.
5. Update the salesperson name value and the city value for the particular salesperson.
6. Delete all the records from the orders table where the value is 305.
7. Delete all the records from the orders table.

5   Write and perform the SQL queries for the bellow (Assume the necessary   04
database OR use the database of Practical-1:
1. Create a view from the existing table as per your requirement.
2. Update a view as per your requirement.
3. Dropping the view
4. ADD a column in an existing table
5. REMOVE column in an existing table
6. MODIFY the datatype of the newly added column.
7. Make a new table from the old table with the same structure.
8. Delete all the records from the table
9. Drop the table
10. Create a table with the CHECK constraint

6   Write and perform the SQL queries for the bellow (Assume the necessary   02
database OR use the database of Practical-1:
1. Write and perform the SQL queries to implement different operators (i.e., +, -, /, *, %) and SQL Aggregate Functions. (Assume the necessary database OR use the database of Practical-1:)
2. Write a SQL statement to find the total purchase amount of all orders

3. Write a SQL statement to find the average purchase amount of all orders.
4. Write a SQL statement to find the number of salesmen currently listing for all of their customers.
5. Write a SQL statement to know how many customers have listed their names.
6. Write a SQL statement to find the number of customers who get at least a rating for his/her performance.
7. Write a SQL statement to know the maximum and minimum purchase amount of all the orders.
8. Write a SQL statement that selects the highest grade for each of the cities of the customers.
9. Write a SQL statement to find the highest purchase amount ordered by each customer with their ID and highest purchase amount.
10. Write a SQL statement to find the highest purchase amount ordered by each customer on a particular date with their ID, order date, and highest purchase amount.
11. Write a SQL statement to find the highest purchase amount on the date '01-JAN-06' for each salesman with their ID
12. Write a SQL statement to find the highest purchase amount with their ID and order date, for only those customers who have the highest purchase amount in a day is more than 100

7   Write and perform the SQL queries for the bellow (Assume the necessary   04
database OR use the database of Practical-1:
1. mention the comment in SQL
2. selects all customers with a CustomerName starting with "G"
3. selects all customers with a CustomerName ending with "G"
4. selects all customers with a CustomerName that has "ra" in any position
5. selects all customers with a city starting with any character, followed by "_haruch"
6. 16. selects all customers with a city starting with "B", followed by any character, followed by "a", followed by any character, followed by "uc"
7. selects all customers with a city starting with "G" and ending with "a"
8. selects all customers that are located in "Goa", "France" or "Ahmedabad"
9. selects all customers that are not located in "Goa", "France" or "Ahmedabad"
10. selects all customers that are from the same city as the salespeople.

8   (a) Create an index on the particular table. Assume the necessary data for   02
creating a table.
(b) Write SQL queries to implement the following by using the database of practical-1: Inner join, Left join, Right join, Full outer join

9   Perform SQL operations mentioned in Practical 3 using MongoDB No-SQL   04
data store. Create a suitable collection (table) for the same.

10   Implement the below commands that are used to control transactions.   02
COMMIT, ROLLBACK, SAVEPOINT, ROLLBACK and SET TRANSACTION.