LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING & TECHNOLOGY

Department of Artificial Intelligence and Machine Learning (704)

Bachelor of Engineering (B.E.) – Semester – II

Course Code:	117043291		Teaching Scheme				
Course Name:	**Database Management System**		Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
Category of Course:	Professional Core Course (PCC)		**5**	**0**	**2**	**6**	**30**
Prerequisite Course:	Computer Programming using Java-1 (117042191)						

	Syllabus				
Unit No.	**Topic**		**Prerequisite Topic**	**Successive Topic**	**Teaching Hours**
01	**Introduction of Database**		---		**1 (3%)**
	1.1 Database-System Applications, Purpose of Database Systems			---	
	1.2 Types of Database Models, Data Independence			---	
	1.3 Database Architecture-Levels, Data Independence, Database Languages, Components of a DBMS Architecture, Database Users and Administrators (DBA)			---	
02	**Entity-Relationship Model**				**2 (8%)**
	2.1 Basic Concepts, Design Process, Entity-Relationship Model		---	---	
	2.2 Constraints, Entity-Relationship Diagrams and its Design Issues		Basic Concepts (117043291 Unit – 2)	---	
	2.3 Extended E-R Features– Generalization, Specialization, Aggregation, Reduction to E-R Database Schema		Basic Concepts (117043291 Unit – 2)	---	
03	**Basics of SQL**				**4 (12%)**
	3.1 Basics of SQL- Rules, Process, Characteristics, Advantages, , SQL Data types (Numeric, Varchar, Char, Integer, Date, Time, Timestamp), DDL, DML, DQL, DCL, Structure – Creation, Alteration		---	SQL Constraints and Functions (117043291 Unit-4), Structured Query Language (SQL) (117043291 Unit - 7), PL/SQL Concepts (117043291 Unit-9), Full Stack Development using JavaScript (017043691 Unit – 10.2), Fundamentals of Computer Science using Python-1(017042491 Unit – 9.1,9.2)	
04	**SQL Constraints and Functions**				**4 (12%)**
	4.1 Defining Constraints – Primary Key, Foreign Key, Unique, Not Null, Check, IN		Basics of SQL (117043291 Unit – 3)	SQL Constraints and Functions (117043291 Unit-5), Structured Query Language (SQL) (117043291 Unit - 7), PL/SQL Concepts (117043291 Unit-9)	
	4.2 Functions – **Aggregate Functions** AVG,COUNT,SUM,MAX,MIN **Built-In Functions –** **1. Numeric/Math** ABS,CEIL,DIV,EXP,FLOOR,MOD, POWER,ROUND,SQRT,TRUNC) **2. Date** AGE,CURRENT_DATE,CURRENT_TIME,CURRENT_TIMESTAMP,EXTRACT [EXTRACT TIMESTAMP -DAY OF MONTH,DAY OF WEEK,DAY OF YEAR,MONTH,WEEK,HOUR,MINUTE,SECOND] **3. String Functions** ASCII,CHR,CONCAT,CONCAT_WS, INITCAP,LEFT,LENGTH,LOWER,LPAD,LTRIM,POSITION, REPEAT,REPLACE, REVERSE,RIGHT,RPAD,RTRIM,SUBSTRING,TRIM,UPPER **Set Operations** UNION,UNIONALL,INTERSECT, MINUS		---	SQL Constraints and Functions (117043291 Unit-5), Structured Query Language (SQL) (117043291 Unit - 7), PL/SQL Concepts (117043291 Unit-9)	
05	**Relational Model**				**2**

	5.1 Structure of Relational Databases, Schema, Keys, Domains, Relations	---	---	**(8%)**
	5.2 Relational Algebra – Fundamental Operators (Projection, Selection, Cross Cartesian, Union, Intersection, Set Difference, Join) and Syntax	Structure of Relational Databases (117043291 Unit – 5)	---	
	5.3 Relational Algebra Queries	Relational Algebra (117043291 Unit – 5)	---	

	Relational Database Design			
06	6.1 Functional Dependency – Definition, Partial FD, Trivial and Non-Trivial FD, Closure of FD Set, Closure of Attributes, Irreducible Set of FD	**---**	---	**2 (9%)**
	6.2 Normalization – 1nf, 2nf, 3nf, BCNF	Function Dependency (117043291 Unit – 6), Normalization (117043291 Unit - 6)	---	
	6.3 Decomposition Using FD- Dependency Preservation		---	

	Structured Query Language (SQL)			
07	7.1 Sub-Queries, Correlated Sub-Queries(Select Statement), Use of Where Clause, Group By, Having, Order By, SQL Conditions/ Operators (AND, OR, NOT, IN, NOT IN, BETWEEN NOT BETWEEN , LIKE)	Basics of SQL (117043291 Unit – 3), SQL Constraints and Functions (117043291 Unit-4)	PL/SQL Concepts (117043291 Unit-9)	**5 (15%)**
	7.2 Join and its Types, Exist, Not Exist, Any, All, View and its Types(Create, Update, Delete)	Basics of SQL (117043291 Unit – 3), SQL Constraints and Functions (117043291 Unit-4)	PL/SQL Concepts (117043291 Unit-9)	
	7.3 Transaction Control Commands – Commit, Rollback, Save point	Basics of SQL (117043291 Unit – 3), SQL Constraints and Functions (117043291 Unit-4)	PL/SQL Concepts (117043291 Unit-9)	

	Transaction & Recovery Management			
08	8.1 Transaction Concept, ACID Properties	---	---	**3 (10%)**
	8.2 Concurrent Executions of Transactions and Related Problems, Serializability, Testing for Serializability, Types of Serializability- Conflict and View	Transaction Concept (117043291 Unit – 8)	---	
	8.3 Solution to Concurrency Related Problems, Locking Mechanism, Two-Phase Locking Protocol, Two- Phase Commit Protocol	Transaction Concept, Serializability (117043291 Unit – 8)	---	
	8.4. System Recovery, Log-Based Recovery	Serializability, Concurrent Execution of Transactions (117043291 Unit – 8)	---	

	PL/SQL Concepts			
09	9.1 PL/SQL Concepts- Block structure, sub-block, Select Into statements, Control Structures (IF, WHIE LOOP, FOR LOOP) Cursors (Implicit, Explicit), Stored Procedures, Stored Function, Database Triggers	Basics of SQL (117043291 Unit – 3), Constraints and Functions (117043291 Unit-4), Structured Query Language (SQL) (117043291 Unit - 7)	---	**5 (15%)**

	Query Processing & Query Optimization			
10	10.1 Overview of Query Processing, Introduction of Query Optimization, Data Security, Audit trail	---	---	**2 (8%)**
	10.2 Introduction, Access Control Concept, Types of Access Controls Techniques	---	---	

Sr No.	Practical Title	Link to Theory Syllabus
1	Consider following databases and draw ER diagram and convert entities and relationships to relation table for a given scenario. **1. COLLEGE DATABASE:** STUDENT (RN, SName, Address, Phone, Gender) CLASS (RN, EnrolNo) SUBJECT (Subcode, Title, Sem, Credits) MARKS (RN, Subcode, EnrolNo, Test1, Test2, Test3, FinalIA) **2. COMPANY DATABASE:** EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate) DLOCATION (DNo,DLoc) PROJECT (PNo, PName, PLocation, DNo) WORKS_ON (SSN, PNo, Hours)	Unit-2
2	To study DDL-create and DML-insert commands. From the below given tables, perform the following queries: CREATE TABLE DEPOSIT (ACTNO VARCHAR2(5) ,CNAME VARCHAR2(18) , BNAME VARCHAR2(18) , AMOUNT NUMBER(8,2) ,ADATE DATE); CREATE TABLE BRANCH(BNAME VARCHAR2(18),CITY VARCHAR2(18)); CREATE TABLE CUSTOMERS(CNAME VARCHAR2(19) ,CITY VARCHAR2(18)); CREATE TABLE BORROW(LOANNO VARCHAR2(5), CNAME VARCHAR2(18), BNAME VARCHAR2(18), AMOUNT NUMBER (8,2));	Unit-3

DEPOSIT

ACT-NO	CNAME	BNAME	AMOUNT	ADATE
100	ANIL	VRCE	1000.00	1-MAR-95
101	SUNIL	AJNI	5000.00	4-JAN-96
102	MEHUL	KAROLBAGH	3500.00	17-NOV-95
104	MADHURI	CHANDI	1200.00	17-DEC-95
105	PRMOD	M.G.ROAD	3000.00	27-MAR-96
106	SANDIP	ANDHERI	2000.00	31-MAR-96
107	SHIVANI	VIRAR	1000.00	5-SEP-95
108	KRANTI	NEHRU PLACE	5000.00	2-JUL-95
109	MINU	POWAI	7000.00	10-AUG-95

BRANCH

VRCE	NAGPUR
AJNI	NAGPUR
KAROLBAGH	DELHI
CHANDI	DELHI
DHARAMPETH	NAGPUR
M.G.ROAD	BANGLORE
ANDHERI	BOMBAY
VIRAR	BOMBAY
NEHRU PLACE	DELHI
POWAI	BOMBAY

CUSTOMERS

ANIL	CALCUTTA
SUNIL	DELHI
MEHUL	BARODA
MANDAR	PATNA
MADHURI	NAGPUR
PRAMOD	NAGPUR
SANDIP	SURAT
SHIVANI	BOMBAY
KRANTI	BOMBAY
NAREN	BOMBAY

BORROW

LOANNO	CNAME	BNAME	AMOUNT
201	ANIL	VRCE	1000.00
206	MEHUL	AJNI	5000.00
311	SUNIL	DHARAMPETH	3000.00
321	MADHURI	ANDHERI	2000.00
375	PRMOD	VIRAR	8000.00
481	KRANTI	NEHRU PLACE	3000.00

1. Describe deposit, branch.
2. Describe borrow, customers.
3. List all data from table DEPOSIT.
4. List all data from table BORROW.
5. List all data from table CUSTOMERS.
6. List all data from table BRANCH.
7. Give account no and amount of depositors.
8. Give name of depositors having amount greater than 4000.
9. Give name of customers who opened account after date '1-12-96'.

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3   Unit-7

Create Table Job (job_id, job_title, min_sal,

COLUMN NAME	DATA TYPE
job_id	Varchar2(15)
job_title	Varchar2(30)
min_sal	Number(7,2)
max_sal	Number(7,2)

Create table Employee (emp_no, emp_name, emp_sal, emp_comm, dept_no)

COLUMN NAME	DATA TYPE
emp_no	Number(3)
emp_name	Varchar2(30)
emp_sal	Number(8,2)
emp_comm	Number(6,1)
dept_no	Number(3)

Create table deposit(a_no,cname,bname,amount,a_date).

COLUMN NAME	DATA TYPE
a_no	Varchar2(5)
cname	Varchar2(15)
bname	Varchar2(10)
amount	Number(7,2)
a_date	Date

Create table borrow(loanno,cname,bname,amount).

COLUMN NAME	DATA TYPE
loanno	Varchar2(5)
cname	Varchar2(15)
bname	Varchar2(10)
amount	Varchar2(7,2)

Retrieve all data from **employee, jobs and deposit.**
1. Give details of account no. and deposited rupees of customers having account opened between dates **01-01-06 and 25-07-06.**
2. Display all jobs with minimum salary is greater than 4000.
3. Display name and salary of employee whose department no is 20. Give alias name to name of employee.
4. Display employee no,name and department details of those employee whose department lies in(10,20)

To study various options of LIKE predicate
1. Display all employee whose name start with 'A' and third character is ' 'a'.
2. Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.
3. Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.
4. Display the null values of employee and also employee name's third character should be 'a'.
What will be output if you are giving LIKE predicate as '%_ %' ESCAPE '\'

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4   Unit-3, 4 & 7

To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables in Practical 3

1. List total deposit from deposit.
2. List total loan from karolbagh branch
3. Give maximum loan from branch vice.
4. Count total number of customers
5. Count total number of customer's cities.
6. Create table supplier from employee with all the columns.
7. Create table sup1 from employee with first two columns.
8. Create table sup2 from employee with no data
9. Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
10. Delete all the rows from sup1.
11. Delete the detail of supplier whose sup_no is 103.
12. Rename the table sup2.
13. Destroy table sup1 with all the data.
14. Update the value dept_no to 10 where second character of emp. name is 'm'.
Update the value of employee name whose employee number is 103.

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5   Unit-4 & 7

To study Single-row functions:
1. Write a query to display the current date. Label the column Date
2. For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary

	3. Modify your query no (2) to add a column that subtracts the old salary from the new salary. Label the column Increase 4. Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names. 5. Write a query that produces the following for each employee: \<employee last name\> earns \<salary\> monthly 6. Display the name, hire date, number of months employed and day of the week on which the employee has started. Order the results by the day of the week starting with Monday. 7. Display the hiredate of emp in a format that appears as Seventh of June 1994 12:00:00 AM. 8. Write a query to calculate the annual compensation of all employees (sal+comm.).	
6	Displaying data from Multiple Tables (join) 1. Give details of customers ANIL. 2. Give name of customer who are borrowers and depositors and having living city nagpur 3. Give city as their city name of customers having same living branch. 4. Write a query to display the last name, department number, and department name for all employees. 5. Create a unique listing of all jobs that are in department 30. Include the location of the department in the output 6. Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK. 7. Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively. Create a query to display the name and hire date of any employee hired after employee SCOTT.	Unit-4 & 7
7	To apply the concept of Aggregating Data using Group functions. 1. List total deposit of customer having account date after 1-jan-96. 2. List total deposit of customers living in city Nagpur. 3. List maximum deposit of customers living in bombay. 4. Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number. 5. Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE. 6. Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998 7. Find the average salaries for each department without displaying the respective department numbers. 8. Write a query to display the total salary being paid to each job title, within each department. 9. Find the average salaries > 2000 for each department without displaying the respective department numbers. 10. Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary. 11. List the branches having sum of deposit more than 5000 and located in city bombay.	Unit-4 & 7
8	To solve queries using the concept of sub query 1. Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT 2. Give name of customers who are depositors having same branch city of mr. sunil. 3. Give deposit details and loan details of customer in same city where pramod is living. 4. Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary. 5. Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000 6. Display the last name and salary of every employee who reports to ford. 7. Display the department number, name, and job for every employee in the Accounting department. 8. List the name of branch having highest number of depositors. 9. Give the name of cities where in which the maximum numbers of branches are located. 10. Give name of customers living in same city where maximum depositors are located.	Unit-4 & 7
9	Manipulating Data: 1. Give 10% interest to all depositors. 2. Give 10% interest to all depositors having branch vrce 3. Give 10% interest to all depositors living in nagpur and having branch city bombay. 4. Write a query which changes the department number of all employees with empno 7788's job to employee 7844'current department number. 5. Transfer 10 Rs from account of anil to sunil if both are having same branch. 6. Give 100 Rs more to all depositors if they are maximum depositors in their respective branch. 7. Delete depositors of branches having number of customers between 1 to 3. 8. Delete deposit of vijay. 9. Delete borrower of branches having average loan less than 1000.	Unit-4 & 7
10	Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write a cursor to select the five highest paid employees from the table.	Unit-9

Major Components/ Equipment	
Sr. No.	**Component/Equipment**
1	Computer
2	MySQL or Oracle or PostgreSQL or SQL Lite

<table>
<tr><td colspan="6">Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)</td></tr>
<tr><td>L:</td><td>5</td><td>T:</td><td>0</td><td>P:</td><td>2</td></tr>
<tr><td colspan="6">Note: In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%</td></tr>
</table>

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory			MCQ	25%	50
Theory	**5**		Theory Descriptive (Mainly Queries or Programme)	25%	50
Theory			Formulas and Derivation	0%	0
Theory			Numerical	0%	0
Expected Theory %	**50%**	**6**	**Calculated Theory %**	**50%**	**100**
Practical			Individual Project	15%	30
Practical			Group Project	15%	30
Practical	**1**		Internal Practical Evaluation (IPE)	15%	30
Practical			Viva	5%	10
Practical			Seminar	0%	0
Expected Practical %	**50%**		**Calculated Practical %**	**50%**	**100**
Overall %	**100%**			**100%**	**200**

Course Outcome

	Upon completion of the course students will be able to
CO1	To learn the fundamentals of data models and to represent a database system using ER diagrams with the mapping of Relational model to demonstrate competence with the fundamental tasks involved with modeling, designing
CO2	To Apply the SQL commands for database manipulation, and to identify and solve the redundancy problem in database tables using normalization
CO3	To Analyze transaction processing, concurrency control and database recovery protocols and To Compare and contrast various indexing strategies in different database systems.
CO4	To Apply the triggers, Functions/Procedures, Cursors and views in database schema to automate the real time problems with Optimized Queries.

Suggested Reference Books

1	Database System Concepts, Abraham Silberschatz, Henry F. Korth & S. Sudarshan, McGraw Hill
2	An introduction to Database Systems, C J Date, Addition-Wesley
3	SQL,PL/SQL the Programming Language of oracle, Ivan Bayross, BPB Publications
4	Fundamentals of Database Systems, R. Elmasri and S.B. Navathe, the Benjamin / Cumming Pub. Co
5	Oracle 9i: PL/SQL Programming ,Scott Urman,Oracle press, Addison Wesley
6	Fundamentals of Database Systems, Ramez Elmasri and Shamkant B Navathe
7	Oracle: The Complete Reference, George Koch, Kevin Loney, TMH /oracle press
8	Mastering SQL, Martin Gruber, B.P.B

List of Open Source Software/Learning website

1	https://www.w3schools.com/
2	https://www.mysql.com/
3	https://www.tutorialspoint.com/index.htm

Practical Project/Hands on Project

Sr. No.	Project List	Linked with Unit
1	**For the following relation schema:** **employee (employee-name, street, city)** **works (employee-name, company-name, salary)** **company (company-name, city)** **manages (employee-name, manager-name)** Give an expression in SQL for each of the following queries: (1) Find the names, street address, and cities of residence for all employees who work for 'City Bank' and earn more than 50,000Rs. (2) Find the names of all employees in the database who live in the same cities as the companies for which they work. (3) Find the names of all employees in the database who live in the same cities and on the same streets as do their managers. (4) Find the names of all employees in the database who do not work for 'City Bank'. Assume that all people work for exactly one company. (5) Find the names of all employees in the database who earn more than every employee of 'Small Bank Corporation'. Assume that all people work for at most one company.	Unit – 3,4,7,9

	(6) Find the names of all employees who earn more than the average salary of all employees of their company. Assume that all people work for at most one company.	
2	**EmployeeDetails (EmpId, Fullname, ManagerId, DateOfJoining)** **EmployeeSalary (EmpId,ProjectName,Salary)** (1) SQL query to fetch all employee records from Employee Details table who have a salary record in Employee Salary table. (2) Write a SQL query to fetch project-wise count of employees sorted by project's count in descending order. (3) SQL query to create a new table named Person with data and structure copied from table EmployeeDetails. (4) SQL query to fetch records that exist in EmployeeDetails and Person tables. (5) SQL query to fetch employee names having salary greater than or equal to 5000 and less than or equal 10000. (6) SQL query to find work experience in days till today.	Unit –3,4,7,9
3	(1) Create above table named student by giving id primary key and name with not null constraint and marks must between 1 to 100. (2) Update name of student whose std_id is 1. Aslo print how many rows updated after update query using cursor in PL/SQL. (3) Display name of all student with their total mark. (4) Add one column named subject in student table and drop constraint not null from name column. (5) Display name of student with stu_id whose marks are greater than average marks of all students. <table><tr><td>id</td><td>std_id</td><td>Name</td><td>Marks</td></tr><tr><td>1</td><td>3</td><td>Abhi</td><td>99</td></tr><tr><td>2</td><td>5</td><td>Geethasri</td><td>89</td></tr><tr><td>3</td><td>6</td><td>Rahim</td><td>49</td></tr><tr><td>4</td><td>9</td><td>Ram</td><td>69</td></tr><tr><td>5</td><td>1</td><td>Rahul</td><td>87</td></tr><tr><td>6</td><td>1</td><td>Rahul</td><td>96</td></tr><tr><td>7</td><td>1</td><td>Rahul</td><td>96</td></tr><tr><td>8</td><td>9</td><td>Ram</td><td>96</td></tr><tr><td>9</td><td>9</td><td>Ram</td><td>96</td></tr></table>	Unit –3,4,7,9
4	**Worker (WORKER_ID, FIRST_NAME, LAST_NAME, SALARY, JOINING_DATE, DEPARTMENT)** **Bonus (WORKER_REF_ID, BONUS_DATE, BONUS_AMOUNT)** **Title (WORKER_REF_ID, WORKER_TITLE, AFFECTED_FROM)** (1) Write an SQL Query to Print All Worker Details From The Worker Table Order By FIRST_NAME Ascending And DEPARTMENT Descending. (2) Write an SQL Query to Fetch the Count of Employees Working In The Department 'Admin'. (3) Write an SQL Query to Fetch First Name of Work with Salaries >= 50000 And <= 100000. (4) Write an SQL Query to Print Details for Workers with The First Name As "Vipul" And "Satish" From Worker Table. (5) Write an SQL Query to Print Details of The Workers Whose FIRST_NAME Contains 'A' or 'a'. (6) Write an SQL Query to Print Details of The Workers Who Are Also Managers. (7) Write an SQL Query to Fetch the List of Employees with The Same Salary.	Unit –3,4,7,9
5	**Write queries for the following tables.** **Employee(Empno, Ename , Salary, Designation),** **Department(Empno, Deptno.)** (1) Display all rows for salary greater than 5000. (2) Display the deptno for the ename='Rahul'. (3) Add a new column deptname in table T2. (4) Change the designation of ename='ramesh' from 'peon' to 'senior clerk'. (5) Find the total salary of all the rows. (6) Display designation wise maximum salary given to employee.	Unit –3,4,7,9