

**IV Semester**  
**Course 9: Database Management Systems**  
Credits -3

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**Learning Objectives:**

To familiarize with concepts of database design

**Learning Outcomes:** On successful completion of the course, students will be able to

1. Differentiate between database systems and file based systems
2. Design a database using ER model
3. Use relational model in database design
4. Use SQL commands for creating and manipulating data stored in databases.
5. Write PL/SQL programs to work with databases.

**UNIT - I**

**Overview of Database Management System:** Introduction to data, information, database, database management systems, file-based system, Drawbacks of file-Based System, database approach, Classification of Database Management Systems, advantages of database approach, Various Data Models, Components of Database Management System, three schema architecture of data base, costs and risks of database approach.

**UNIT - II**

**Entity-Relationship Model:** Introduction, the building blocks of an entity relationship diagram, classification of entity sets, attribute classification, relationship degree, relationship classification, reducing ER diagram to tables, enhanced entity-relationship model (EER model), generalization and specialization, IS A relationship and attribute inheritance, multiple inheritance, constraints on specialization and generalization, advantages of ER modeling.

**UNIT - III**

**Relational Model:** Introduction, CODD Rules, relational data model, concept of key, relational integrity, relational algebra, relational algebra operations, advantages of relational algebra, limitations of relational algebra, relational calculus, tuple relational calculus, domain relational Calculus (DRC), Functional dependencies and normal forms upto 3<sup>rd</sup> normal form.

**UNIT - IV**

**Structured Query Language:** Introduction, Commands in SQL, Data Types in SQL, Data Definition Language, Selection Operation, Projection Operation, Aggregate functions, Data Manipulation Language, Table Modification Commands, Join Operation, Set Operations, View, Sub Query.

**UNIT - V**

**PL/SQL:** Introduction, Shortcomings of SQL, Structure of PL/SQL, PL/SQL Language Elements, Data Types, Operators Precedence, Control Structure, Steps to Create a PL/SQL, Program, Iterative Control, Procedure, Function, Database Triggers, Types of Triggers.

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**Text Books:**

1. Operating System Principles by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne (7th Edition) Wiley India Edition.

**Reference Books**

1. Database Management Systems by Raghu Ramakrishnan, McGrawhill
2. Principles of Database Systems by J. D. Ullman
3. Fundamentals of Database Systems by R. Elmasri and S. Navathe
4. SQL: The Ultimate Beginners Guide by Steve Tale.

**SUGGESTED CO-CURRICULAR ACTIVITIES & EVALUATION METHODS:**

**Unit 1: Activity:** Seminar Presentation on Database Management Systems

**Evaluation Method:** Depth of research, clarity of explanations, ability to address questions and engage the audience.

**Unit 2: Activity:** Case Study on EER model

**Evaluation Method:** Identification of inheritance relationships, effective use of generalization and specialization, and adherence to constraints.

**Unit 3: Activity:** Exercise on Normalization: Assign students a set of unnormalized tables and have them normalize the tables to third normal form

**Evaluation Method:** Normalized table designs, identification of functional dependencies, adherence to normalization rules, and elimination of anomalies.

**Unit 4: Activity:** Competition on SQL Query Writing

**Evaluation Method:** Query correctness, efficiency, proper use of SQL commands, ability to handle complex scenarios, and creativity in query formulation.

**Unit 5: Activity:** Peer Review of PL/SQL code

**Evaluation Method:** Peer evaluation of code quality, adherence to coding standards, proper use of language elements, and logic.

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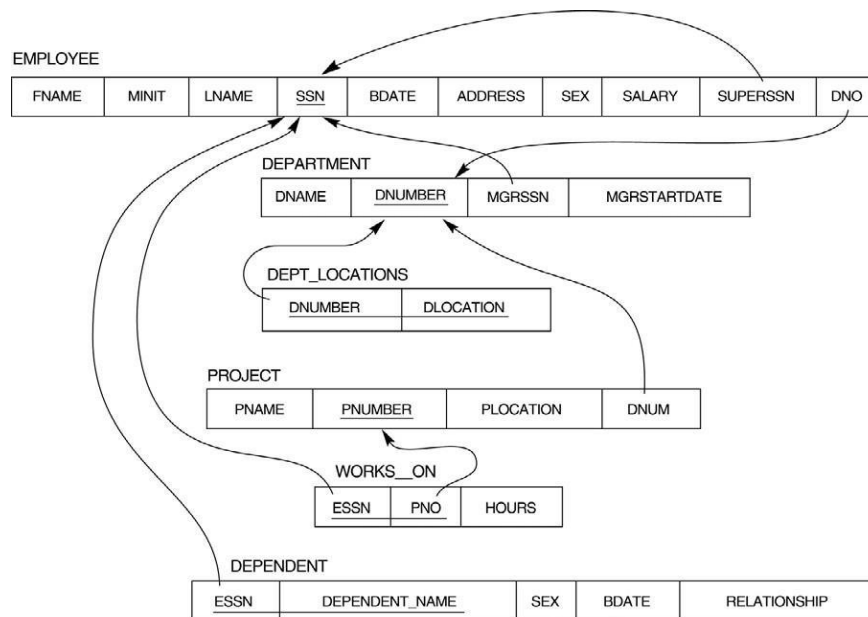
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**List of Experiments:**

1. Draw ER diagram for hospital administration
2. Creation of college database and establish relationships between tables
3. Relational database schema of a company is given in the following figure.

**Relational Database Schema - COMPANY**



**Questions to be performed on above schema**

1. Create above tables with relevant Primary Key, Foreign Key and other constraints
  2. Populate the tables with data
  3. Display all the details of all employees working in the company.
  4. Display ssn, lname, fname, address of employees who work in department no 7.
  5. Retrieve the Birthdate and Address of the employee whose name is 'Franklin T. Wong'
  6. Retrieve the name and salary of every employee
  7. Retrieve all distinct salary values
  8. Retrieve all employee names whose address is in 'Bellaire'
  9. Retrieve all employees who were born during the 1950s
  10. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
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11. Retrieve the names of all employees who do not have supervisors
  12. Retrieve SSN and department name for all employees
  13. Retrieve the name and address of all employees who work for the 'Research' department
  14. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.
  15. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
  16. Retrieve all combinations of Employee Name and Department Name
  17. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project.
  18. Increase the salary of all employees working on the 'Product X' project by 15%. Retrieve employee name and increased salary of these employees.
  19. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
  20. Select the names of employees whose salary does not match with salary of any employee in department 10.
  21. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
  22. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.
  23. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department.
  24. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
  25. Delete all dependents of employee whose ssn is '123456789'.
  26. Perform a query using alter command to drop/add field and a constraint in Employee table.
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