

Course Code: CSE2007	Course Title: Database Management Systems	TPC	3	2	4
Version No.	2.1				
Course Pre-requisites/ Co-requisites	CSE2001				
Anti-requisites (if any).	SWE2006				
Objectives:	<div>1. To introduce students to the fundamentals of Database Systems.</div> <div>2. To train students to apply logical database design principles, including E-R diagrams and database normalization.</div> <div>3. To focus on Relational data model concepts.</div> <div>4. To enable students to construct simple and moderately advanced database queries using structured Query Language (SQL).</div> <div>5. To encourage students to design and implement a small database project</div>				
CO's Mapping with PO's and PEO's					
Course Outcomes	Course Outcome Statement	PO's / PEO's			
CO1	Understanding the need of Relational Database Management Systems over traditional File processing Systems and its different architectures	PO1, PO4			
CO2	Conceptual data modelling and Relational Database designing	PO1, PO2, PO3, PO4			
CO3	Learn the process of Database normalization	PO1, PO2, PO3, PO4			
CO4	Database programming and optimization	PO1, PO2, PO3, PO5			
CO5	Learn Transaction processing and Database recovery techniques	PO1, PO5			
CO6	Learn storage and file structures, Hashing, and Indexing techniques	PO1, PO3, PO5			
TOTAL HOURS OF INSTRUCTIONS : 45					
Module No. 1	Introduction to DBMS and Conceptual data modelling			6 Hours	
Introduction and motivation, Data independence, Three schema architecture, Centralized and Client/Server architectures, Database components, Database users, Entity Types, Entity Sets, Attributes, Entity Type (Strong and Weak), Relationship Types, Relationship Sets, Roles, Structural Constraints, ER diagram construction.					
Module No. 2	Relational Data Model			7 Hours	
The Relational Data Model and Relational Database Constraints, key, null, referential integrity constraints, Relational Database Design using ER-to-Relational Mapping, Relational Algebra and Relational calculus.					
Module No. 3	Database design theory and Normalization			8 Hours	
Functional dependency (FD), Closure of FD, Closure of Attributes, Cover, Equivalence of FD, Canonical cover, Key generation, Normalization, Desirable properties of decomposition.					
Module No. 4	SQL, Query Processing and Optimization			7 Hours	
SQL, Steps in Query Processing, Transforming SQL queries to Relational Algebra, Heuristic Query Optimization.					

<b>Module No. 5</b>	<b>Transaction Processing, Concurrency Control, and Recovery</b>	<b>9 Hours</b>
<b>Transaction Processing:</b> Transaction and System concepts, Desirable properties of Transactions, Characterizing Schedules Based on Recoverability and Serializability, <b>Concurrency Control:</b> Two-Phase Locking, Timestamp Ordering, <b>Database Recovery:</b> Recovery Concepts, Immediate Update, Deferred Update, Shadow Paging.		
<b>Module No. 6</b>	<b>Physical Database Design</b>	<b>8 Hours</b>
Storage and file structure: Memory Hierarchies and Storage Devices, Placing File Records on Disk, Hashing Techniques, Indexing Techniques (Primary Indexes, Secondary Indexes, Clustering Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+-Trees).		
<b>Lab Exercises</b> <ol style="list-style-type: none"> <li>1. Create Table Employee with attributes firstName,LastName,SSN,Address,Salary,Birthday, Sex,SupervisorSSN,DepartmentNo.</li> <li>2. Create a Table Department with attributes DNo,DNAME,ManagerSSN,MgrStartDate.</li> <li>3. Insert the data given above in both employee, department and project tables.</li> <li>4. Display all the employees' information.</li> <li>5. Display Employee name along with his SSN and Supervisor SSN.</li> <li>6. Display the employee names whose bdate is '29-MAR-1959'.</li> <li>7. Display salary of the employees without duplications.</li> <li>8. Display the MgrSSN, MgrStartDate of the manager of 'Finance' department.</li> <li>9. Modify the department number of an employee having fname as 'Joyce' to 5</li> <li>10. Alter Table department add column DepartmentPhoneNum of NUMBER data type and insert values into this column only.</li> <li>11. Alter table department to modify the size of DepartmentPhoneNum.</li> <li>12. Modify the field name DepartmentPhoneNum of departments table to PhNo.</li> <li>13. Rename Table Department as DEPT.</li> <li>14. Alter Table department remove column PhNo.</li> <li>15. Create a table COPYOFDEPT as a copy of the table DEPT.</li> <li>16. Delete all the rows from COPYOF DEPT table.</li> <li>17. Remove COPYOF DEPT table.</li> <li>18. Add Foreign Keys using Alter Table .</li> <li>19. Drop Foreign key defined on SuperSSN and add it using Alter table command.</li> <li>20. Find the employee names having salary greater than Rs.25000.</li> <li>21. Find the employee names whose salary lies in the range between 30000 and 70000.</li> <li>22. Find the employees who have no supervisor.</li> <li>23. Display the bdate of all employee s in the format 'DDthMonthYYYY'.</li> <li>24. Display the employee names whose bdate is on or before 1978.</li> <li>25. Display the employee names having 'salt lake' in their address.</li> <li>26. Display the department name that starts with 'M'.</li> <li>27. Display the department names' that ends with 'E'.</li> <li>28. Display the names of all the employees having supervisor with any of the following SSN 554433221, 333445555.</li> <li>29. Display all the department names in upper case and lower case.</li> <li>30. Display the first four characters and last four of the department names using substring function.</li> <li>31. Display the substring of the Address (starting from 5th position to 11 th position) of all employees.</li> <li>32. Display the Mgrstartdate on adding three months to it.</li> <li>33. Display the age of all the employees rounded to two digits.</li> <li>34. Find the last day and next day of the month in which each manager has joined.</li> <li>35. Print a substring from the string 'Harini'.</li> </ol>		

36. Replace the string 'ni' from 'Harini' by 'sh'.
37. Print the length of all the department names.
38. Print the system date in the format 25 th May 2007.
39. Display the date after 10 months from current date.
40. Display the next occurrence of Friday in this month.
41. How many different departments are there in the 'employee' table
42. For each department display the minimum and maximum employee salaries
43. Print the average annual salary.
44. Count the number of employees over 30 age.
45. Print the Department name and average salary of each department.
46. Create a view to display the employee details who is working in IT department.
47. Create a logical table to store employee details who is getting salary more than 10000.
48. Create a table to store the employees details based on the department no
49. List the names of all managers who have no dependents.
50. List the employee's names and the department names if they happen to manage a department.
51. [Hello World Program in PL/SQL](#)
52. [PL/SQL Program To Add Two Numbers](#)
53. [PL/SQL Program for Prime Number](#)
54. [PL/SQL Program to Find Factorial of a Number](#)
55. [PL/SQL Program to Print Table of a Number](#)
56. [PL/SQL Program for Reverse of a Number](#)
57. [PL/SQL Program for Fibonacci Series](#)
58. [PL/SQL Procedure to Check Number is Odd or Even](#)
59. [PL/SQL Function to Reverse a String](#)
60. Write a PL/SQL program to retrieve the employees working in DNO=5 and increase their salary by 10%.
61. Write a PL/SQL cursor
62. Study of PL/SQL Conditional Statements
63. Study of PL/SQL Loops
  - a. Study of PL/SQL procedures and functions
  - b. Study of PL/SQL cursors
  - c. Write a program using PL/SQL to raise Triggers
  - d. Write a PL/SQL program to handle Exceptions

#### **Text Books**

1. R. Elmasri & S. B. Navathe, "Fundamentals of Database Systems", Pearson Education 7<sup>th</sup> Edition, 2017.

#### **References**

1. A. Silberschatz, H. F. Korth & S. Sudershan, "Database System Concepts", McGraw Hill, 7<sup>th</sup> Edition 2016.
2. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom, "Database Systems: The Complete Book", Pearson Education, Second Edition, 2014.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 2014

<b>Course Type</b>	<b>Embedded Theory and Lab(ETL)</b>	
<b>Mode of Evaluation</b>	<b>Theory</b>	<b>75%</b>
	Continuous Assessment Test-1	15
	Continuous Assessment Test-2	15
	Digital Assignments/Quizes (Min)	30
	Final Assessment Test	40
	<b>Laboratory</b>	<b>25%</b>

<b>Modified by</b>	<b>Dr. Abhijit Adhikari and Dr. Sandipan Maiti</b>
<b>Recommended by the Board of Studies on</b>	<b>14<sup>th</sup> BoS, 11.05.2024</b>
<b>Date of Approval by the Academic Council</b>	<b>12<sup>th</sup> Academic Council, 25.05.2024</b>