Course Code CSE3001	Database Management Systems	CT C
		LTP 4
Prerequisite:	Data Structures and Algorithms	

Objectives:

This course imparts the students with background to understand, design, implement, and use database management systems. The course will highlight the significant functions of database management system. This course is devised to learn and explore

- Advantages of using a DBMS rather than a file system.
- Designing an Entity-Relationship model for a real life application.
- Mapping a database schema from ER model.
- Evaluating relational schemas for design qualities
- Optimize a query.
- Basic concepts on transaction processing, concurrency control and recovery.
- Fundamental view on unstructured data and its management.

Storage of databases and techniques to access them using various algorithms

Expected Outcomes:

At the completion of this course, students should be able to do the following:

- Explain the role of a database management system in an organization.
- Describe the structure and operation of the relational data model.
- Construct database queries using Structured Query Language (SQL).
- Design and implement a database project depending on the business requirements, considering various design issues.
- Implement the concept of a database transaction and related database facilities, including concurrency control, backup and recovery.

Student Outcomes (SO):b,c,i,k,l

b. An ability to analyze a problem, identify and define the computing requirements appropriate to its solution.

c. An ability to design, implement and evaluate a system / computer-based system, process, component or program to meet desired needs

i. Design and conduct experiment as well as analyze and interpret data.

k. An ability to use current techniques, skills and tools necessary for computing engineering practice.

l. An ability to apply mathematical foundations, algorithmic principles and computer science theory in the modelling and design of computer-based systems (CS)

Unit No	Unit Content	No. of hours	SOs
1	**Introduction to Database system:** purpose of database system, view of data, Independence, relational databases, -Database Language- Database System architecture- levels, Mappings, Database, users and DBA Data Models: Importance, Basic building blocks, Degrees of data abstraction. Database design and ER Model: Overview, ER-Model,	09	c

	Constraints, ER-Diagrams, ERD Issues, weak entity sets.		
2	**Relational Models:** Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, selection, Projection, relational algebra queries, tuple relational calculus, set operations, renaming, Joins, Division, syntax. Operators, grouping and ungrouping, relational comparison. Codd's rules, Relational Schemas, Introduction to UML **Relational database model:** Logical view of data, keys, integrity rules. **Normalization:** 1NF, 2NF, 3NF, BCNF, Multi valued dependencies and Fourth Normal Form.	10	c
3	**Relational Database design**: features, atomic domain. **SQL:** data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers. Data Manipulation Language (DML) and Transaction Control Language (TCL) , Basic SELECT statements , Table Joins, Restricting and Sorting Data - Order By / Group By. Retrieving Data Using the SQL SELECT Statement, Single-Row Functions, Conversion Functions and Conditional Expressions, Reporting Aggregated Data Using the Group Functions, Displaying Data from Multiple Tables. Joins, Set Operators, DML Statements, Data Definition Language - Data Dictionary Views - Creating Sequences, Synonyms, and Indexes, Creating Views - Introduction to views, data independence, security, updates on views, comparison between tables and views.	09	b
4	**PL/SQL:** Declaring PL/SQL Variables, Writing Executable Statements, Using SQL Statements Within a PL/SQL Block, Control Structures, Composite Data Types, Using Explicit Cursors, Handling Exceptions, Introducing Stored Procedures and Functions. **Data Storage:** Overview of Physical Storage Media - Magnetic disk Flash storage -RAID-File and Record Organization-Indexing and Hashing, Ordered Indices - B+Tree Index File-Static Hashing -Dynamic Hashing-Query Processing: Overview-measures of Query Cost. Query Optimization Techniques- Cost based Optimization-Heuristic Optimization	08	l
5	**Transaction Management:** Transaction concepts-properties of transactions-Transaction Atomicity and Durability-Transaction Isolation-Implementation of Isolation Levels-serializability of transactions, testing for serializability. **Concurrency Control:** Lock based protocols--Deadlock handling-Multiple Granularity-Time stamp based protocols -System recovery, Two- Phase Commit protocol, **Recovery system:** Failure classification --Recovery and atomicity - Recovery Algorithms.	07	c
6	**Guest Lecture on Contemporary Topics**	02	
	Total Lecture:	45	
Mode of Teaching and Learning: Flipped Class Room, One Lecture to be videotaped, Digital/Computer based models to augment lecture for practice/tutorial, 2 hours lectures by industry experts on contemporary topics			

Mode of Evaluation and assessment:

The assessment and evaluation components may consist of unannounced open book examinations, quizzes, student's portfolio generation and assessment, and any other innovative assessment practices followed by faculty, in addition to the Continuous Assessment Tests and Final Examinations.

Text Books:

1.	R. Elmasri & S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 7 th Edition, 2015			
2.	Raghu Ramakrishnan,Database Management Systems,Mcgraw-Hill,4th edition,2015			

Reference Books:

1.	A. Silberschatz, H. F. Korth & S. Sudershan, Database System Concepts, McGraw Hill, 6 th Edition 2010			
2.	Thomas Connolly, Carolyn Begg," Database Systems : A Practical Approach to Design, Implementation and Management",6th Edition,201			
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Recommendation by the Board of Studies on	*June 25, 2018*
Approval by Academic council on	*July 18, 2018*
Compiled by	*Dr S Raju and Dr R Ganesan*

Indicative List of Experiments

No.	Description of Experiment	SO
1	Consider the following relations containing airline flight information: Flights(flno: integer, from: string, to: string,distance: integer, departs: time, arrives: time) Aircraft(aid: integer, aname: string, cruisingrange: integer) Certified(eid: integer, aid: integer) Employees(eid: integer, ename: string, salary: integer) Note that the Employees relation describes pilots and other kinds of employees as well every pilot is certified for some aircraft (otherwise, he or she would not qualify as a pilot), and only pilots are certified to fly. Write the following queries in SQL 1. Find the eids of pilots certified for some Boeing aircraft. 2. Find the names of pilots certified for some Boeing aircraft. 3. Find the aids of all aircraft that can be used on non-stop flights from Bonn to Madras. 4. Identify the flights that can be piloted by every pilot whose salary is more than $100,000. 5. Find the names of pilots who can operate planes with a range greater	i

	than 3,000 miles but are not certified on any Boeing aircraft.	
2	SAILORS (SID:INTEGER, SNAME:STRING, RATING:INTEGER, AGE:REAL) BOATS (BID:INTEGER, BNAME:STRING, COLOR:STRING) RESERVES (SID:INTEGER, BID:INTEGER, DAY:DATE) 1. Display names & ages of all sailors. 2. Find all sailors with a rating above 7. 3. Display all the names & colors of the boats. 4. Find all the boats with Red color. 5. Find the names of sailors who have reserved boat number 123. 6. Find SIDs of sailors who have reserved Pink Boat; 7. Find the color of the boats reserved by Rajesh. 8. Find names of the sailors who have reserved at least one boat. 9. Find the names of sailors who have reserved a red or a green boat. 10. Find the names of sailors who have reserved boat 103. 11. Find the names of sailors who have not reserved boat 103. 12. Find sailors whose rating is better than some sailor called Rajesh. 13. Find the sailor's with the highest rating using ALL. 14. To count number SIDs of sailors in Sailors table 15. To count numbers of boats booked in Reserves table. 16. To count number of Boats in Boats table. 17. To find age of Oldest Sailor. 18. To find age of Youngest Sailor. 19. Find the average age of sailors with a rating of 10. 20. Count the number of different sailor names. 21. Find the name and age of the oldest sailor. 22. Count the number of Sailors. 23. Find the names of sailors who are older than the oldest sailor with a rating of 10. 24. Display all the sailors according to their ages. 25. To display names of sailors according to alphabetical order.	i
3	Design the data base for a wholesale furniture company. The database has to allow to analyze the company's situation at least with respect to the Furniture, Customers and Time. Moreover, the company needs to analyze:	i

	the furniture with respect to its type (chair, table, wardrobe, cabinet. . .), category (kitchen, living room, bedroom, bathroom, office. . .) and material (wood, marble. . .) the customers with respect to their spatial location, by considering at least cities, regions and states The company is interested in learning at least the quantity, income and discount of its sales.	

4	Simple script to backup all SQL server database
	
	Create a database table with the following fields:
	    Field name Data type
	    Ship_id Number -- This is the ID of a particular Ship
	    Date_expected Date --The date at which the goods are expected to arrive
	    Qty_expected Number --The quantity that is supposed to arrive
	    Description Varchar2 --The description of the items
	    Color Varchar2 --The color of the items
	    Qty_hand Number –The quantity on hand for these items
	    Itemrate Number—Price of each item.
	
	Write a PL/SQL program that uses implicit cursor to display the data expected, quantity expected, item description, color and quantity on hand for any particular Ship ID number.
		i

5	Create a transparent audit system for a table Client_master (client_no, name, address, Bal_due). The system must keep track of the records that are being deleted or updated. The functionality being when a record is deleted or modified, the original record details and the date of operation are stored in the auditclient(client_no, name, bal_due, operation, userid, update) table, then the delete or update is allowed to go through.	i
6	Using the supplier and parts database, write an cursor program to read and print all parts in part number, deleting every tenth one as you go, and begin a new transaction after every tenth row. You can use the foreign key delete CASCADE rule from parts,commit,rollback and savepoint .	I
7	Assuming a patient should not receive both treatment and prescription	I

	from the same doctor, write a program to find out all the doctor who provide both treatment and prescription to the same patient. In addition, raise and display an exception if this situation occurs.	
8	Write a PL/SQL block which includes a procedure getCleanerDetails which accepts a cleaner number and returns the cleaners name and salary. Create a stored function called getCleanersLocation. This function takes as input a cleaner's number and returns the cleaner's depot address. Call the function from within an SQL statement to select the cleaner's name and location for a particular cleaner.	I,k
9	Write a PL/SQL block which includes a procedure getCleanerDetails which accepts a cleaner number and returns the cleaners name and salary. The main block should call the procedure with cleaner number '113' and output this cleaner's details including the salary which has been increased by 10%.	I,k
10	Create a Trigger that raises an User Defined Error Message and does not allow the update and Insert operation in the database	I,k
11	Join Queries : Assume necessary database schema • Display the name of each employee with his department name. • Display a list of all departments with the employees in each department. • Display all the departments with the manager for that department. • Display the names of each employee with the name of his/her boss. • Display the names of each employee with the name of his/her boss with a blank for the boss of the president. • Display the employee number and name of each employee who manages other employees with the number of people he or she manages. Repeat the display for the last question, but this time display the rows in descending order of the number of employees managed.	I