GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering
Level: Diploma
Branch: Information & Communication Technology
Subject Code : DI04032011
Subject Name : Database Management System

w. e. f. Academic Year:	2025-26
Semester:	4th
Category of the Course:	PCC

Prerequisite:	Basics of Computer Programming
Rationale:	The aim of this course is to get understanding of the basic concepts of database management system used for business, scientific and engineering application which stored centralized. The students will develop the skills to design and develop database using different database models manage & retrieve data from different perspective using Structured Query Language (SQL) in ORACLE (centralized storage) so there is no need of storing data in files and paper. This helps students to design ER-models to represent simple databases and convert them into relational tables, populate relational databases and formulate SQL queries on data. Students will improve database design through normalization. Students will understand how database systems must provide for the safety of the stored information, despite system crashes or attempts at unauthorized access.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the fundamental concepts of database systems and role of databases in sustainable development and identify eco-friendly practices in database systems.	R,U,A
02	Design database using Entity Relationship approach	R,U,A
03	Manage and Implement database using SQL.	R,U,A
04	Apply concepts of normalization to design an optimal database.	R,U,A
05	Explain transaction management concepts for concurrent use of database.	R,U,A

Revised Bloom's Taxonomy (RBT)

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	**T**	**PR**	**C**	**ESE (E)**	**PA(M)**	**PA(I)**	**ESE (V)**	
2	0	2	3	70	30	20	30	150

UNDERPINNING THEORY:

Only the major Underpinning Theory is formulated as higher level UOs of *Revised Bloom's taxonomy* in order development of the COs and competency is not missed out by the students and teachers. If required, more such higher level UOs could be included by the course teacher to focus on attainment of COs and competency.

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
Unit – I Introduction to Database Systems	1.1 Introduction 1.1.1 Data and Information 1.1.2 Database and Database Management System 1.1.3 Metadata 1.1.4 Data items,fields & records 1.1.5 Data Dictionary 1.2 Purpose of Database System 1.3 File oriented System versus database system 1.4 Application of DBMS 1.5 Database Administrator 1.5.1 Roles and responsibilities of DBA 1.6 Schema, Sub-Schema, Instances 1.7 Data Abstraction 1.7.1 Internal Level 1.7.2 Conceptual Level 1.7.3 External Level 1.8 Data Independence 1.9 Database Architecture 1.9.1 ER Model 1.9.2 Relational Model 1.9.3 Object oriented data model 1.9.4 Network Data Model 1.9.5 Hierarchical Data Model	04	15

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	1.10 Role of databases in smart cities & renewable energy tracking		
Unit – II ER Model and Relational Algebra	2.1 Basic concepts of E-R 2.1.1 Entity 2.2.2 Attributes 2.2.2 Attributes 2.2.3 Relationship 2.2.3.1 Participation 2.2.3.2 Recursive relationships 2.2.3.3 Degree of relationship set 2.2 Mapping Cardinality 2.3 Key 2.3.1 Primary, Foreign, Super, Candidate 2.4 ER Diagrams 2.5 Weak Entity Sets 2.6 Enhanced ER Model 2.6.1 Subclass & Super Class 2.6.2 Generalization 2.6.3 Specialization 2.6.4 Aggregation 2.7 Converting ER Diagrams to database	05	20
Unit-III Structured Query Language	3.1 SQL Data types 3.2 Data Definition Language Commands: create, alter, truncate, drop 3.3 Data Manipulation Language Commands: insert, select, update, delete 3.4 Privilege command: grant, revoke 3.5 SQL views 3.6 Single row function 3.7 Date functions 3.8 Numeric &Character function 3.9 Conversion function 3.10 Miscellaneous function 3.11 Group function 3.13 Operators 3.14 Arithmetic 3.15 Comparison 3.16 Logical Group by 3.17 Having and order by clause 3.18 Set operators: Union, union all, intersect, minus 3.19 Joins: simple join, equi join, non equi join, self-join, outer join	12	32

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	.20 Need of Constraints 3.21 Domain Integrity constraints: Not null, Check 3.22 Entity Integrity constraints 3.22.1 Unique 3.22.2 Primary key 3.23 Referential integrity Constraints 3.23.1 Foreign key 3.23.2 Reference key		
Unit–IV Refining database design through Normalization	4.1 Importance of Normalization 4.2 Functional Dependencies4.2.1 Partial Functional Dependency 4.2.2 Full Functional Dependency 4.2.3 Transitive Dependency 4.3 Normal Forms 4.3.1 First Normal Form 4.3.2 Second Normal Form 4.3.3 Third Normal Form	05	18
Unit–V Transaction Management	5.1 Transaction concepts, properties of transactions. 5.2 Serializability of transactions 5.2.1 Conflict Serializability 5.2.2 View Serializability	04	15
	Total	**30**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	22	28	--	--	--

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:
(a) Books:
1. "An Introduction to Database Systems" C. J., Kannan, A., & Swamynathan,(8th ed.)Pearson Education India, ISBN-13: 978-8177585568, (2006).
2. "Database System Concepts" Henry F. Korth, (4th ed.), McGraw Hill, Delhi, (2011).
3. "Introduction to Database Systems" ITL ESL, (5th ed.), Pearson Education, New Delhi, (2010).
4. SQL/PL/SQL" Ivan Bayross, BPB Publications, New Delhi, (2010).

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(b) Open source software and website:

1. DBMS: http://nptel.iitm.ac.in/video.php?subjectId=106106093

2. SQL Plus Tutorial: http://holowczak.com/oracle-sqlplus-tutorial/

3. Database Tutorials:http://www.roseindia.net/programming-tutorial/Database-Tutorials

4. SQL Basic Concepts: http://www.w3schools.com/sql/

5. SQL Tutorial : http://beginner-sql-tutorial.com/sql.htm

Suggested Course Practical List:

Sr. No.	Practical Outcomes (PrOs)	Unit No.	Approx.
Hrs. required			
1	Prepare a report on current database trends, architecture and tools.	1	2
2	Database applications for sustainability: Campus energy tracker, smart waste system, eco transport DB	1	2
3	Draw ER-Diagram for Library Management System and convert it relational schema	2	2
4	Implement SQL queries to perform various DDL Commands. (Create minimum 5 tables with different data types and operate upon them)	3	4
5	Implement SQL queries to perform various DML Commands. (Insert minimum 10 rows using different insert methods, edit and remove data using update and delete commands) and retrieve data using SELECT command and various SQL operators.	3	4
6	Implement SQL queries using Date functions like add-months, months-between, round, nextday, truncate etc	3	2
7	Implement SQL queries using Numeric functions like abs, ceil, power, mod, round, trunc, sqrt etc. and Character Functions like initcap, lower, upper, ltrim, rtrim, , replace, substring, instr etc.	3	2
8	Implement SQL queries using Conversion Functions like to-char, to-date, to-number and Group functions like Avg, Min, Max, Sum, Count, Decode etc.	3	2
9	Write SQL query for set operators and join operations.	3	2
10	Apply the concept of integrity/data constraints while creating/altering a table	3	2
11	Write SQL queries for CREATE USER, GRANT, REVOKE and DROP USER command.	3	2
12	Practices on Normalization – using any database perform various normal forms.	4	2
13	Prepare a report on transaction management concepts for concurrent access of database by multiple users.	5	2
	Total		**30**

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List of Laboratory/Learning Resources Required:

a. Hardware:
   Computer Systems with minimum PIV processor (or equivalent) and 1 GB RAM.

b. Software:
SQL/PLSQL supporting software. (e.g. Oracle, SQL Server, MySQL)

A suggestive list of micro-projects:

Sample Project Definitions: Hotel management, Event Management, Hospital Management, Health Monitoring Management System, Airline Management, Bank Management system, Transportation Management System, Library Management System etc

This has to match the competency and the COs. Similar micro-projects could be added by the concerned course teacher:

Students have to perform the following steps for any chosen project.

   a) Choose any topic of your choice and enlist its requirements.
   b) Draw an ER Diagram for your chosen topic and prepare tables, establish relationships between them.
   c) Normalize the database.
   d) Determine the different scenarios and how data will be fetched with queries.
   e) Write the relational algebra queries for queries mentioned.

Suggested Activities for Students:

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

   i. Prepare seminar presentations explaining the organization of database in various live systems like banking, insurance, online store etc.

   ii. Prepare power point presentation for different SQL Statements.

   iii. Prepare case study explaining the need for converting a large table to many smaller tables using 1NF, 2NF, 3NF

   iv. Design database which can be used in the course on .net programming

   v. Database applications for sustainability

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