

Program Name : Computer Engineering Program Group / Diploma in Electronics and Computer Engineering / Diploma in Computer Hardware & Maintenance / Diploma in Artificial Intelligence and Machine Learning / Diploma in Cloud Computing and Big Data

Program Code : CO/CM/CW/TE/HA/AN/BD

Semester : Third

Course Title : Database Management System

Course Code : 22319

1. RATIONALE

Each and every organization like shopping mall, hospital, banking, institutes, industry needs to share huge amount of data in effective manner. This course aims to develop skills in students to create, store, modify, manage and extract information from a database. Database system can be used as a backend for developing database applications.

2. COMPETENCY

The aim of this course is to help the student to attain the following *industry identified* competency through various teaching learning experiences:

- Apply Database management concept using SQL.

3. COURSE OUTCOMES (COs)

The theory, practical experiences and relevant soft skills associated with this course are to be taught and implemented, so that the student demonstrates the following industry oriented COs associated with the above mentioned competency:

- Design Normalized database on given data.
- Create and Manage Database using SQL command.
- Write PL/SQL code for given database.
- Apply triggers on database also create procedure and function according to condition.
- Apply security and confidentiality on given Database.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme												
L	T	P		Theory						Practical						
				Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	2	2	8	3	70	28	30*	00	100	40	25#	10	25	10	50	20

(*): Under the theory PA; Out of 30 marks, 10 marks of theory PA are for micro-project assessment to facilitate integration of COs and the remaining 20 marks is the average of 2 tests to be taken during the semester for the assessment of the UOs required for the attainment of the COs.

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; ESE - End Semester Examination; PA - Progressive Assessment



5. COURSE MAP (with sample COs, PrOs, UOs, ADOs and topics)

This course map illustrates an overview of the flow and linkages of the topics at various levels of outcomes (details in subsequent sections) to be attained by the student by the end of the course, in all domains of learning in terms of the industry/employer identified competency depicted at the centre of this map.

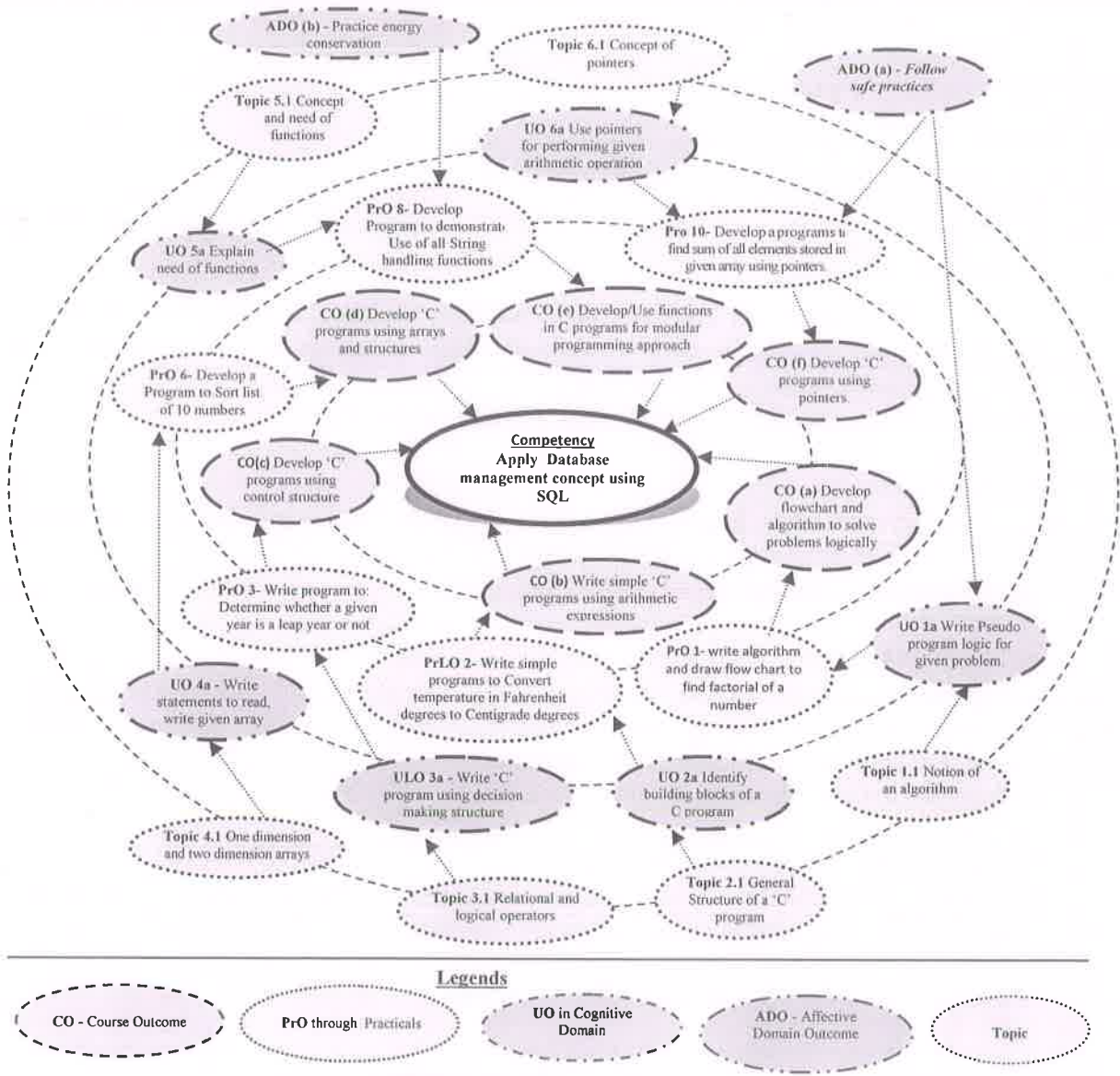
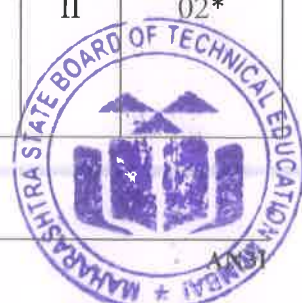


Figure 1 - Course Map

6. SUGGESTED PRACTICALS/ EXERCISES

The practicals in this section are PrOs (i.e. sub-components of the COs) to be developed and assessed in the student for the attainment of the competency:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
1	Perform following in GUI based database software using GUI only i) Create Database ii) Create tables and assign primary key .	II	02*



S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
	iii) Modify the table structure-add column ,change the data type of column, delete the column from table. iv) Insert, update and delete the record from table. v) Retrieve data from the table according to condition given.		
2	Perform following in GUI based database using GUI only i) Apply given validation on table and set error messages. ii) Set default value for column. iii) Set and remove database password.	II	02
3	Design E-R diagram and Create Normalized Database on given data.	II	02
4	i) Create and Execute DDL commands using SQL. ii) Apply following Integrity constraints on table: iii) Primary key, Foreign key, Unique key constraint, Null , Not Null and Check constraint.	II	02*
5	Create and Execute DML commands using SQL.	II	02*
6	Write Queries using following operators: Arithmetic Operators, Comparison Operators, Logical Operators, Set Operators, Range Searching operators-Between, Pattern matching operators-Like.	II	02*
7	Write Queries using following Functions: String, Arithmetic, Date and time, Aggregate Functions.	III	02*
8	Execute Queries using the Select command with Where, Having, Group by and order by clauses.	III	02*
9	Execute the queries for implementation of Inner and Outer Join.	III	02
10	Implement Views i) Create different views ii) Insert, modify and delete records through views. iii) Delete the views.	III	02
11	Create and Execute Indexes, Sequences, and synonyms in SQL.	III	02*
12	Write a PL/SQL programs using if then else, for, while and nested loop.	IV	02*
13	Write a PL/SQL code to implement implicit and explicit cursors.	IV	02
14	Write PL/SQL Programs based on Exceptions handling.(Predefined and user-defined exceptions)	IV	02
15	Write PL/SQL code to create Procedures and functions.	IV	02
16	Write PL/SQL code to create triggers on given database.	IV	02
17	Executing DCL commands using SQL i) Create users ii) Grant privileges to users iii) Revoke privileges from users.	V	02*
	Total		34

Note

i. A suggestive list of **PrOs** is given in the above table. More such PrOs can be added to attain the COs and competency. A judicious mix of minimum 12 or more practical need to be performed, out of which, the practicals marked as '*' are compulsory, so that the student reaches the 'Precision Level' of Dave's 'Psychomotor Domain Taxonomy' as generally required by the industry.



ii. The 'Process' and 'Product' related skills associated with each PrO is to be assessed according to a suggested sample given below:

S. No.	Performance Indicators	Weightage in %
a.	SQL queries and PL/SQL programming	60
b.	Database Integrity	10
c.	Quality result displayed by SQL queries.	10
d.	Answer to sample questions	10
e.	Submit report in time	10
Total		100

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- a. Follow safety practices.
- b. Practice good housekeeping.
- c. Demonstrate working as a leader/a team member.
- d. Maintain tools and equipment.
- e. Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1st year
- 'Organising Level' in 2nd year
- 'Characterising Level' in 3rd year.

7. MAJOR EQUIPMENT/ INSTRUMENTS REQUIRED

The major equipment with broad specification mentioned here will usher in uniformity in conduct of experiments, as well as aid to procure equipment by authorities concerned.

S. No.	Equipment Name with Broad Specifications	Pro. S. No.
1	Computer system (Any computer system with basic configuration)	All
2	Any GUI based database software (MS-Access/Visual Foxpro/MySQL)	1-2
3	Any RDBMS software (MySQL/SQL server)	3-16

8. UNDERPINNING THEORY COMPONENTS

The following topics are to be taught and assessed in order to develop the sample UOs given below for achieving the COs to attain the identified competency. More UOs could be added:

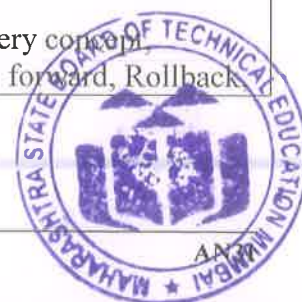
Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Unit – I Database System	1a State the importance of DBMS over file processing in the	1.1 Concept of Data, database, DBMS, advantages of DBMS over file processing system, Application of database.



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
Concept	<p>given situation.</p> <p>1b Describe the overall structure of the given DBMS</p> <p>1c Identify the relevant database model in the given situation.</p> <p>1d Draw the E-R diagram of the given database and identify relationship between the entities.</p>	<p>1.2 Three level Architecture for Database System.</p> <p>1.3 Data abstraction: Different levels of Data abstraction, Instance and schema, Data independence - Logical and Physical Independence.</p> <p>1.4 Overall Structure of DBMS.</p> <p>1.5 Data Modeling: Record based logical model- Relational, Network, Hierarchical</p> <p>1.6 Data Modeling Using the E-R Model: Entity Relationship Model, Strong Entity set, Weak Entity set, Types of Attributes, E-R Diagrams.</p>
Unit- II Relational Data Model	<p>2a Explain the concept of RDBMS also appropriateness for the given problem.</p> <p>2b Design Normalized database structure in the given problem.</p> <p>2c Design SQL queries to create Relational database and apply in the given data constraints.</p> <p>2d Identify the operators for queries implementation of the given problem.</p>	<p>2.1 Fundamentals of RDBMS – Record, fields, data types, tables and database</p> <p>2.2 Concept of RDBMS, E.F.Codd's Rule for RDBMS, Key concepts- Candidate key, Primary key, Foreign key.</p> <p>2.3 Normalization: Normalization Concepts, Need of Normalization, Types of Normalization- 1NF,2NF,3NF</p> <p>2.4 Introduction to Structured Query Language, Data Types in SQL, components of SQL- DDL,DML,DCL,DQL</p> <p>2.5 DDL Commands: CREATE, ALTER, DROP, TRUNCATE, DESC, RENAME</p> <p>2.6 Data Integrity Constraint: Types of Data Integrity Constraint: I/O constraint- Primary key, Foreign key, Unique key constraint, Business Rule Constraint-Null, Not Null and Check constraint.</p> <p>2.7 DML Commands: INSERT, UPDATE, DELETE</p> <p>2.8 DCL Commands: COMMIT, SAVEPOINT, ROLLBACK, GRANT, and REVOKE.</p> <p>2.9 DQL Commands: SELECT.</p> <p>2.10 SQL Operators: Arithmetic Operators, Comparison Operators, Logical Operators, Set Operators, Range Searching operators- Between, Pattern matching operators-Like.</p>
Unit III- Interactive SQL and Advance SQL: SQL Performanc	<p>3a. Write the given queries using relevant functions.</p> <p>3b. Write query to combine the given multiple table using</p>	<p>3.1 In-built Functions: String, Arithmetic,</p> <p>3.2 Date and time, Aggregate functions.</p> <p>3.3 Queries using Group by, having, and Order by clause, Joins-Inner and Outer Join</p> <p>3.4 Views: Concept of View, The Create View</p>



Unit	Unit Outcomes (UOs) (in cognitive domain)	Topics and Sub-topics
e Tuning	<p>Join.</p> <p>3c. Design SQL queries to implement VIEWS on the given tables.</p> <p>3d. Apply and drop INDEXES and SYNONYM on the given table.</p>	<p>Command, Updating Views, Views and Joins, Views and Sub queries, Dropping Views.</p> <p>3.5 Sequences: Creating Sequences, Altering Sequences, Dropping Sequences.</p> <p>3.6 Indexes: Index Types, Creating of an Index: Simple Unique, and</p> <p>3.7 Composite Index, Dropping Indexes</p> <p>3.8 Synonyms: Creating Synonyms, Dropping Synonyms.</p>
Unit IV- PL/SQL Programming	<p>4a. Write simple PL/SQL Code using control structure and handle various exceptions in the given situation.</p> <p>4c. Create cursor for retrieving multiple records in the given situation.</p> <p>4d. Create and Execute stored procedures and functions in the given situation.</p> <p>4e. Create and apply database trigger using PL/SQL in the given situation.</p>	<p>4.1 Introduction of PL/SQL, Advantages of PL/SQL, The PL/SQL Block Structure, PL/SQL execution environment, PL/SQL data Types, Variables, Constants.</p> <p>4.2 Control Structure: Conditional Control, Iterative Control, Sequential Control.</p> <p>4.3 Exception handling: Predefined Exception, User defined Exception.</p> <p>4.4 Cursors: Implicit and Explicit Cursors, Declaring, Opening and Closing a Cursor, Fetching a Record from Cursor, Cursor for loops, Parameterized Cursors.</p> <p>4.5 Procedures: Advantages, Creating, Executing and Deleting a Stored Procedure.</p> <p>4.6 Functions: Advantages, Creating, Executing and Deleting a Function.</p> <p>4.7 Database Triggers: Use of Database Triggers, How to apply database Triggers, Types of Triggers, Syntax for Creating Trigger, Deleting Trigger.</p>
Unit V- Database security and Transaction Processing	<p>5a. Provide security to the given database by assigning various privileges to the user.</p> <p>5b. Create and manage the given database Users.</p> <p>5c. Explain the importance of Transaction in the given situation.</p> <p>5d. Explain advantages of Database Backup and Recovery in the given situation.</p>	<p>5.1 Database security: Introduction to database security, Data security Requirements, Types of Database Users-Creating, altering and Deleting Users.</p> <p>5.2 Protecting the data within database-Database Privileges: Systems privileges and object Privileges, Granting and Revoking Privileges: Grant and Revoke command.</p> <p>5.3 Transaction: Concept, Properties and States of Transaction.</p> <p>5.4 Database Backup -Types of Failures, Causes of failures, Database Backup Introduction, Types of Database Backups-Physical and Logical.</p> <p>5.5 Database Recovery-Recovery concepts, Recovery Techniques-Roll forward, Rollback</p>



Note: To attain the COs and competency, above listed UOs need to be undertaken to achieve the 'Application Level' of Bloom's 'Cognitive Domain Taxonomy'.

9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Database System Concepts	10	04	04	04	12
II	Relational Data Model	16	02	04	12	18
III	Interactive SQL and Advance SQL: SQL Performance Tuning	14	02	04	08	14
IV	PL/SQL Programming	14	02	04	10	16
V	Database security and Transaction Processing	10	02	04	04	10
Total		64	12	20	38	70

Legends: R=Remember, U=Understand, A=Apply and above (Bloom's Revised taxonomy)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

10. SUGGESTED STUDENT ACTIVITIES

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:

- Prepare journal of practical.
- Undertake micro-projects.

11. SUGGESTED SPECIAL INSTRUCTIONAL STRATEGIES (if any)

These are sample strategies, which the teacher can use to accelerate the attainment of the various learning outcomes in this course:

- Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- 'L' in item No. 4 does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
- About **15-20% of the topics/sub-topics** which is relatively simpler or descriptive in nature is to be given to the students for *self-directed learning* and assess the development of the COs through classroom presentations (see implementation guideline for details).
- With respect to item No.10, teachers need to ensure to create opportunities and provisions for *co-curricular activities*.
- Guide student(s) in undertaking micro-projects.
- Demonstrate students thoroughly before they start doing the practice.
- Encourage students to refer different websites to have deeper understanding of the subject.
- Observe continuously and monitor the performance of students in Lab



12. SUGGESTED MICRO-PROJECTS

Only one micro-project is planned to be undertaken by a student that needs to be assigned to him/her in the beginning of the semester. In the first four semesters, the micro-project are group-based. However, in the fifth and sixth semesters, it should be preferably be **individually** undertaken to build up the skill and confidence in every student to become problem solver so that s/he contributes to the projects of the industry. In special situations where groups have to be formed for micro-projects, the number of students in the group should **not exceed three**.

The micro-project could be industry application based, internet-based, workshop-based, laboratory-based or field-based. Each micro-project should encompass two or more COs which are in fact, an integration of PrOs, UOs and ADOs. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The total duration of the micro-project should not be less than **16 (sixteen) student engagement hours** during the course. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs.

A suggestive list of micro-projects is given here. Similar micro-projects could be added by the concerned faculty:

- Survey on various database System Software and compare it.
- Design E-R Diagram for Hospital/college/medical/Jewellery Shop/Library/Blood Bank.
- Design Normalized Database for Hospital/college/medical/Jewellery Shop / Library / Blood Bank.
- Apply trigger on given database.
- Create procedure and function according to given condition.
- Any other micro-projects suggested by subject faculty on similar line.

13. SUGGESTED LEARNING RESOURCES

S. No.	Title of Book	Author	Publication
1	Introduction to Database Management Systems	ISRD Group	McGraw Hill Education, New Delhi, 2015
2	Introduction to Relational databases & SQL programming	Allen	McGraw Hill Education, New Delhi, 2015
3	Database System Concepts McGraw Hillin ANSI C	Korth	McGraw Hill Education, New Delhi, 2015
4	Complete Reference: Mysql	Vikram Vaswani	McGraw Hill Education, New Delhi, 2015

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

- www.tutorialpoint.com (Important website)
- wielyIndia.com or DreamtechPress.com
- <http://phindia.com/gupta/chapter/chapter1.pdf>
- www.williamstannings.com
- www.nptel.ac.in
- <https://www.khanacademy.org/>

