Program Name : **Diploma in Information Technology**

Program Code : **IF**

Semester : **Fourth**

Course Title : **Database Management**

Course Code : **22416**

1. RATIONALE

Managing data as a resource is an important function of information management. Organizations need to maintain huge amount of data in effective manner. In software industry the relational database management system is being used predominantly to manage the data stored in the database. This subject enables students to create, store, modify data and extract information from a database using SQL. After learning this subject student will be able to use RDBMS 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 concepts 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:

a. Create Database using SQL commands
b. Manage Database using SQL commands.
c. Implement Advanced SQL concepts on Database.
d. Write PL/SQL code for database application.
e. Apply security and safety on Database.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme			Credit (L+T+P)	Examination Scheme											
				Theory							Practical					
L	T	P		Paper Hrs.	ESE		PA		Total		ESE		PA		Total	
					Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
3	-	4	7	3	70	28	30*	00	100	40	50#	20	50	20	100	40

(*): 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; **C** – Credit, **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.

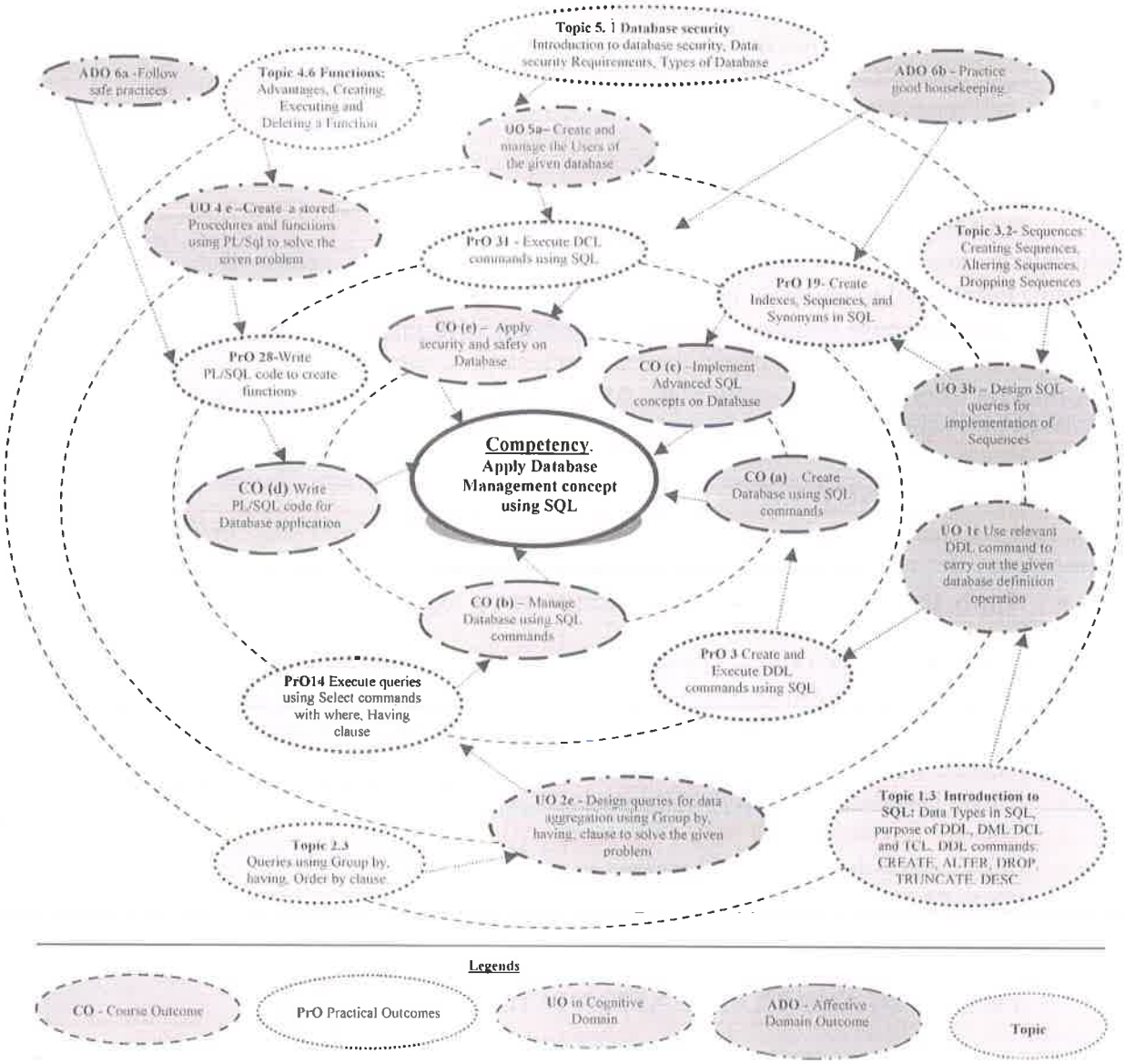

Figure 1 - Course Map

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.	Install and configure Database product (such as MySQL, ORACLE or any other relational database product)	I	02*
2.	Write Queries using Relational Algebraic operations.	I	02*
3.	Create and Execute DDL commands using SQL Part-I.	I	02*
4.	Create and Execute DDL commands using SQL Part-II.	I	02*
5.	Apply following Integrity constraints on table: Primary key, Foreign key, Unique key constraint	I	02*

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. Required
6.	Apply following Integrity constraints on table: Null, Not Null and Check constraint.	I	02
7.	Create and Execute DML commands using SQL Part-I.	II	02*
8.	Create and Execute DML commands using SQL Part-II.		02
9.	Write Queries using following operators: Arithmetic Operators, Comparison Operators, Logical Operators.	II	02*
10.	Write Queries using following operators: Set Operators, Range Searching operators-Between, Pattern matching operators-Like.	II	02*
11.	Write Queries using String, Arithmetic Functions.	II	02*
12.	Write Queries using Date and time Functions.	II	02*
13.	Write Queries using Aggregate Functions- Min, Max, Sum, Avg, Count.	II	02*
14.	Execute Queries using the Select command with Where, Having clauses.	II	02*
15.	Execute Queries using the Select command with Group by and order by clauses.	II	02*
16.	Execute queries using Inner Joins.	II	02*
17.	Execute queries using Outer Joins.	II	02*
18.	Implement Views to perform following operations: a. Create views. b. Insert, modify and delete records through views. c. Delete the views.	III	02*
19.	Create Indexes, Sequences, and Synonyms in SQL.	III	02*
20.	Execute Views, Indexes, Sequences and synonyms in SQL.	III	02*
21.	Write a PL/SQL programs using if then else, for.	IV	02*
22.	Write a PL/SQL programs using while and nested loop.	IV	02
23.	Write a PL/SQL code to implement implicit cursors.	IV	02*
24.	Write a PL/SQL code to implement explicit cursors.	IV	02
25.	Write PL/SQL Programs based on Exceptions handling. (Predefined exceptions).	IV	02*
26.	Write PL/SQL Programs based on Exceptions handling. (user-defined exceptions)	IV	02*
27.	Write PL/SQL code to create Procedures.	IV	02*
28.	Write PL/SQL code to create functions.	IV	02*
29.	Write PL/SQL code to create triggers on given database Part-I.	IV	02*
30.	Write PL/SQL code to create triggers on given database Part-II.	IV	02
31.	Executing DCL commands using SQL a. Create users b. Grant privileges to users c. Revoke privileges from users.	V	04*
	Total		**64**

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 judicial mix of minimum 24 or more practical need to be performed, out of which, the practicals marked as '' are compulsory, so that the student*

reaches the 'Application Level' of Bloom's Taxonomy' as generally required by the industry.

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

S. No.	Performance Indicators	Weightage in %
1	Coding of SQL queries and PL/SQL programming	60
2	Database Integrity	10
3	Quality of result displayed by SQL queries/ PL/SQL programming.	10
4	Answer to sample questions	10
5	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. 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 and
- '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.
1.1	Computer system (Any computer system with basic configuration)	All
1.2	Any RDBMS software (MySQL/SQL server or any other)	All

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 Creating	1a. Describe the given RDBMS term with example.	1.1 **Relational Database Design:** Concept of Relational Database

Relational Database	1b. Design SQL queries to create the specified Relational database 1c. Use relevant DDL command to carry out the given database definition operation. 1d. Categorise the given SQL command in DDl, DML, DCL. 1e. Apply the given data constraint for data integration. 1f. Describe the procedure to create the given database using SQL commands.	Design, different types of RDBMS software, different relational algebra operator. 1.2 **RDBMS Terminology** –Relation, Attribute, Domain, Tuple, cardinality, Degree. 1.3 **Introduction to SQL:** Data Types in SQL, purpose of DDL, DML DCL and TCL. DDL commands: CREATE, ALTER, DROP, TRUNCATE, DESC, RENAME, Use of data constraints
Unit– II Interactive SQL for data extraction	2a Design relevant query for extracting the data based on the given criteria. 2b Use 'Like' clause in SQL query with the given matching Pattern. 2c Use the given built-in function in SQL query. 2d Design queries using the given aggregate function. 2e Design queries for data aggregation using Group by, having clause to solve the given problem. 2f Describe the procedure to manage the given database using SQL commands.	2.1 DML commands: INSERT, UPDATE, DELETE, SELECT SQL operators: arithmetic operators, comparison operators, Logical operators, Set operators, Range Searching operators- Between, Pattern matching operators- Like 2.2 **In built Functions**: String, Arithmetic, ate and time, Aggregate Functions and Miscellaneous Functions. Conversion Functions, Special Date formats using To char () function. 2.3 Queries using Group by, having, Order by clause. 2.4 Joins, Types of Joins, Sub queries. 2.5 TCL: Commit, Save point, Rollback, set transaction
Unit III- Advance features of SQL	3a. Design SQL queries for implementing the given View/ sub query. 3b. Design SQL queries for implementation of the given Sequences. 3c. Create Indexes using SQL Query to solve the given problem. 3d. Describe the procedure to create Synonym using SQL Query to solve the given problem.	3.1 **Views**: Concept of View, The Create View Command, Updating Views, Views and Joins, Views and Sub queries, Dropping Views. 3.2 **Sequences**: Creating Sequences, Altering Sequences, Dropping Sequences. 3.3 **Indexes**: Index Types, Creating of an Index: Simple Unique, and Composite Index, Dropping Indexes 3.4 **Synonyms:** Creating Synonyms, Dropping Synonyms.

Unit-IV PL/SQL Programming	4a. Describe the use of the given component of PL/SQL. 4b. Use the relevant control structure in PL/SQL Code to solve the given conditional/ iterative problem. 4c. Write the PL/SQL Code to handle the given exception. 4d. Write the PL/SQL codes to create cursor for retrieving multiple records for the given problem. 4e. Create a stored Procedures and Functions using the PL/SQL to solve the given problem. 4f. Write PL/SQL code for the given database application .	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. 4.2 **Control Structure**: Conditional Control, Iterative Control, Sequential Control. 4.3 **Exception handling**: Predefined Exception, User defined Exception. 4.4 **Cursors**: Implicit and Explicit Cursors, Declaring, Opening and Closing a Cursor, Fetching a Record from Cursor, Cursor for loops, Parameterized Cursors. 4.5 **Procedures**: Advantages, Creating, Executing and Deleting a Stored Procedure. 4.6 **Functions:** Advantages, Creating, Executing and Deleting a Function. 4.7 **Database Triggers**: Use of Database Triggers, apply database Triggers, Types of Triggers, Syntax for Creating Trigger, Deleting Trigger.
Unit –V Database security and Transaction Processing	5a. Describe the procedure to Create the users of the given database. 5b. Describe the procedure to Provide security to database by assigning/revoking the given privilege to the user. 5c. Explain the given ACID property of transactions in database. 5d. Describe the procedure to Carry out backup of the given Database by following the standard process.	5.1 **Database security**: Introduction to database security, Data security Requirements, Types of Database Users, Creating, altering and Deleting Users. 5.2 **Protecting the data within database-Database Privileges**: Systems privileges and object Privileges, Granting and Revoking Privileges: Grant and Revoke command. 5.3 **Transaction and Concurrency Control:** Concept, Properties and States of Transaction, Concurrency issues, need for transactions, Necessary properties of transactions (ACID properties), Transaction states, Lock-Based Concurrency Control 5.4 **Database Backup** -Types of Failures, Causes of failures, Database Backup

***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	Creating Relational Database	4	02	02	04	08
II	Interactive SQL for data extraction	12	02	04	12	18
III	Advance features of SQL	12	02	04	10	16
IV	PL/SQL Programming	12	02	04	10	16
V	Database security and Transaction Processing	08	04	04	04	12
Total		**48**	**12**	**18**	**40**	**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:

a. Prepare journals based on practical performed in laboratory.
b. Give seminar on relevant topic.
c. 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:

a. Massive open online courses (***MOOCs***) may be used to teach various topics/sub topics.
b. ***'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.
c. 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).
d. With respect to item No.10, teachers need to ensure to create opportunities and provisions for ***co-curricular activities***.
e. Guide student(s) in undertaking micro-projects.
f. Demonstrate students thoroughly before they start doing the practice.
g. Encourage students to refer different websites to have deeper understanding of the subject.
h. Observe continuously and monitor the performance of students in Lab.
i. Demonstrate students thoroughly before they start doing the practice.
j. Encourage students to refer different websites to have deeper understanding of the subject.

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 are given here. Similar micro-projects could be added by the concerned faculty:

a. For Hospital Management: Patient data base/Doctor database/Billing (any one database)
b. College Admission: Student personal Information System/Merit list database(any one data base)
c. Medical Purchase: Database of medicine inventory records.
d. Library Management: book issue /book stock database.
e. 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, 2005, New Delhi, ISBN-13:9780070591196
2	Database System Concepts	Korth, Henery Abraham, Silberschatz Sudarshan ,S	McGraw Hill Education, New Delhi, 2013, ISBN-13: 978-9332901384
3	Complete Reference: Mysql	Vaswani Vikram	McGraw Hill Education, New Delhi, ISBN-13: 9780070586840
4	SQL, PL/SQL The Programming Language of ORACLE	Bayross, Ivan	BPB Publications, New Delhi3rd Edition, ISBN-13: 978-8176569644
5	Database Management	Leon Alexis & Leon Mathews	Vikas Publishing, New Delhi ISBN-13:9788182092228

14. SUGGESTED SOFTWARE/LEARNING WEBSITES

a. www.tutorialpoint.com (Important website)
b. wielyIndia.com or DreamtechPress.com
c. http://phindia.com/gupta/chapter/chapter1.pdf
d. www.williamstannings.com