Course Code & Name	26CAPL7001 ADBMS Lab		
Teaching Hours /week (L: T:P: R)	0:0:4:0	Credits	2
CIE Marks	50	ESE Marks	50
Course Type	Lab (PCL)	Exam Hours	3
Prerequisites (if any)	26CAPL2002		

Course Objectives:

- To provide in-depth knowledge of relational and non-relational database systems, enabling students to design, implement, and optimize databases using SQL and PL/SQL.
- To familiarize students with modern NoSQL technologies and administrative operations, including configuration, query processing, replication, sharding, and deployment of databases in local and cloud environments.

Course Outcomes (COs)

At the end of the course students should be able to:

CO#	Course Outcomes	Bloom's Knowledge Level (KL)
CO1	Create optimized relational databases using SQL.	K3
CO2	Develop procedural database applications using PL/SQL.	K3
CO3	Implement operations in non-relational (NoSQL) databases.	K3
CO4	Manage and administer NoSQL databases using shell commands and deploy them in local/cloud environments.	K4
CO5	To enable students to design, develop, and manage relational databases using SQL and PL/SQL, and NoSQL databases using appropriate NoSQL commands and database administration tools	K4

Note: *K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

CO #	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	3	3	3	3	2	1	1	2
CO 2	3	2	3	3	2	2	1	2
CO 3	3	2	3	3	2	2	1	3

CO 4	3	3	3	3	3	2	2	3
CO5	3	2	3	3	2	1	-	1

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation*

Course Assessment Method

(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE)

Attendance	(Continuous Assessment) Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record	Internal Lab Examination-1	Internal Lab Examination- 2	Total
8	**22**	**10**	**10**	**50 Marks**

End Semester Examination Marks (ESE)

Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	**15**	**10**	**10**	**5**	**50 Marks**

Continuous Assessment (22 Marks)

1. Conduct of Lab Experiments/Project (12 Marks)
2. Timely Completion of Lab Reports/ Project Reports (5 Marks)
3. Viva Voce (5 Marks)

Final Marks Averaging: The final marks for conduct of experiments, viva, and records are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. Procedure/Algorithm/Flowchart (10 Marks)

2. Conduct of Experiment/Execution of Work (15 Marks)
3. Quality of Output (10 Marks)
4. Viva Voce (10 Marks)
5. Record (5 Marks)

SYLLABUS

Exp. No.	List of Experiments
1	• Design a relational database schema for a given case study. Create tables using DDL commands with appropriate integrity constraints. • Alter existing tables to add, modify, or delete attributes or constraints. • Insert, update, and delete records in tables using DML commands. • Retrieve specific information from one or more tables using simple select queries.
2	• Demonstrate the use of transaction control commands (COMMIT, ROLLBACK, SAVEPOINT). • Create users and assign privileges using GRANT and REVOKE commands. • Test access control by performing operations under different user privileges.
3	• Filter and sort data using WHERE, GROUP BY, HAVING, and ORDER BY clauses. • Write subqueries and nested queries to retrieve complex data. • Create and manipulate views to simplify data access. • Perform various join operations (INNER, LEFT, RIGHT, FULL) between tables. • Apply set operators (UNION, INTERSECT, EXCEPT) and aggregate functions (SUM, AVG, COUNT, MAX, MIN).
4	• Analyze query execution plans using EXPLAIN or EXPLAIN ANALYZE. • Demonstrate query optimization by rewriting inefficient queries. • Create indexes on selected columns and compare query performance before and after indexing.
5	• Explore the structure and execution model of PL/SQL blocks (anonymous block, declaration, execution, and exception sections). • Write and execute a simple PL/SQL block to display a message using DBMS_OUTPUT.PUT_LINE.

	• Declare and use scalar, composite, and reference variables. • Use conditional statements (IF–THEN–ELSE, CASE) and iterative statements (LOOP, WHILE, FOR). • Write a PL/SQL block to find the factorial or Fibonacci series using loops.
6	• Handle predefined and user-defined exceptions. • Write a PL/SQL block that uses implicit cursors for INSERT, UPDATE, and DELETE operations. • Declare, open, fetch, and close explicit cursors. • Display employee details one by one using an explicit cursor in a loop. • Demonstrate cursor attributes like %FOUND, %NOTFOUND, %ROWCOUNT.
7	• Create a BEFORE INSERT or AFTER UPDATE trigger on a table. • Differentiate between row-level and statement-level triggers. • Write a trigger to prevent invalid transactions (e.g., salary cannot be negative). • Implement an audit trail using triggers to log changes made to a table.
8	• Create and execute a stored procedure to perform a specific task (e.g., update salary, insert new record). • Demonstrate passing parameters (IN, OUT, IN OUT). • Write a function to compute and return derived values (e.g., calculate tax, bonus). • Call the function within SQL statements. • Demonstrate use of COMMIT, ROLLBACK, and SAVEPOINT within PL/SQL blocks.
9	• Explore the characteristics and types of NoSQL databases. • Identify scenarios where NoSQL is preferred over relational databases. • Perform basic CRUD operations • Create databases and collections in MongoDB. • Insert multiple JSON documents. • Perform insertOne(), insertMany(), find(), updateOne(), updateMany(), and deleteOne() operations.
10	• Retrieve documents using filters, comparison, and logical operators. • Perform data aggregation using $match, $group, $project, $sort, and $limit stages.

	• Compute summary statistics such as counts and averages.
11	• Explore the administrative interface and shell commands of a NoSQL system (e.g., MongoDB shell or Cassandra CLI). • Understand configuration files, startup parameters.
12	Local Deployment with Application Front-End • Connect a NoSQL database (e.g., MongoDB or Cassandra) to a simple application built in Python, Java, or PHP. • Perform CRUD operations through the front-end interface. Cloud Deployment – MongoDB Atlas • Create and configure a free cluster on MongoDB Atlas. • Connect using MongoDB Compass or shell. • Perform CRUD and indexing operations in the cloud environment.
13	**Micro project:** Students can be given a group micro project, so that they learn to work in a team environment.

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	Mc Graw Hill	3rd Edition 2014
2	NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence	Pramod J. Sadalage and Martin Fowler	Addison-Wesley	1st Edition 2013

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	MongoDB: The Definitive Guide	Kristina Chodorow	O'Reilly	2019

2	HBase: The Definitive Guide	Lars George	O'Reilly Media	2011
3	Professional NoSQL	Sasank Tiwari	John Wiley & Sons	1st Edition
4	MongoDB Administrator's Guide	Cyrus Dasadia	Packet	2017
5	Cassandra: The Definitive Guide Distributed Data at web scale	Eben Hewitt, Jeff Carpenter	O'Reilly Media	2010

Web References/ Video Links (NPTEL, SWAYAM…)	
Sl.No	**Link ID**
1	https://www.youtube.com/watch?v=C8OHGF2lE2U
2	https://www.youtube.com/watch?v=qAFivl3z8jo
3	https://www.mongodb.com/docs/manual/reference/built-in-roles/#built-in-database-user-roles
4	https://www.digitalocean.com/community/tutorials/how-to-use-indexes-in-mongodb