PART A:Introduction			
Program: Certificate	Class: UG	Year:1Year	Session:2025-26
Subject: Computer Application			

1	Course Code	CI	
2	Course Title	DBMS (Theory)	
3	Course Type (Core Course/Elective/Generic Elective/ Vocational	Core Course	
4	Pre-Requisite(if any)	At least Intermediate in Any course/stream	
5	Course Learning Outcomes(CLO)	On completion of this course, students will be able to: • Understand fundamental concepts of database management systems. • Gain proficiency in relational databases, SQL queries, and normalization techniques. • Learn transaction management, concurrency control, and recovery techniques. • Develop skills to implement databases using MS Access, MySQL, or Postgre SQL. • Explore emerging trends such as No SQL, Cloud Databases, and Big Data.	
6	Credit Value	Theory-4 Credits	
7	Total Marks	Max.Marks:30+70	Min. Passing Marks: 35

PART B: Content of the Course
No. of Lectures(in hours per week):2Hrs.per week
Total No. of Lectures :60Hrs.

Module	Topics	No. of Lectures
I	Indian Knowledge System (IKS) in DBMS The Indian Knowledge System (IKS) in DBMS introduces traditional Indian methods of knowledge storage and their relevance to modern databases. Ancient Indian texts, temple records, and manuscripts followed structured classification similar to databases. Concepts like data organization, indexing, and retrieval were seen in Vedic literature, Arthashastra, and Ayurveda. DBMS applications in IKS include digitization of manuscripts, Sanskrit computational linguistics, and digital preservation initiatives like the National Mission for Manuscripts. Ethical data handling, inspired by Dharma principles, aligns with modern database security. Integrating IKS with DBMS helps students understand historical data management techniques while applying them to contemporary database technologies. Keywords: Digital Libraries, National Mission for Manuscripts, Data Security, Dharma Principles, SQL, Archival Systems,	10

	Historical Data Management. Activity: • Research and present examples of ancient Indian data management practices. • Explore digital preservation initiatives like the National Mission for Manuscripts. • Create a mini-project to simulate the indexing and retrieval of historical data using SQL. • Discuss the relevance of Dharma principles in modern data security practices.	
II	Introduction to Database Systems Definition of database and DBMS, characteristics and advantages of DBMS, comparison between file system and DBMS, database users and administrator roles, applications of databases, introduction to different data models including hierarchical, network, relational, and object-oriented models. Overview of DBMS architectures such as one-tier, two-tier, and three-tier models, data abstraction and data independence, conceptual, logical, and physical data models. Keywords: Database, DBMS, File System, Data Models, Data Abstraction, Data Independence, Architecture. Activity: • Compare and contrast the features of file systems and DBMS. • Identify different database models with real-world examples. • Illustrate DBMS architecture using a diagram. • Explain data abstraction and data independence with practical examples.	10

III	Relational Database Model and Structured Query Language (SQL) Introduction to the relational model, relational schema and tuples, concept of keys including primary key, foreign key, candidate key, and super key, integrity constraints such as domain, entity, referential, and key constraints. Overview of relational algebra and its operations for data manipulation. Introduction to SQL, importance of SQL in databases, SQL data types and constraints, SQL commands including Data Definition Language (DDL), Data Manipulation Language (DML), Data Control Language (DCL), and Transaction Control Language (TCL). Creating and managing tables in SQL, performing basic SQL queries such as SELECT, INSERT, UPDATE, DELETE, and understanding joins including INNER JOIN, OUTER JOIN, LEFT JOIN, and RIGHT JOIN. Keywords: Relational Model, Schema, Primary Key, Foreign Key, Integrity Constraints, SQL, DDL, DML, Joins. Activity: • Create a relational schema for a sample database. • Use SQL commands to create, insert, update, and delete records. • Write SQL queries with different types of joins. • Apply integrity constraints to sample tables. • Perform relational algebra operations on sample datasets.	10
IV	Database Design, Normalization, and Indexing Database anomalies and redundancy, functional dependencies and types, normalization techniques including First Normal Form (1NF), Second Normal Form (2NF), Third Normal Form (3NF), and Boyce-Codd Normal Form (BCNF). Denormalization and its impact on performance, database design process, and schema refinement. Database security concepts, security threats and their solutions, authentication and authorization mechanisms, role of database administrators (DBA), indexing techniques for query optimization, single-level and multi-level indexing, clustered and non-clustered indexing, B-trees and B+ trees, and hashing techniques for data retrieval. Keywords: Normalization, Functional Dependencies, 1NF, 2NF, 3NF, BCNF, Indexing, Security, DBA. Activity: • Design a database schema and apply different levels of normalization (1NF, 2NF, 3NF, and BCNF). • Implement indexing techniques in SQL and compare query performance. • Demonstrate the impact of denormalization on database performance. • Explore security threats and implement basic authentication and authorization in SQL.	10

V	Transactions, Concurrency Control, and Recovery Mechanisms Concept of transactions and ACID properties (Atomicity, Consistency, Isolation, Durability), need for concurrency control, problems of concurrent transactions, lock-based concurrency control, timestamp-based concurrency control, and deadlocks in databases with prevention techniques. Overview of database recovery, recovery techniques such as log-based recovery, checkpointing, shadow paging, and ARIES recovery algorithm. Implementation of transaction management in SQL with COMMIT and ROLLBACK operations. Keywords: Transactions, ACID Properties, Concurrency, Locks, Deadlocks, Recovery, Commit, Rollback. Activity: • Implement transactions in SQL using COMMIT and ROLLBACK. • Demonstrate concurrent transactions and identify potential issues like deadlocks. • Use lock-based and timestamp-based concurrency control techniques. • Perform database recovery using log-based recovery and checkpointing.	10

VI	Emerging Trends in Databases and Practical Applications Introduction to NoSQL databases, differences between SQL and NoSQL, types of NoSQL databases (document-based, key-value, column-family, and graph databases), advantages and limitations of NoSQL. Cloud databases and Database-as-a-Service (DBaaS), big data and distributed database systems, introduction to data warehousing and business intelligence, future trends in database management systems including AI-driven databases and blockchain databases. Practical applications include hands-on SQL queries on sample databases, designing and normalizing a relational database, developing a small-scale inventory management system, transaction processing with concurrency control, and creating a database system for a library or student management system. Keywords: NoSQL, Cloud Database, DBaaS, Big Data, Data Warehousing, Blockchain, AI in Databases. Activity: • Explore NoSQL databases and compare them with SQL databases. • Design and normalize a relational database. • Develop a small-scale inventory management system using SQL. • Implement transaction processing with concurrency control. • Create a database system for a library or student management application.	10
PARTC: Learning Resources		
Textbooks, Reference Books, Other Resources		

Suggested Readings:

1. Database System Concepts–Abraham Silberschatz, Henry Korth, S.Sudarshan(McGraw-Hill).
2. Fundamentals of Database Systems–Ramez Elmasri, Shamkant B.Navathe (Pearson).
3. SQL: The Complete Reference–James R. Groff, Paul N. Weinberg(McGraw-Hill).
4. Modern Database Management–Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi.
5. Introduction to Database Systems–C.J. Date.
6. MySQL8.0 Reference Manual–Oracle Corporation.

Suggestive digitalplatformweblinks:

1. https://–LearnSQLwithinteractiveexamples.
2. https://–DBMStutorialscoveringnormalization,transactions, and indexing.
3. https://–In-depthDBMSconceptsandSQLqueries.
4. https://–ComprehensiveDBMSarticlesandproblem-solving.
5. https://nptel.ac.in/courses/106/106/106106095–NPTELOnlineCourseonDatabaseManagement Systems.

Suggested equivalent online courses
https://nptel.ac.in/courses/106/105/106105163/

PART D: Assessment and Evaluation

Maximum Marks:	100
Continued Comprehensive Evaluation(CCE):	30
University Exam(UE):	70
Time:03:00 Hours	

Internal Assessment: Continued Comprehensive Evaluation (CCE):	Class Tests/Presentation/ Assignment	30Marks
External Assessment: University Exam	Section(A):Very Short Questions Section (B) : Short Questions Section(C):Long Questions	70Marks

Any remarks/suggestions: Learning's in the course should be emphasized more on practical aspects and real world problems and their solutions.

PART A:Introduction			
Program: Certificate	Class: UG	Year:1Year	Session:2025-26
Subject: Computer Application			

1	Course Code	CI	
2	Course Title	DBMS Lab(Practical)	
3	Course Type(Core Course/Elective/Generic Elective/ Vocational	Core-Course	
4	Pre-Requisite(if any)	To study this course, a student must have had the class.	
5	Course Learning Outcomes(CLO)	On completion of this course, learners will be able to: • Understand fundamental concepts of database management systems. • Gain proficiency in relational databases, SQL queries, and normalization techniques. • Learn transaction management, concurrency control, and recovery techniques. • Develop skills to implement databases using MS Access, MySQL, or Postgre SQL.	
6	Credit Value	Practical-2Credits	
7	Total Marks	Max.Marks:30+70	Min.PassingMarks:35

PART B: Content of the Course		
No. of Lab. Practical's(in hours per week):2Hrs.perweek		
Total No. of Labs: 30		
	Suggestive list of Practical's	No .of Labs.

	1. Create a comparison table between the File System and DBMS, highlighting at least five key differences. 2. Identify different types of database users in a university database system and describe their roles. 3. Create a database named CollegeDB with a table Students having attributes: StudentID (Primary Key), Name, Age, Course, and Email. Insert at least five records. 4. Write an SQL query to fetch details of students who are enrolled in the 'B.Sc CS' course. 5. Given the table Employee(EmpID, Name, Dept, Salary, Address), identify functional dependencies and normalize it up to BCNF. 6. Create an index on the Salary column in the Employee table and explain how it improves query performance. 7. Write an SQL transaction where you transfer ₹5000 from one bank account to another and ensure ACID properties. 8. Implement an SQL commit and rollback example for an inventory management system. 9. Create a NoSQL document-based database for a library system using MongoDB and insert five sample book records. 10. Research and list at least three real-life applications where blockchain databases are used. 11. Find an example of ancient Indian knowledge storage techniques (e.g., palm leaf manuscripts) and compare them with modern database storage. 12. Write an SQL query to create a digital archive system for Sanskrit texts with attributes like TextID, Title, Author, Language, and Year.	70
PARTC: Learning Resources		
Textbooks, Reference Books, Other Resources		

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- SQL: The Complete Reference – James R. Groff, Paul N. Weinberg (McGraw-Hill).
- Modern Database Management – Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi.
- Introduction to Database Systems – C.J. Date.
- MySQL 8.0 Reference Manual – Oracle Corporation.

Suggestive digital platform web links:

- https://–LearnSQLwithinteractiveexamples.
- https://–DBMStutorialscoveringnormalization,transactions, and indexing.
- https://–In-depthDBMSconceptsandSQLqueries.
- https://–ComprehensiveDBMSarticlesandproblem-solving.
- https://nptel.ac.in/courses/106/106/106106095–NPTELOnlineCourseonDatabaseManagement Systems.

Suggested equivalent online courses
https://nptel.ac.in/courses/106/105/106105163/

PART D:Assessment and Evaluation

Maximum Marks:	100
Continued Comprehensive Evaluation(CCE):	30
University Exam(UE):	70
Time:03:00 Hours	

Internal Assessment: Continued Comprehensive Evaluation (CCE):	Class Tests/Presentation/Assignment	30 Marks
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Any remarks/suggestions: Learnings in the course should be emphasized more on real world problems and their solutions.