

****Course Name: Database Management Systems (DBMS)****

****Course Code: DBMS101****

****Course Description:****

This course introduces the fundamental concepts of Database Management Systems (DBMS), which are essential for storing, retrieving, and managing data efficiently. It covers topics ranging from basic database architecture to advanced data manipulation techniques.

****Course Duration:****

This is typically a one-semester course and is worth 3 credit hours.

****Syllabus:****

1. ****Introduction to DBMS****

- Overview of databases and DBMS
- Advantages and disadvantages of DBMS
- Types of database models (hierarchical, network, relational, object-oriented, etc.)

2. ****Relational Database Management System****

- Relational database concepts
- Entity-Relationship (ER) model
- Relational model and relational algebra
- SQL (Structured Query Language) fundamentals

3. ****Database Design and Normalization****

- Database design process
- Functional dependencies
- Normalization techniques (1NF, 2NF, 3NF, BCNF)
- Denormalization and trade-offs

4. ****Data Modeling****

- Conceptual, logical, and physical data models
- Entity-Relationship Diagrams (ERDs)
- Mapping ERDs to relational schemas

5. ****Structured Query Language (SQL)****

- SQL basics (SELECT, INSERT, UPDATE, DELETE)
- Advanced SQL queries (Joins, Subqueries, Aggregations)
- Views, Indexes, and Triggers in SQL

6. ****Transaction Management and Concurrency Control****

- ACID properties of transactions
- Transaction states and processing
- Concurrency issues and serializability
- Locking and deadlock handling

7. ****Database Security****

- Data security and access control
- User authentication and authorization
- Database auditing and logging

8. ****Data Integrity and Constraints****

- Integrity constraints (Primary keys, Foreign keys, Check constraints)
- Handling data integrity violations

9. ****Database Connectivity and APIs****

- Connecting applications to databases
- ODBC, JDBC, and ORM (Object-Relational Mapping)

10. ****Introduction to NoSQL Databases****

- Overview of NoSQL databases
- Types of NoSQL databases (document-oriented, key-value, column-family, graph-based)
- Comparison with relational databases

****Practical/Lab Work:****

The practical sessions will involve hands-on experience with a relational database management system (e.g., MySQL, PostgreSQL) and SQL queries. Students will work on creating and managing databases, designing tables, writing SQL queries, and implementing various database-related concepts.

****Assessment Methods:****

Assessment for the course will typically involve a combination of the following methods:

- Written examinations (theory-based questions)
- Practical exams (performing tasks in a DBMS)
- Assignments and projects
- Class participation and quizzes

Please note that the above syllabus is just a template and can be adapted by educational institutions based on their preferences and resources. It is always a good idea to refer to the official syllabus provided by your university or college for the most accurate and up-to-date information.