Database Management System (3-1-3)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Objectives:

The objective of this course is to provide fundamental concept, theory and practices in design and implementation of DBMS.

Course Contents:

1. **Introduction** **(4 hrs)**
   - 1.1 Concept and applications
   - 1.2 Objectives and Evolution
   - 1.3 Needs of DBMS
   - 1.4 Data abstraction
   - 1.5 Data independence
   - 1.6 Schema and Instances
   - 1.7 Concept of DDL, DML and DCL
   - 1.8 Database Manager and users

2. **Data Models** **(4hrs)**
   - 2.1 Logical, Physical and Conceptual Model
   - 2.2 E-R Model
   - 2.3 Relation with UML class diagrams
   - 2.4 2.4Alternate data models (Network Data Model, hierarchical Data Model)

3. **Relational Model** **(4 hrs)**
   - 3.1 Definitions and terminology
   - 3.2 Structure of relational databases
   - 3.3 The relational algebra
   - 3.4 Schema and Views
   - 3.5 Data dictionary

4. **Relational Database Query languages** **(8 hrs)**
   - 4.1 SQL – features of SQL, queries and sub-queries, Join operations, set operations and other SQL constructs
   - 4.2 DDL and DML queries in SQL
   - 4.3 Stored procedures
   - 4.4 QBE

5. **Database Constraints and Relational Database Design** **(8 hrs)**
   - 5.1 Introduction
   - 5.2 Integrity constraints
   - 5.3 Referential Integrity
   - 5.4 Assertions and Triggers

5.5 Functional dependencies
5.6 Normalization and Normal Forms (1NF, 2NF, 3NF, BCNF, 4NF)
5.7 Multivalued Dependencies
5.8 Decomposition of relation schemes

6. Security **(3 hrs)**
6.1 Needs of security
6.2 Security and integrity violations
6.3 Access control
6.4 Authorization
6.5 Security and Views
6.6 Encryption and decryption

7. Query Processing **(3 hrs)**
7.1 Introduction to query processing
7.2 Equivalence of expressions
7.3 Query cost estimation
7.4 Query Optimization

8. File organization and indexing **(4 hrs)**
8.1 Disks and storage
8.2 Organization of records into blocks
8.3 File organizations - The sequential and the indexed sequential file organizations
8.4 B+ Tree index
8.5 Hash index

9. Crash Recovery **(3 hrs)**
9.1 Failure classification
9.2 Concept of log-based recovery and shadow paging
9.3 Data Backup/Recovery
9.4 Remote backup system

10. Transaction Processing and Concurrency Control **(4 hrs)**
10.1 Introduction to Transactions
10.2 ACID properties of transaction
10.3 Schedules and Serializability
10.4 Concepts of locking for concurrency control

11. Advanced Database concepts **(3 hrs)**
11.1 Object-Oriented Model
11.2 Object-Relational Model (ORM)
11.3 Distributed databases
11.4 Concepts of Data Warehouses

Laboratory:
There shall be enough laboratory exercises based on some RDBMS (like ORACLE, MS-SQL server, MySQL, etc) to complement theoretical part studied. An individual project should be given to each student. 10% of sessional marks should be allocated for evaluation for lab works and project.

Text Book:

H. F. Korth and A. Silberschatz, *Database System Concepts*, McGraw Hill.

Reference Books:

1. K. Majumdar and P. Bhattacharaya, *Database Management Systems*, Tata McGraw Hill, India.
2. R. E. Mani and S. C. Nevathe, *Fundamentals of Database Systems*, Benjamin/Cummings Publishing Co. Inc.
3. G.C Everest, *Database Management*, McGraw Hill.