CMP 226   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

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    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.

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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.