Programme: B.Tech. (CSE, CCE) Year: II Semester: I

**CSE 227: Information and Database Management Systems**

Course: Core Credits: 4 Hours: 40(L)+20(P)

**Course Context and Overview:**

The course is primarily concerned with the capture, digitization, representation, organization, transformation, and presentation of information; algorithms for efficient and effective access and updating of stored information; data modeling and abstraction; and physical file storage techniques.

**Prerequisites Courses:**

CSE 215:Data Structures

**Course outcomes (COs):**

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| **On completion of this course, the students will have the ability to:** |
| CO1 – Understand the different issues involved in the design and implementation of a  database system |
| CO2 – Apply the modeling concepts and notation of the relational data model. |
| CO3 – Determine database storage structures and access techniques for a given problem. |
| CO4 – Understand the basic working of database management aspects in terms of transaction processing, concurrency control, and recovery. |

**Course Topics:**

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| **Topics** | **Lecture Hours** |
| **UNIT – I: Information Management Concepts** | 3 |
| Information systems as socio technical systems, basic information storage and retrieval concepts, Information capture and representation, supporting human needs: searching, retrieving, linking, browsing, navigating. Information management applications, Declarative and navigational queries, use of links, Analysis and indexing, Quality issues: reliability, scalability, efficiency, and effectiveness |
| **UNIT – II: Introduction to DBMS** | 3 |
| File system vs DBMS, Approaches to and evolution of database systems, Components of database systems, Design of core DBMS functions (e.g., query mechanisms, transaction management, buffer management, access methods), Database architecture and data independence, Use of a declarative query language |
| Lab (Data management using file system) | 2 |
| **UNIT – III: Data Modeling** | 4 |
| Data modeling, Conceptual models (entity-relationship diagrams), Relational data models, Semi-structured data model (expressed using DTD or XML Schema) |
| **UNIT – IV: Relational Databases** | 7 |
| Mapping conceptual schema to a relational schema, Entity and referential integrity, Relational algebra and relational calculus, Relational Database design, Functional dependency, Decomposition of a schema; lossless-join and dependency-preservation properties of a decomposition, Candidate keys, superkeys, and closure of a set of attributes, Normal forms (3NF, BCNF) |
| Lab (SQL - DDL) | 4 |
| **UNIT – V: Query Languages** | 3 |
| Overview of database languages, SQL (data definition, query formulation, update sublanguage, constraints, integrity), Selections, Projections, Select-project-join, Aggregates and  group-by, Subqueries, stored procedures, triggers |
| Lab (SQL - DML) | 4 |
| **UNIT – VI: File structures, Indexing, and Hashing** | 6 |
| Secondary storage devices; File records; Unordered file; Ordered file, Hashed file; Indexes; Dense and Sparse index; Single-level and Multi-level indexes; Multi-level indexing using B+-tree |
| Lab (Indexes) | 3 |
| **UNIT – VII: Transaction Processing, Concurrency Control, and Recovery** | 12 |
| Transaction and system concepts; ACID properties; Serializability; Concurrency control techniques – Two phase locking, Deadlock and starvation; Recovery concepts; Immediate update, Deferred update; Write-ahead logging; Checkpointing; |
| Lab (Triggers) | 4 |
| **UNIT – VIII: Advanced Topics** | 2 |
| Introduction to distributed, and object-oriented databases; Basic concepts of Data warehouse; Approaches for managing large volume of data (noSQL database systems) |
| Lab (Views) | 3 |

**Textbook references :**

**Text Book:**

* R. Elmasri and S. Navathe, *Fundamentals of Database Systems*, Addison-Wesley, 6th ed., 2011

**Reference books:**

* Silberschatz, H. Korth, and S. Sudarshan, *Database System Concepts*, McGraw-Hill.
* R. Ramakrishnan, *Database Management Systems*, WCB/McGraw-Hill.
* C.J. Date, An Introduction to *Database Systems*, Pearson, 8th ed.

**Additional Resources (NPTEL, MIT Video Lectures, Web resources etc.):**

* http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/
* http://nptel.ac.in/courses/106106093/
* <http://nptel.ac.in/courses/106106095/>
* http://www.nptelvideos.in/2012/11/database-management-system.html

**Evaluation Methods:**

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| **Component** | **Weightage** |
| Lab evaluation 1 | 5% |
| Lab evaluation 2 | 5% |
| Lab Quiz | 5% |
| Lab: Project | 10% |
| Quiz 1 | 5% |
| Quiz 2 | 5% |
| Quiz 3 | 5% |
| Assignment | 10% |
| Midterm | 20% |
| Final Examination | 30% |
| **Total** | **100%** |

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