| CSE11108 | Database Management Systems | L | T | P | C |
|---|---|---|---|---|---|
| Version 1.0 | Contact Hours 45 | 3 | 0 | 0 | 3 |
| Pre-requisite/Exposure | Set Theory, Knowledge of programming language. | | | | |
| Co-requisite | NIL | | | | |

**Course Objectives:**

5. To understand database concepts, applications, data models, schemas and instances.
6. To implement the relational database design and data modelling using entity-relationship (ER) model.
7. To demonstrate the use of constraints and relational algebra operations and Normalization process
8. To learn the new emerging Technologies and Applications in database.

## Course Outcomes:

On the completion of this course the student will be able to

1. **Describe** the characteristics of database and the architecture of Database system.
2. **Model** the elements used in Entity- Relationship diagram.
3. **Summarize** relational model concept and illustrate the relational constraints.
4. **Build** Structured Query Language (SQL) and apply to query a database and **Define** normalization for relational databases.
5. **Develop** some Standalone (Example)/ Mobile/ Web Application DB on real world case studies.

## Course Description:

Databases form the backbone of all applications today tightly or loosely coupled, intranet or internet based, financial,social, administrative, and so on. Database Management Systems (DBMS) based on relational and other models have long formed the basis for such databases. Consequently, Oracle, Microsoft SQL Server, Sybase etc. have emerged as

in the details, they share a common set of models, design paradigms and a Structured Query Language (SQL). In this leading commercial systems while MySQL, PostgreSQL etc. lead in open source and free domain. While DBMS's differ background the course examines data structures, file organizations, concepts and principles of DBMS's, data analysis,

database design, data modeling, database management, data & query optimization, and database implementation. Morespecifically, the course introduces relational data models; entity-relationship modeling, SQL, data normalization, and database design. Further it introduces query coding practices using MySQL (or any other open system) through variousassignments. Design of simple multi-tier client / server architectures based and Webbased database applications is alsointroduced.

## Course Content:

| Unit-I | 9 Lecture Hours |
|---|---|
| **Overview of database management systems and the relational mode:** Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object-oriented data models, integrity constraints, data manipulation operations. ER models: Entity Set, Relation Ship Set, Cardinality Properties, Type of Entities, Type of Keys, Aggregation, Specialization and Generalization. | |
| **Unit-II** | **9 Lecture Hours** |
| **Database design: E-R diagrams, constraints, normal forms** Relational algebra, Fundamental Operations, Additional Operations. Select, Project, Cartesian Product, UNION, Set difference, Rename. Types of joining operations, Division, Intersection, Aggregate. Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. | |
| **Unit-III** | **9 Lecture Hours** |
| **SQL: data definition, data manipulation, queries, views, constraints, triggers:** Relational database design: Integrity Constraint, Domain Constrain, Referential Integrity, Functional Dependencies, Closure of Set, Cover and Canonical Cover, Types of Anomalies, Armstrong's axioms, Extended Armstrong's axioms, Assertions and Demons. Data Base Decomposition: Domain and data dependency, Normal forms: 1NF, 2 NF, 3 NF, BCNF, Dependency preservation, Lossless design. | |
| **Unit-IV** | **9 Lecture Hours** |
| **Storage and indexing: B-trees, hashing:** Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. Storage strategies: Indices, B-trees, B+-trees, hashing, File System, Disk Organization, Physical Storage, Buffer management. | |
| **Unit-V** | **9 Lecture Hours** |
| **Case Studies : Standalone (Example)/ Mobile/ Web Application DB:** Transaction processing: Failure, Recovery from Failure, Different States of Transaction, Transaction Isolation, ACID property, Serializability of scheduling, Multi-version and optimistic Concurrency Control schemes. Concurrency control: Locking and timestamp-based schedulers, 2-Phase Locking Protocol, Dead Lock, Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Advanced topics: Distributed databases, Data warehousing and data mining. | |

**Text Books:**

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F Korth, S. Sudarshan, Hill 2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, McGraw-

   Computer Science Press.

**Reference Books:**

1. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education

2. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

**Modes of Evaluation: Quiz/Assignment/Presentation/Extempore/**

**Written ExaminationExamination Scheme:**

| Components | Mid Term | Class Assessment | End Term |
|---|---|---|---|
| Weightage (%) | 20 | 30 | 50 |

## Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

| Mapping between COs and POs | | |
|---|---|---|
| Course Outcomes (COs) | | Mapped Program Outcomes |
| CO1 | **Describe** the characteristics of database and the architecture of Database system. | PO1, PO2, PSO1 |
| CO2 | **Model** the elements used in Entity- Relationship diagram. | PO2, PO3, PO4, PSO1 |
| CO3 | **Summarize** relational model concept and illustrate the relational constraints. | PO1, PO2, PO4, PSO2 |
| CO4 | **Build** Structured Query Language (SQL) and apply to query a database and **Define** normalization for relational databases. | PO2, PO3, PO4, PO5, PO6, PSO3 |
| CO5 | **Develop** some Standalone (Example)/ Mobile/ Web Application DB on real world case studies. | PO3, PO5, PSO3 |

| Course Code | Course Title | PO 1 Engineering knowledge | PO 2 Problem analysis | PO 3 Design/development of solutions | PO 4 Conduct investigations of complex problems | PO 5 Modern tool usage | PO 6 The engineer and society | PO 7 Environment and sustainability | PO 8 Ethics | PO 9 Individual and team work | PO 10 Communication | PO 11 Project management and finance | PO 12 Life-long learning | PSO 1 Adequate strong skills in learning new programming environments, analyse and design algorithms for efficient | PSO 2 The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project | PSO 3 Ability to analyse the impact of Computer Science and Engineering solutions in the societal and human context, design, |
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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSE11108 | Database Management Systems | 2 | 3 | 2 | 3 | 2 | 1 | - | - | - | - | - | - | 2 | 1 | 1 |

1 = Weakly Mapped 2 = Moderately Mapped 3 = Strongly Mapped