| CSEN2061 | DATABASE MANAGEMENT SYSTEMS | L | T | P | S | J | C |
|---|---|---|---|---|---|---|---|
| | | 3 | 0 | 2 | 0 | 0 | 4 |
| **Pre-requisite** | None | | | | | | |
| **Co-requisite** | None | | | | | | |
| **Preferable exposure** | MATH1041: Discrete Mathematics | | | | | | |

**Course Description:**

*This course provides fundamental and practical knowledge on database concepts by means of organizing the information, storing and retrieve the information in an efficient and a flexible way from a well-structured relational model. This course ensures that every student will gain experience in creating data models and database design*

**Course Educational Objectives:**

- Focus the role of a database management system in an organization and construct ER Diagram
- Demonstrate basic database concepts, including the structure and operation of the relational data model and basic database queries using SQL
- Applying advanced database queries using Structured Query Language (SQL)
- Evaluating logical database design principles and database normalization
- Demonstrate the concept of a database transaction, concurrency control, and data object locking and protocols

**UNIT 1 Introduction to DBMS and Database Design 9 hours, P - 6 hours**

**Introduction to DBMS**: File system vs DBMS, advantages of DBMS, storage data, queries, DBMS structure, Types of Databases – Hierarchical, Network, Relational, Key-Value, Object Oriented, XML DB

Overview of File Structures in database

**Data base Design**: data models, the importance of data models.

E-R model: Entities, attributes and entity sets, relationship and relationship set, mapping cardinalities, keys, features of ER model, conceptual database design with ER model.

**UNIT 2 Relational Model and Basic SQL 9 hours, P - 6 hours**

**Relational model**: Integrity constraints over relations and enforcement, querying relation data, logical database design, views, destroying/altering tables and views.

**Basic SQL**: Introduction to SQL, Basic SQL Queries: DML, DDL, DCL, TCL

**UNIT 3 Advances SQL and PL/SQL 9 hours, P - 6 hours**

**Structured Query Language (SQL)**: Select Commands, Union, Intersection, Except, Nested Queries, Aggregate Operators, Null values, Relational set operators, SQL join operators

**Relational Algebra(RA)**: Selection, Projection, Set operations, Joins

**Relational Calculus (TRC, DRC)**: Tuple Relational Calculus, Domain Relational Calculus

PL/SQL, Assertions, Triggers

**UNIT 4 Schema Refinement and Normal Forms 9 hours, P - 6 hours**

**Schema Refinement and Normal Forms**: Introduction to Schema Refinement, Functional Dependencies, Reasoning about Functional Dependencies. Normal Forms, Properties of Decomposition, Normalization, different types of dependencies.

**UNIT 5 Introduction to Transaction Management, Concurrency Control and Crash Recovery 9 hours, P - 6 hours**

**Introduction to Transaction Management**: ACID properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

**Concurrency Control**: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking. Crash Recovery: Aries, Recovering from a System Crash.

**DBMS LAB**

1. Developing a sample ER model for the specified database.
2. Create a database and learn to set various constraints (can use Sailors example from textbook1, University example from textbook2)
3. Familiarization of SQL DDL commands-create, alter, drop, rename and truncate
4. Use of DML commands-select, insert, update and delete
5. Use of different of operators for nested sub-queries.
6. Use of Joins
7. Use of grouping functions
8. Creating Views
9. PL/SQL programming environment
10. Declaring triggers and use of cursors.

**Lab infrastructure**

1. Oracle Server and Client System
2. SQL Server
3. MS Access

**Textbooks:**

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill, 3e, 2014

Note: File Structure refer Chapter 8

2. H.F.Korth and A.silberschatz, Database System Concepts, McGraw-Hill, 6e, 2011.

**References:**

1. D. Ullman, Principles of Database and Knowledge – Base Systems, Vol 1,1/e, Computer Science Press,1990.
2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education, 7e, 2016.

**Course Outcomes:**

After successful completion of the course the student will be able to:

1. Understand database design principles
2. Apply data Modelling using E-R diagrams
3. Create refined data models using normalization
4. Build database queries using Structured Query Language
5. Understand the transaction management and concurrency control

**CO-PO Mapping:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | 1 | | | | | | | 2 | | |
| **CO2** | | | 3 | 2 | | | | | 2 | | | | | 2 | |
| **CO3** | | 2 | 2 | | | | | | | | | | | | 1 |
| **CO4** | | 3 | | | | | | | | | | | 2 | | |
| **CO5** | | | 3 | | 2 | | | | | | | 2 | | 2 | |

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

**APPROVED IN:**

**BOS : 06-09-2021** **ACADEMIC COUNCIL: 22nd AC (01-04-2022)**

**SDG No. & Statement:**

**SDG Justification:**