**University of Central Punjab**

**Faculty of Information Technology**

**SPRING 2023**



1. **Course Description**

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| **Course Code** | CSDB2313 | | | |
| **Course Title** | Introduction to Database Systems | | | |
| **Credit Hours** | 4(3+1) | | | |
| **Assessment Instruments with Weights** (quizzes, midterms, final, assignments, presentation, lab work, etc.) | Assignments (10%)  Quizzes (20%)  Class Participation (10%)  Mid Term (20%)  Final Term (40%) | | | |
| **Course Instructors** | Mr. Liaquat Majeed Sheikh | | | |
| **Course Coordinator** | Mr. Liaquat Majeed | | | |
| **Lab Instructors** |  | | | |
| **Office Hours** | TBA | | | |
| **Plagiarism Policy** | **All the parties involved in first cheating case in Midterm or Final term will be awarded ‘F’ for the course.** | | | |
| **Current Catalog Description** | * The course aims to introduce basic database concepts, different data models, data storage, retrieval and database design techniques. * The course primarily aims to introduce the concepts of relational data model. * This course includes detailed discussion on various features of Databases such as Design, ER Model, Relational Model, and Normalization. * Introduction to SQL and its practical use. It will also include practical demonstration and use of a commercial database packages. * Introduction to the advance topics of Databases like data mining, data warehousing & indexing etc. | | | |
| **Textbook** | * Ramez Elmasri, Fundamentals of Database Systems (7th Edition) | | | |
| **Reference Books** | * C. J. Date, An Introduction to Database Systems (8th Edition) * Raghu Ramakrishnan, Database Management Systems (3rd Edition) * Silberschatz Korth sudarshan, Database System Concepts (6th Edition) | | | |
| **Course Objectives** | Familiarize students to:   * Data Models * SQL * Designing Database | | | |
| **Course Goals** | The goal of this course is to learn about the fundamentals of relational DBMS i.e. how to Design relational databases, Use a relational database, Build a relational database, Be able to create, access, and manipulate a database through SQL and from an application. Also to make concepts of normalization clear in order to build a good relational schema. To make students efficient enough to understand the problems and make out a relational database for the problem situation. Grasp fundamental concepts in design and different aspects of databases. Familiarize them to the latest trends in database field. | | | |
| **Learning Outcomes** | Students successfully completing this course should be able to:   1. Design a relational model of a database. 2. Implement a database on a DBMS 3. Apply normalization rules to normalize a database. 4. Familiarize them to Advance Topics of database systems. | | | |
| **Topics Covered in the Course, with Number of Lectures on Each Topic** | Attached | | | |
| **Lab Projects** | Yes | | | |
| **Theory & Lab Exam** | Mid Term: Theory 1. Hrs + Lab 3 Hrs  Final Term: Theory 3 Hrs + lab 3 Hrs | | | |
| **Class Time Spent on** (in credit hours) | **Theory** | **Problem Analysis** | **Solution Design** | **Labs** |
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| **Week** | **Lecture** | **Topics Covered** | **Learning Outcomes** |
| 1 | 1 | Introduction to databases, Comparison to File system.  Introduction to Relational model, Relational Model constraints. |  |
| 2 | Update operations and Dealing with constraint violation.  Concept of keys (super key, candidate key, primary key, foreign key) |  |
| 2 | 3 | Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes, and Keys |  |
| 4 | ERD - Relationship Types, Relationship Sets, Roles |  |
| 3 | 5 | ERD - Structural Constraints, Weak Entity Types, Ternary Relationships |  |
| 6 | Enhanced ER |  |
| 4 | 7 | ERD - Relational Schema Reduction |  |
| 8 | ERD - Practice |  |
| 5 | 9 | Introduction to SQL (DDL)  Create database, show database, create table  Adding constraint in create table (e.g. default, unique, foreign key (cascade), primary key, not null)  Drop database  Desc table (description)  Drop table |  |
| 10 | Alter table (add, modify, drop)  Insert Statement and variations (all attribute, row with null attribute, Optional attribute)  Update Statement, Delete Statement |  |
| 6 | 11 | Introduction to SQL (DML)  Select statement without conditions  Wild card (\*) vs <attribute list>  Select statement with conditions & Where Clause with comparison operator (<, >, <=, >=, < >, = =)  Where clause, IS NULL, IS NOT NULL, |  |
| 12 | Special operators  Between, is null, like wild cards (\_, %), order by, distinct, limit  Set operations |  |
| 7 | 13 | Multi-table Select(Cross Product),  Joins(Inner, Natural) |  |
| 14 | Simple Nested Query using where attribute IN (Query) clause, Any and All |  |
| 8 | 15 | SQL Practice |  |
| 16 | .Revision |  |
|  |  | **MID TERM** |  |
| 9 | 17 | Co-related Nested Query using Exists and Not Exists |  |
| 18 | Aggregate functions (sql)  (count, max, min, sum, avg)  Group by  Having |  |
| 10 | 19 | Outer Joins(Left, Right, Full) |  |
| 20 | SQL Practice |  |
| 11 | 21 | Relational Algebra: Unary Relational Operations (select, project, rename) Relational Algebra Operations from set theory (Union, Intersection, Except/Minus)  Union Compatible |  |
| 22 | Binary Relational Operations Join, natural join, cross product , Examples of queries |  |
| 12 | 23 | Aggregate Functions + RA Practice |  |
| 16 | SQL Stored Procedures, Views |  |
| 13 | 17 | Functional Dependencies, Inference Rules, |  |
| 18 | Closure & Super Keys |  |
| 14 | 19 | Identifying Candidate Keys |  |
| 20 | Minimal Cover, Equivalent Sets of Fds , Lossy and Loss less decomposition |  |
| 15 | 21 | Normalization: 1nf 2nf, 3nf, BCNF |  |
| 22 | Normalization with Examples. |  |
| 16 | 23 | Identification of Normal Form |  |
| 24 | Revision |  |