

Occupational Courses
ITEX 104 Database System

Course Title: **Database System**

Course Code: **104**

Semester: II

Credit Hours: 3 (2+1)

Nature of the course: T/P

1. Course Description and Goals

This course covers the fundamental concepts about database management system. The main objective of this course is to make the learners familiar with different database systems to be dealt with in real world scenarios. The course begins from the historical development of database systems to its implementation in relational system and conclude with knowledge on crash recoveries. It aims at making the learners familiar for using various database systems, and database programming using SQL. Learners will be at least able to design a database system required at their working place.

2. Learning Outcomes

On completion of this course, the students will be able to:

- a) understand the basic concepts of database management system.
- b) design a simple database system and normalize it
- c) use SQL programming language to design queries
- d) understand and plan recovery mechanism in case of failure

3. Content with specific objectives

Specific objectives	Contents
<ol style="list-style-type: none">1. understand the idea of DBMS2. gather idea of different databases in modern market3. understand the development of database systems4. understand the concept of abstraction, independence5. understand the idea of schema and instances and implement in real life example	Unit One: Introduction to DBMS (5 Hrs.) <ol style="list-style-type: none">1. Concepts of DBMS2. Application of DBMS3. Historical development of database systems (File system, Hierarchical, Network, Relational)4. Database Architecture5. Data Abstraction6. Data Independence7. Schema and Instances
<ol style="list-style-type: none">1. Understand the concept of entity-relationship model	Unit Two: Data Modelling (7 hrs.) <ol style="list-style-type: none">1. Logical, Physical and Conceptual2. E-R model

<ul style="list-style-type: none"> 2. implement the ideas of entities, keys, attributes in real life examples 3. understand constraints and implement in real example 4. to be able to design ER diagrams in real world scenario 	<ul style="list-style-type: none"> 3. Entities, keys, attributes, relationship 4. Constraints 5. E-R diagram practices
<ul style="list-style-type: none"> 1. Understand the concept and use of SQL 2. categorize DDL, DML, DCL and implement with examples 3. implement aggregate functions 4. understand and implement nested subqueries 5. understand the concept of different types of views 	Unit Three: SQL (7 hrs.) <ul style="list-style-type: none"> 1. Introduction to SQL 2. Basic structure of queries 3. DDL, DML, DCL 4. Set Operations 5. Aggregate Functions – GROUP BY, HAVING etc. 6. Nested Subqueries 7. Relations (Joined, derived) 8. Views
<ul style="list-style-type: none"> 1. Understand the concept of relational algebra 2. understand the concept of relational calculus 3. understand various operations and functions in relational algebra 4. understand various activities withing the relational calculus domain 	Unit Four: Relational Algebra and Calculus (7 hrs.) <ul style="list-style-type: none"> 1. Introduction to Relational Algebra 2. Selection and Projection 3. Set Operations 4. Renaming 5. Joins, Division 6. Introduction to Relational Calculus 7. Tuple Relational Calculus 8. Domain Relational Calculus 9. Calculus vs Algebra
<ul style="list-style-type: none"> 1. understand the concept of normalization 2. understand the concept of decomposition 3. understand and implement the concept of functional dependencies 	Unit Five: Normalization (6 hrs.) <ul style="list-style-type: none"> 1. Introduction to Normalization, importance 2. Non loss decomposition 3. Functional Dependencies 4. 1NF,2NF,3NF, BCNF, DKNF, 5. Features of a good relational database design

4. normalize to different extent for real world scenarios 1NF, 2NF, 3NF, BCNF, etc	
1. understand the concept and importance of hashing and indexing 2. understand various types of hashing techniques 3. understand various types of indexing techniques	Unit Six: Hashing and Indexing (6 hrs.) 1. Basic Concepts 2. Ordered Indices 3. B ⁺ Tree, B- Tree Indexing 4. Static Hashing, Dynamic Hashing 5. Comparison of Ordered Indexing and Hashing
1. understand the concept of transaction 2. define and understand ACID properties 3. understand serializability 4. understand the concept of deadlock and its prevention 5. understand lock-based and timestamp-based protocols	Unit Seven: Transaction Management and Concurrency Control (5 hrs.) 1. ACID properties 2. Concurrent Executions 3. Serializability, recoverability 4. Lock-based Protocols (2PL, Deadlocks) 5. Timestamp Based Protocols
1. understand the concept of crashing 2. classify different types of failures 3. understand various process of recovery	Unit Eight: Crash Recovery (5 hrs.) 1. Failure Classification 2. Recovery and Atomicity 3. Log-based Recovery 4. Advance Recovery System, Remote Backup systems

9. Major Teaching and Learning Strategy

The course is designed to be implemented both theoretically and practically. Learners and facilitators both should be involved in classroom activities. Practical demonstration of SQL queries should be done, and students' knowledge should be assessed on timely basis. Group discussions and participation in group is recommended mostly for depth understanding of the subject matter. Facilitator is responsible for developing classroom materials required for teaching-learning process, use of multimedia is recommended as visuals/images would prove more fruitful for student involvements. Facilitator should atleast demonstrate the use of MySQL/ MongoDB or any other database that are most popular in the software market.

10. Assessment Plan

- a. In-semester**
- b. End-semester**

11. References

1. A. K. Majumdar and P. Bhattacharaya, "Database Management Systems", Tata McGraw Hill, India
2. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education
3. "Database Systems: Design, Implementation, and Management", 10th Edition by Thomas Connolly and Carolyn Begg