

**Faculty of Science and Information Technology**

**Department of Software Engineering**

**Course Code: SWE 211**

**Course Title: Introduction to database with lab**

1. OBJECTIVES

The objective of this course is to provide the participants the various ideas about database and database design with the main focus on the relational model and the SQL (Structured Query Languages).

1. OUTCOMES

After completion of this course student will:

1. Describe  fundamentals of  data  and  database  concept
2. Compare  and  contrast  the  relational  database  model  with  other  database model
3. Explain  and  use  the  database  development  lifecycle
4. Design  databases  using  data  modeling  and  data  normalization technique
5. Create  databases  using  popular  database  management  system  tools
6. Solve  problems  by  constructing  database  queries  using  SQL
7. Develop  insights  into  future  data  management  tool  and  technique  trends
8. CONTENTS

This course will cover Introduction to database, Database system concepts and architectures, Data modeling, Entity Relationship Model, Relational Model, Relational algebra and calculus, Structured Query Languages (SQL), File organization and retrieval, Relational database design, Transaction Management, Concurrency control and Database Security

1. COURSE OUTLINE

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| **Lectures** | **Contents** | **Details** |
| Lecture 1 | Introduction to database | What is database management system (DBMS), purpose of DBMS, advantages and implications of DBMS and relational DBMS |
| Lecture 2 | Database system concepts and architectures | Data models, Instances and Schemas, database languages, transaction management, database users and database architectures |
| Lecture 3 | Data modeling using Entity Relationship Model | Entity Types, Entity Sets, Attributes, Keys, Relationships, relationship Types, Roles, and Structural Constraints |
| Lecture 4 | Data modeling using Entity Relationship Model | Weak Entity set, Refining the ER Design for different databases, ER Diagrams, Naming Conventions and Design Issues |
| Lecture 5 | Data modeling using Entity Relationship Model | Extended ER features: Aggregation, Specialization and Generalization |
| **Exam** |  | **Quiz** 1 |
| Lecture 6 | Relational Model | Relational Model Concepts, Structure of relational database, Relational Database Design Using ER-to-Relational Mapping, Relational Constraints and Relational Database Schemas |
| Lecture 7 | Relational algebra and calculus | Basics relational algebra operations: introduction, Selection and projection, set operations, renaming, Joins |
| Lecture 8 | Relational algebra and calculus | Basics relational algebra operations: syntax, semantics, Operators, grouping and ungrouping, relational comparison |
| **Exam** |  | **Quiz 2** |
| Lecture 9 | SQL | Basic structures, data-definition languages, Null values and set operations |
| **Exam** |  | **Mid Term** |
| Lecture 10 | SQL | Data manipulation languages and Aggregate functions |
| Lecture 11 | SQL | Nested sub queries, derived relations, joined relations and views |
| Lecture 12 | SQL | Query optimization, Assertion and Trigger |
| Lecture 13 | SQL | SQL Practise |
| **Exam** |  | **Quiz 3** |
| Lecture 14 | Relational database design | Decomposition, Functional dependency |
| Lecture 15 | Relational database design | Decomposition, Functional dependency |
| Lecture 16 | Relational database design | Normalization (1NF, 2NF, 3NF, BCNF) |
| Lecture 17 | Relational database design | Normalization (1NF, 2NF, 3NF, BCNF) |
| Lecture 18 | Concurrency control | Concurrency Problems, Solution to Concurrency Problems, Locking, Compatibility Matrix, Deadlock, Wait for Graph |
| Lecture 19 | Database Security | Security issues involving distributed database systems, Failure and recovery |
| Lecture 20 | Final Review | Other necessary topics and final review of the course |
| **Exam** |  | **Final** |

1. MARKS DISTRIBUTION

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| Class Attendance | 05% |
| Assignment | 05% |
| Class test (Quiz) | 15% |
| Lab | 25% |
| Mid Term Exam | 20% |
| Final Exam | 30% |
| TOTAL | 100% |

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1. REFERRED TEXTBOOKS
2. Database Systems Concepts, A. Silberschatz, H. Korth and S. Sudarshan, McGraw Hil
3. An Introduction to Database Systems, R. Ramakrishnan and J. Gehrke, McGraw Hill
4. An Introduction to Database Systems, C. J. Date, Wesley.