Course Outline

Title	**Database Systems**
Code	**IT-243**
Credit Hours	3 *Theory/week:* Weight 3 Cr. Hrs. Contact Hours 3 Hrs. Lectures: 2 Duration 1.5 Hrs.
Instructor	Dr. Fiaz Majeed fiaz.majeed@uog.edu.pk
Prerequisite Skill/Knowledge/Understanding	○ Students have concepts of Information Technology discipline. ○ Students have concepts of Information data structure. ○ Concepts of programming language and data structure are essential for developing Project.
Program Name	BSIT
Aims and Objectives	• To teach Students history of Database. • To provide understanding of Data Models and teach their Comparison. • To provide understanding of Analysis and Design issues of Databases. • To provide Entity Relationship Diagram Concepts. • ERD Transformation into tables. • Develop strong skills of Structured Query Language • To provide an overview of Distributed Database and its comparison with Centralize Databases • To create awareness of Contemporary Advance Topics of Databases
Learning Outcomes	• Student will understand the requirements of Database Systems • Student can Design and Implement Databases using any DBMS • Students will have the expertise of SQL. • Good concepts of modeling techniques (ERD) • He knows when to implement a Centralized and Distributed environments. • Students will be aware of Advance topics of database. • Students will capable of designing and implementing real time solutions of database related problems.

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<tr><td>Syllabus</td><td>Topics: Traditional File Based Systems; Database Approach; Roles in Database Environment; History of Database Management Systems; Advantages and Disadvantages of DBMS; ANSI-SPARC Architecture; Data Manipulation Language (DML); Data Models; Functions of DBMS; Components of DBMS; Multi-User DBMS Architectures; History of Relational Model; Terminologies; Relational Data Structures, Mathematical Relation, Database Relations, Relational Keys, Representing Relational, Database Schemas; Relational Integrity; Relational Algebra; Introduction to SQL; Data Manipulation; Integrity enhancement Feature; Data Definition: Create a Database, Creating Tables, Altering Table, Dropping Table, Creating Index, Removing Index; Views: Creating Views, Removing views, Restrictions on Views, Updating Views, Advantages and Disadvantages, View Materialization; Transactions; Access Control; Information Systems Life Cycle; Database Application Life Cycle; Database Planning; System Definition; Requirements Collection & Analysis; Database Design; DBMS Selection; Implementation; Testing; Data Administration & Database Administration; Entity Types; Relationship Types; Attributes; Strong & weak Entity Types; Attributes on Relationships; Structural Constrains; Problems with ER Models; Specialization/Generalization For EERD; Constraints on Specialization/Generalization; Insertion Anomalies, Deletion Anomalies, Update Anomalies; Functional Dependency; Process of Normalization; First Normal Form; Second Normal Form; Review of Normalization (1NF-BCNF); Introduction and overview of Database Design Methodology; Conceptual Database Design Methodology; Logical Database Design Methodology; Comparisons of Logical and Physical Database Design; Overview of Physical Database Design; Physical Database Design Methodology: Centralized and Distributed Databases; Advance Topics.</td></tr>
<tr><td>Text Book/s</td><td>Thomas Connally and Carolyn Begg “Database Systems”, 6th Edition, 2014, ISBN 0-515-13038-9.</td></tr>
<tr><td>Reference Books/Material</td><td>Hand-outs</td></tr>
<tr><td>Instructional Aids/Resources</td><td>• Windows Environment
• Oracle 10g client & Server / SQL Server
• Erwin / DB Designer
• Multimedia in Class Rooms as well as in Labs
• Photocopy Facility for Handouts/Case Studies
• E-Books (Provided)</td></tr>
<tr><td>Assessment Criteria</td><td>
<table>
<tr><th>Sessional 25%</th><th></th><th>Mid 25%</th><th>Final 50%</th><th>Total 100%</th></tr>
<tr><td>Quizzes, Test,</td><td>05</td><td>Paper: 25</td><td>Paper 50</td><td></td></tr>
<tr><td>Project</td><td>15</td><td></td><td></td><td></td></tr>
<tr><td>Assignment</td><td>05</td><td></td><td></td><td></td></tr>
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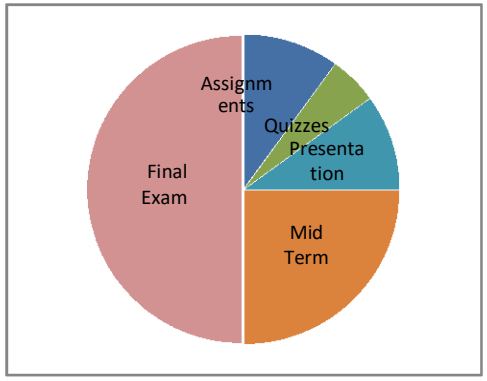
Recommendations	*Project is the compulsory part of this Course. Marks division for sectional or project may vary on the basis of complexity of project or available time for project execution and documentation.

Grading Policy:

1	Assignments	10%
2	Quizzes	5%
3	Project Presentation	10%
3	Mid term	25%
4	Final Exam	50%



Important notes:

Quizzes:

A number of quizzes will take place in the class to measure the learning progress of the students. These quizzes will be announced or unannounced.

Plagiarism Policy:

During this course a strict no tolerance plagiarism policy will be adopted regarding class assignments and term projects. While collaboration in this course is highly encouraged, you must ensure that you do claim other people's work/idea as your own. Plagiarism occurs when the words, ideas, assertion, theories, figures, images, programming code of others is presented as your own work. Failing to comply with plagiarism policy will lead to strict penalties including zero marks in assignments.

Frame work				
Week	**Lecture**	**Topic**	**Source** (Book-Chapter No. Section No.)	**Recommendations for Learning Activities** (Mention Assignments, Test, Quizzes, Practical, Case Study, Projects, Lab Work or Reading Assignments)
1	1	***Database Approach:*** • The Database • The Database Management System (DBMS) • Advantages & Disadvantages • Components of the DBMS Environment **Traditional File Based Systems:** • File-Based approach • Limitations	Text A-Ch1 Text B-Ch1	• Distribution of Course Outline • Discuss its objective • Prerequisite Test
	2	***Roles in Database Environment:*** • Data and Database Administrators • Database Designers • Application Developers • End-Users • History of Database Management Systems	Text A –Ch1 Hands outs	

2	3	**Types of Database**
		Centralized Database
		• Personal Computer Database
		• Client/Server database
		• Distributed Database
		  ○ Homogeneous Distributed Database
		  ○ Heterogeneous Distributed Database
		• Teleprocessing
		ANSI-SPARC Architecture:
		• External Level
		• Conceptual Level
		• Internal Level
			Text A –Ch2
			Text B-Ch4
			Hands outs	

	4	**Database System Models:** • Concept and Evaluation Of Database Model • Flat file Model • Hierarchical model • Network Model • Relational Model • Object Relational Model • Object Based data Model	Text A –Ch2 Text B-Part III Hands outs	Quiz:1

3	5	**Overview of Information System Life Cycle**
		• Planning
		• Analysis
		• Develop Conceptual Data model
		  ○ Design
		  ○ Logical Database Design
		  ○ Physical Database Design
		• Implementation
		• Maintenance
			Text A –Ch9
			
			Hands outs	

	6	**Database planning** **Database Analysis:** • Uses of Fact-Finding Techniques • What Facts are collected? • Fact Finding Techniques • Examining Documentation • Interviewing • Observation • Research • Questionnaires • A worked Example	Text A –Ch10 Text B-Ch2	Assignment: 1
4	7	**Database Design:** • Approaches to Database Design • Data Modeling • Phases of Database Design **Conceptual Database Design:** • Introduction to Entity-Relational model • Entity Types ***Relationship Types:*** • Degree of Relationship Type • Recursive Relationship	Text A –Ch9 Text B-Ch5 & 6	
	8	**Attributes:** • Simple & Composite Attributes • Single Valued & Multi-Valued Attributes • Derived Attributes • Keys • Strong & weak Entity Types • Attributes on Relationships	Text A –Ch 11	

5	9	**Structural Constrains:** • One-to-One Relationships • One-to-Many Relationships • Many-to-Many Relationships • Cardinality and Participation Constrain	Text A –Ch11	Quiz:2
	10	**Specialization/Generalization For EERD:** • Super Classes & Sub Classes • Super Class / Sub Class Relationships • Attributes Inheritance • Specialization Process • Generalization Process • Constraints on Specialization/Generalization • Aggregation and Composition	Text A –Ch12	
6	11	***Logical Database Design*** ***Normalization:*** • Purpose of Normalization • Data Redundancy & Update Anomalies: o Insertion Anomalies o Deletion Anomalies o Update Anomalies • The Process of Normalization • First Normal Form (INF) • Second Normal Form(2NF) • Functional Dependency	Text A –Ch13 Text B-Ch7	Assignment:2
	12	**Third Normal Form:** ***Transitive Dependency*** • Boyce-Codd Normal Form • Forth Normal Form • Multi-valued Dependency • Fifth Normal Form (5 NF) • Lossless-Join Dependency • Case Study	Text A –Ch13 Text B-Ch7	
7	13	**Relational Algebra:** • Relations: mathematical definition • Selection • Projection • Union of two relations	Text B –Ch6 Text B-Ch2	

	14	**Relational Calculus:** • Difference of two relations • Intersection of two relations Cartesian product		
8	15	***Introduction to SQL:*** **Objective of SQL** • History of SQL • Importance & Environment of SQL • Categories of SQL Commands • DML • DDL • DCL **Data Definition: Creating a Database** • Creating Tables • Altering Table • Dropping Table • Creating Index • Removing Index	Text A –Ch5 Text A- Ch 2	Quiz:3
	16	**Data Integrity:** • Types of Data integrity: • Entity Integrity • Domain Integrity • Referential Integrity • User-defined Integrity	Text A –Ch6	Assignment:3
9	17	**Constraints:** • PRIMARY KEY Constraint • UNIQUE Constraint • IDENTITY Property • DEFAULT Definition • FOREIGN Key Constraint • CHECK Constraint • NOT NULL Constraint • Rules	Text A –Ch6 Text B-Ch5	Assignment of Term Projects
	18	***Data Manipulation:*** Understanding the SELECT command Format • The SELECT Clause • The FROM Clause • The WHERE Clause	Text A –Ch5	

10	19	***Use of Operators:*** • Relational Operators • Logical Operators • Wildcard Characters • Understanding the NULL values and Expressions • ORDER BY Clause	Text A –Ch5	
	20	***Aggregate Functions in SQL*** • The GROUP BY Clause • The HAVING Clause • Querying from Multiple Tables • UNIION • Sub Query	Text A –Ch5	Quiz:4
11	21	**Types of Sub Query** • Nested Sub query o Single row sub query o Multiple row sub query • Correlated Sub query • Parameters Queries	Text A –Ch5	
	22	**Joins** • Types of Joins o Inner join o Outer Join o Left outer join o Right outer join	Text A –Ch5	
12	23	**Views:** • Creating Views • Removing views • Restrictions on Views • Updating Views • Advantages and Disadvantages • View Materialization	Text A –Ch6	Assignment:4
	24	**Changing the Content of Tables using Action Queries** • The INSERT table Statement • The DELETE table Statement • The UPDATE table Statement • Append Action Query	Text A –Ch7	

13	25	**Indexes** • Types of Indexes • Indexed sequential Files • Secondary indexes • Multilevel indexes • B+ trees • Clustered, Non Clustered Indexes	Text B –Ch6	
	26	RAID	Text A –Ch18 Text B –Ch6	
14	27	**Transaction Management:** • The Concept of Transaction • Transaction and Scheduling Properties of successful transactions.	Text A –Ch17	
	28	• Concurrent Execution of Transactions • Serialzability • Lock-Based Concurrency Control • Deadlocks	Text A –Ch19 Text B-Ch12	
15	29	• Incremental Log with Deferred Updates • Incremental Log with immediate Updates • Concurrency Control	Text A –Ch19	Mock up Exam
	30	Data Whitehouse and Mining Concepts	Text A –Ch25	
16	31	**Presentation**		Term Project Evaluation
	32	**Revision/tying up loose ends**		