

Course Title: **Database design**

Course Code: CSE323

Program: Master Degree In Computer Engineering

Department: Computer Engineering

Course coordinator: Dr. Rim Afdhal

Institution: Private Higher School of Engineers of Gafsa (ESIP)

A. A. Course Identification

1. Credit hours:	3 (1.5-0-1.5)
2. Course type	
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>	
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>	
3. Level/year at which this course is offered:	2.1/3
4. Pre-requisites for this course (if any):	Data Structures (CSE131), Understanding of Discrete Mathematics.

1. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Self-study	Total workload
1	Traditional classroom	29	74
2	Blended	45		
3	E-learning		
4	Distance learning		
5	Other (Specify)		

2. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22.5
2	Laboratory/Studio	-
3	Tutorial	22.5
4	Others(specify)	-
	Total	45

B. Course Objectives and Learning Outcomes

Course Description

This course provides a comprehensive introduction to database concepts. Students will learn essential concepts such as database design, SQL programming, and transaction management. Through hands-on activities, they will gain hands-on experience creating, manipulating, and securing databases using DBMS tools and technologies. The curriculum covers topics such as data modeling, normalization, advanced SQL queries, and concurrency control, equipping students with the skills needed to develop and manage robust database solutions.

Course Main Objectives

- ✓ The primary objectives of this course are to:
- ✓ Understand Database Fundamentals: Gain a solid foundation in relational database concepts, including the architecture and components of Database Management Systems (DBMS).
- ✓ Develop Data Modeling Skills: Learn to design efficient database structures using Entity-Relationship Diagrams (ERDs) and apply normalization techniques to optimize data integrity and reduce redundancy.
- ✓ Master SQL Proficiency: Acquire the ability to construct and execute SQL queries for data definition, manipulation, and retrieval within an Oracle environment.
- ✓ Know the management of competitive transactions
- ✓ Enhance Data Integration and Security: Understand the principles of data integration and implement robust security measures to protect data within Oracle databases.

1. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	✓ Demonstrates a comprehensive understanding of the theoretical foundations and architectures of database systems.	PLO.K2
1.3	✓ Uses problem-solving skills to construct and execute database queries.	PLO.K3
2	Skills	
2.1	✓ Develops and implements effective database schemas through proficient design and modeling skills.	PLO.S2
2.3	✓ Demonstrates the ability to manage concurrent transactions and maintain data integrity, ensuring robust and reliable database operations.	PLO.S7

C.1. Course Content

No	List of Topics	Contact Hours
1	<p>Chapter 1: Introduction to Databases and DBMS</p> <ol style="list-style-type: none"> 1. Definition and role of databases. 2. Differences between databases and traditional file systems. 3. Overview of Database Management Systems (DBMS). 4. Database models: hierarchical, network, relational. 5. DBMS functionalities (data management, security, integrity). 6. Database architecture (internal, conceptual, external schemas). 	4.5
2	<p>Chapter 2: The Relational Model</p> <ol style="list-style-type: none"> 1. Fundamental concepts: tables, attributes, primary and foreign keys. 2. Referential integrity and constraints (UNIQUE, NOT NULL, CHECK, FOREIGN KEY). 3. Basic operations of the relational model. 4. Relational algebra: selection, projection, join, union, intersection, difference, division. 	4.5
3	<p>Chapter 4: Database Normalization</p> <ol style="list-style-type: none"> 1. Introduction to normalization and its objectives. 2. Functional dependencies: definition and identification. 3. Normal forms: 1NF, 2NF, 3NF, BCNF. 4. Normalization process: steps and techniques. 5. Advantages and disadvantages of normalization. 6. Case study: applying normalization to an existing database schema. 	3
4	<p>Chapter 3: The Entity-Relationship (E/R) Model</p> <ol style="list-style-type: none"> 1. Introduction to database modeling. 2. Key concepts: entities, attributes, relationships, cardinalities. 3. E/R diagrams: notation and conventions. 4. Conversion from E/R model to relational schema. 5. Practical case study: modeling and transformation into a relational schema. 	4.5
5	<p>Chapter 5: SQL Language</p> <ol style="list-style-type: none"> 1. Introduction to SQL and its components. 2. Data Definition Language (DDL): 3. Data Manipulation Language (DML): inserting, updating, deleting, and querying data (INSERT, UPDATE, DELETE, SELECT). 4. Advanced queries: joins (INNER, OUTER, LEFT, RIGHT), aggregates (GROUP BY, HAVING), subqueries. 	6

	5. SQL query optimization (indexing, optimized queries).	
6	Chapter 6: Transaction Management and Concurrency 1. Definition and properties of transactions (ACID). 2. Issues related to concurrent access: lost updates, uncommitted reads, phantom reads. 3. Concurrency control: locking protocols (two-phase locking), lock management (shared, exclusive), deadlock prevention. 4. Transaction isolation levels in Oracle. 5. Non-locking concurrency control techniques: timestamp ordering, validation-based protocols.	4.5
Total		27

C.2. Practical Work Content

No	List of Topics	Contact Hours
1	Tutorial1 : Introduction to Databases and DBMS	1.5
2	Tutorial2 The Relational Model	3
3	The Entity-Relationship (E/R) Model	3
4	Database Normalization	3
5	SQL Language	4.5
6	Transaction Management and Concurrency	3
Total		18

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	AssessmentMethods
1.0	Knowledge and Understanding		
PLO.K2	✓ Demonstrates a comprehensive understanding of the theoretical foundations and architectures of database systems.	Lecturing	Assignments, Quizzes , Exams,
PLO.K3	✓ Uses problem-solving skills to construct and execute database queries.		
2.0	Skills		
PLO.S2	✓ Develops and implements effective database schemas through	Lecturing/Labdemonstrate	Assignments, Quizzes , Exams,

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	proficient design and modeling skills.		
PLO.S7	✓ Demonstrates the ability to manage concurrent transactions and maintain data integrity, ensuring robust and reliable database operations.		

7. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Practical Work (written or oral)	Weekly	00%
2	Quizzes, Homework assignments	Random	00%
3	First midTerm	8	35%
5	Final Exam	16	65%

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :	
1-	Office hours
2-	Blackboard interface

F. Learning Resources and Facilities

1. Learning Resources

Required Text books	<ol style="list-style-type: none"> 1. Elmasri, Ramez, and Shamkant B. Navathe. <i>Fundamentals of Database Systems</i>. 7th ed., Pearson, 2016. 2. Garcia-Molina, Hector, Jeffrey D. Ullman, and Jennifer Widom. <i>Database Systems: The Complete Book</i>. 2nd ed., Prentice Hall, 2009. 3. Silberschatz, Abraham, Henry F. Korth, and S. Sudarshan. <i>Database System Concepts</i>. 7th ed., McGraw-Hill Education, 2019.
Essential References Materials	NA
Electronic Materials	<ol style="list-style-type: none"> 1. Oracle Database Online Documentation 2. Oracle Learning Library

Other Learning Materials	NA
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2. Facilities Required

Item	Resources
Accommodation	Classroom board Computer lab with the necessary software Internet access
Technology Resources	Data projector

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment.	Students, course coordinator, Alumni, Employers	Direct/Indirect
Extent of achievement of course learning outcomes.	Faculty, Program Leaders, quality department	Direct
Quality of Learning resources	Faculty, Program Leaders,	Direct, Indirect
Teaching and learning quality and effectiveness.	Students, Faculty Program Leaders,	Direct, Indirect

H. Specification Approval Data

Council / Committee	Computer Engineering Council
Date	11/09/2023

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