MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Database Management Systems**			**Module Delivery**	
Module Type	**SUPPORT**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**SOFT2406**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	SOFT		**College**	CIT	
Module Leader	Lubna Thanoon Alkahla		**e-mail**	lubna.thanoon@uoninevah.edu.iq	
Module Leader's Acad. Title	LECTURER		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	20/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. To understand the importance of database systems and their role in managing data effectively. 2. To explore the evolution of data management systems and their impact on modern organizations. 3. To gain knowledge of different data models, including relational, hierarchical, network, and object-oriented. 4. To learn the basics of the Entity-Relationship (ER) model and how to create ER diagrams for database design. 5. To develop practical skills in SQL, including Data Definition Language (DDL) and Data Manipulation Language (DML). 6. To explore database security and authorization mechanisms to protect data from unauthorized access and ensure data privacy. 7. To gain an introduction to NoSQL databases and understand their characteristics, use cases, and advantages over traditional relational databases.

Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	1. Understand the fundamental concepts of database systems and their significance in modern data management. 2. Explore the evolution of data management systems, from traditional file systems to modern database systems. 3. Gain knowledge of various data models, including relational, hierarchical, network, and object-oriented models. 4. Comprehend the basics of the relational model, including entity types, attributes, relationships, and mapping ER diagrams to relational schemas. 5. Acquire an understanding of relational database design and normalization concepts, including functional dependencies, normalization forms (1NF, 2NF, 3NF, BCNF), and multi-valued dependencies (4NF). 6. Develop proficiency in SQL (Structured Query Language) for data definition (DDL), data manipulation (DML), and writing queries for retrieving, inserting, updating, and deleting data. 7. Learn advanced SQL concepts such as creating and managing views, updating data through views, and using materialized views for precomputing and storing query results. 8. Explore indexing and query optimization techniques to enhance database performance and efficiency. 9. Understand transaction management and concurrency control mechanisms to ensure data consistency and isolation in multi-user database environments. 10. Gain knowledge of database security and authorization principles, including user management, access control, and best practices for securing databases. 11. Familiarize students with NoSQL databases and their characteristics, use cases, and differences compared to traditional relational databases.

Indicative Contents **المحتويات الإرشادية**	1. Overview of database systems and their importance: Introduction to databases and their role in managing and organizing data. Understanding the benefits of using database systems for data storage, retrieval, and manipulation. Exploring the impact of database systems in various industries and applications. 2. Evolution of data management systems: Historical overview of data management systems, from file systems to modern database systems. Understanding the limitations of traditional file systems and the need for more advanced data management solutions. Introduction to the concept of database management systems (DBMS) and their evolution over time. 3. Data models: Overview of different data models used in database systems, including relational, hierarchical, network, and object-oriented models. Understanding the characteristics and advantages of each data model. 4. Introduction to the relational model: Understanding the basic concepts of the relational model, including tables, rows, columns, and relationships. Exploring the importance of keys (primary keys, foreign keys) for establishing relationships between tables. Introduction to relational algebra and the use of relational operators (e.g., select, project, join) for querying and manipulating data. 5. Entity-Relationship (ER) Model: Exploring the basics of the ER model for representing entities, attributes, and relationships. Understanding ER diagrams and the notation used to represent entities, attributes, and relationships. 6. Relational Database Design and Normalization: Understanding functional dependencies and their role in database design.

	Exploring the principles of normalization to eliminate data redundancy, improve data integrity, and optimize database performance. 7. Structured Query Language (SQL): Introduction to SQL and its role as the standard language for interacting with relational databases. 8. Indexing and Query Optimization: Understanding the concept of indexing and its role in improving query performance. Exploring different types of indexes (e.g., B-tree, hash) and their trade-offs. 9. Transaction Management and Concurrency Control: Understanding the importance of transaction management in maintaining data consistency and integrity. Exploring concurrency control mechanisms to handle simultaneous access and modifications to the database.
	10. Database Security and Authorization: Understanding the importance of database security and access control. Exploring authentication and authorization mechanisms for user management and access privileges. Introducing best practices for securing databases, including encryption, auditing, and role-based access control. 11. NoSQL: Introduction to NoSQL databases and their characteristics. Understanding the differences between NoSQL and relational databases. Exploring different types of NoSQL databases.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategies for the "Database Systems" module include interactive lectures, hands-on labs, group discussions, case studies, assignments, and projects. These strategies aim to facilitate knowledge transfer, promote critical thinking, enhance technical skills, provide real-world applications, and assess understanding. Through a combination of theoretical concepts, practical exercises, collaborative learning, and industry insights, students gain a comprehensive understanding of database systems, data modeling, SQL, advanced concepts, indexing, transaction management, and database security.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**150**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3 and 6	LO #3, #4 and #6, #7
	Assignments	2	10% (10)	6 and 14	LO #3, #4 and #10
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	15	LO #11
Summative assessment	Midterm Exam	2hr	10% (10)	8	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Database Systems ● Overview of database systems and their importance ● Evolution of data management systems ● Data models: Relational, Hierarchical, Network, Object-Oriented ● Introduction to the relational model
Week 2	Entity-Relationship (ER) Model ● Basics of the ER model ● ER diagrams and notations ● Entity types, attributes, and relationships ● Mapping ER diagrams to relational schemas

Week 3	Relational Database Design and Normalization ● Functional dependencies and normalization concepts ● Normalization process (1NF, 2NF, 3NF) ● Boyce-Codd Normal Form (BCNF) ● Multi-valued dependencies and Fourth Normal Form (4NF)
Week 4	Structured Query Language (SQL) ● Introduction to SQL and its role in relational databases ● SQL Data Definition Language (DDL) ● SQL Data Manipulation Language (DML) ● SQL queries: SELECT, INSERT, UPDATE, DELETE
Week 5	Structured Query Language (SQL) – Continued… Querying and Filtering Data with SQL: ● SELECT statement and its various clauses (e.g., FROM, WHERE, ORDER BY) ● Filtering data using conditions and logical operators ● Sorting query results and limiting the number of returned rows
Week 6	Structured Query Language (SQL) – Continued… Aggregating and Grouping Data with SQL ● GROUP BY clause for grouping data ● Aggregate functions (e.g., COUNT, SUM, AVG, MAX, MIN) for calculating summary statistics ● HAVING clause for filtering grouped data
Week 7	Mid-term Exam
Week 8	Advanced SQL Concepts ● Creating and managing views ● Updating data through views ● Materialized views for precomputing and storing query results
Week 9	Indexing and Query Optimization
Week 10	Transaction Management and Concurrency Control
Week 11	Database Security and Authorization
Week 12	Database Security and Authorization – Continued…

Week 13	NoSQL
Week 14	NoSQL– Continued…
Week 15	
Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Install a database management system (DBMS) and create a new database and tables based on a specific scenario (e.g., a library management system, or a student information system).
Week 2	Lab 2: Create an ER diagram using a tool like Lucidchart or draw.io.
Week 3	Lab 3: Convert the ER diagram into a relational schema by identifying tables, attributes, and candidate keys.
Week 4	Lab 4: Executing basic SQL queries and retrieving data from tables
Week 5	Lab 5: ● Writing SQL queries with filtering and sorting conditions ● Using operators and functions for manipulating and formatting data
Week 6	Lab 6: Writing SQL queries to perform grouping and aggregation
Week 7	Mid-term Exam
Week 8	Lab 8 : Create an updatable view and perform INSERT, UPDATE, and DELETE operations on the view.
Week 9	Lab 9: Create and test the indexes on the provided dataset and measure the performance improvement.
Week 10	Lab 10: Execute concurrent transactions with different isolation levels.
Week 11	Lab 11: Define access control rules for specific tables and columns in the database.
Week 12	Lab 12: Assign a task where students need to implement encryption techniques (e.g., symmetric encryption, asymmetric encryption) for specific columns in the database.
Week 13	Lab 13: Design and create a data model for a specific application using the chosen NoSQL database.
Week 14	Lab 14: Perform CRUD (Create, Read, Update, Delete) operations on the data model to understand how data is stored and retrieved.
Week 15	Lab 15:
Week 16	**Lab 16: Wrap-Up and Module Reflection**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Database System Concepts**, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 7th Edition, McGraw-Hill / ISBN 978-0078022159	No
Recommended Texts	Database Illuminated, Catherine M. Ricardo and Susan D. Urban, 3rd Edition, Jones & Bartlett Learning	No
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.