Course Specification of Database Fundamentals

Course No (...................)

2020/2021

Head of Department	Vise Dean for Quality Assurance	Dean of the Faculty	Dean of Academic Development center and Quality
Dr. Ahmed Al-shalabi	Dr. Anwar Al-Shamiri	Dr. Nagi Al-Shibani	Assoc. Prof. Dr.Huda Al.Emad
			Rector of Sana'a University
			Prof. Dr. Qassim Mohammed Abbas

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وحدة ضمان الجودة

I. Course Identification and General Information:

1	**Course Title:**		Database Fundamentals				
2	**Course Code & Number:**						
3	**Credit hours:**		**C.H**				TOTAL
			Th.	Seminar	Pr	Tr.	
			2	**-**	**2**		**3**
4	**Study level/ semester at which this course is offered:**		2nd Level-1st Semester				
5	**Pre –requisite (if any):**		None				
6	**Co –requisite (if any):**		None				
7	**Program (s) in which the course is offered:**		IS,IT,CS				
8	**Language of teaching the course:**		English/Arabic				
9	**Study System**		Term based System				
10	**Mode of delivery:**		Full Time				
11	**Location of teaching the course:**		Faculty of Computer and Information Technology				
12	**Prepared By:**		Dr.Ebraheem M.Alhaddad				
13	**Date of Approval**						

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II.   Course Description:

This course introduces the basics of database systems, as well as modeling, design and manipulation of relational databases. At the end of this course, a student will be able to understand and apply the fundamental concepts required for the use and design of database systems. Topics include basic concepts and terminology of the database approach, data modeling (the entity relationship model, relational data model), database design theory (entity relationship to relational mappings, normalization using functional dependencies), data definition and manipulation languages (relational algebra, SQL). The course will enable the students to create and manipulate databases on the Oracle database management system.

III.	Course Intended learning outcomes (CILOs) of the course	Referenced PILOs
a.1	Explain the role of database users and features of database systems, and architecture of database systems.	A
a.2	Explain the main issues related to the design and use of structured data.	
b.1	Construct conceptual (E/R & EER) and logical data models applying database design principles.	B
b.2	Evaluate data redundancy levels and their impact on database integrity and maintainability.	
b.3	Distinguish between good and bad database design.	
c.1	Implement a database using commercial DBMS.	C
c.2	Implement queries, using SQL, to search, update and delete information in such databases.	
d.1	Exhibit self-learning abilities in data management and analysis.	D

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d.2	Work as an effective member or leader of diverse teams, communicating effectively and operating within cross-disciplinary and cross-cultural contexts in the workplace.	

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Explain the role of database users and features of database systems, and architecture of database systems.	Lectures, presentation, discussions	Assignments, Exams, Presentations.
a2- Explain the main issues related to the design and use of structured data.	Lectures, presentation, discussions	Assignments, Exams, Presentations.

(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:

Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Construct conceptual (E/R & EER) and logical data models applying database design principles.	Lectures Class discussions. Presentations	Assignments, Exams, Presentations.
b2- Evaluate data redundancy levels and their impact on database integrity and maintainability.	Lectures Discussions.	Assignments, Exams, Presentations.

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b3 - Distinguish between good and bad database design.	Lectures Class discussions. Presentations	Assignments, Exams, Presentations.

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
C1- Perform relational database normalization and relational algebra.	Lab experiment, Project	Quizzes, Exams, Project assignment
C2- Implement queries, using SQL, to search, update and delete information in such databases.	Lab experiment, Project	Quizzes, Exams, Project assignment

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Exhibit self-learning abilities in data management and analysis.	Group projects, Interview, Discussion	Reports, Project assignment, Presentations
d2- Work as an effective member or leader of diverse teams, communicating effectively and operating within cross-disciplinary	Group projects, Discussion	Reports, Project assignment, Presentations

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and cross-cultural contexts in the workplace.		

IV.	Course Content:				
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Topics List	Number of Weeks	contact hours
1	Introduction to Databases	a1,a2,b3	- Characteristics of the Database Approach - Advantages of Using the DBMS Approach - When Not to Use a DBMS - Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Classification of Database Management Systems	2	4
2	The Relational Data Model and Relational Database Constraints	a1,a2,b1, b2	- Relational Model Concepts. - Relational Model Constraints and Relational Database Schemas.	1	2
3	SQL	a2,b2,c1, c2	- SQL Data Definition and Data Types - Specifying Constraints in SQL	3	6

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			- Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL. - Complex SQL Retrieval Queries - Comparisons Involving NULL and Three-Valued Logic - Nested Queries		
4	The Relational Algebra and Relational Calculus	a2,b2,c1,c2	- Unary Relational Operations: SELECT and PROJECT - Relational Algebra Operations from Set Theory - Binary Relational Operations: JOIN and DIVISION	1	2
5	Data Modeling Using the Entity–Relationship (ER) Model	a2,b1,b2,c1,c2,d1	- Database design process - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Relationship Types of Degree - Higher than Two	2	4
6	The Enhanced Entity–Relationship (EER) Model	a2,b1,b2,b3,c1,d1	- Subclasses, Superclasses, and Inheritance - Specialization and Generalization - Constraints and Characteristics of Specialization and	1	2

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			Generalization Hierarchies - Modeling of UNION Types - Using Categories		
7	Relational Database Design by ER- and EER-to-Relational Mapping	a1,a2,b1, b2,b3,c1	- Relational Database Design Using ER-to-Relational Mapping - Mapping EER Model Constructs - to Relations	2	4
8	Functional Dependencies and Normalization for Relational Databases	a1,a2,b1, b2,b3,c1	- Functional Dependencies - Normal Forms Based on Primary Keys	2	4
Number of Weeks /and Units Per Semester				**14**	**28**

B - Practical Aspect: (if any)

Order	Tasks/ Experiments	Number of Weeks	contact hours	Learning Outcomes
1	Install ORACLE	1	2	c1,c2
2	Creating & managing tables	1	2	b2,c1,c2
3	Writing Basic SELECT statements	1	2	b2,b2,c2

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4	Restricting and sorting data	1	2	b2,c1,c2
5	Single-Row Functions	1	2	b2,c1,c2
6	Including Constraints	1	2	b2,c2
7	Displaying data from multiple tables	1	2	c1,c2,d1
8	Mid Exam	1	2	a1,a2,b1,b2,c1,c2
9	Manipulating Data	2	4	c1,c2,
10	Aggregating Data	2	4	b2,c1,c2
11	Creating Views	1	2	b2,c1,c2
12	Subqueries	2	4	b2,c1,c2
Number of Weeks /and Units Per Semester		**14**	**28**	

V. Teaching strategies of the course:

- Lectures
- Class discussions
- Laboratory work
- Group projects
- Presentation

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Data Requirements	b1,c2,d1,d2	4th	2

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2	E/R Diagram	b1,c2,d1,d2	9th	2
3	Relational Diagram	b2, bc1, c2,d1,d2	12th	2
4	Final project Discussion	b2,c1,c2,d1,d2	15th	4

VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Project	4th, 9th ,12th ,15th	10	10%	b2, bc1, c2,d1,d2
3	Mid Term Exam practical	8th	5	5%	b1,b2,c1,c2,d1
4	Mid Term Exam Theoretical	10th	10	10%	a1,a2,b1,b2
5	Final Exam (practical)	16th	10	10%	a1,a2,b1,b2,c1,c2
6	Final Exam (theoretical)	16th	60	60%	a1,a2,b1,b2,c1,c2
	Total		**100**	**100%**	

Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. Ramez Elmasrim & Shamkant B. Navathe – 2016 - "Fundamentals of Database Systems" – 7th edition – USA -PERSON

2- Essential References.

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	1. Thomas Connoll & Carolyn Begg – 2015 – "Database Systems A Practical Approach to Design, Implementation, and Management" - 6th edition – USA –PERSON. 2. Jeffrey D. Ullman – "A First Course in Database Systems"- 3rd edition – USA –PERSON.
3- Electronic Materials and Web Sites *etc*.	
	1- http://infolab.stanford.edu/~ullman/fcdb.html 2- https://15415.courses.cs.cmu.edu/fall2016/

IX. Course Policies:

Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: ------------------------------------
The University Regulations on academic misconduct will be strictly enforced. Please refer to **-----------**

1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class, he will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4	**Assignments & Project** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:**

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	Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments my given directly to students using soft or hard copy

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Faculty of Computer & Information Technology

Department of Computer Science

Program of Computer Science

Course syllabus of Database Fundamentals

Course No (...................)

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I. - Information about Faculty Member Responsible for the Course:

Name of Faculty Member		Office Hours					
Location& Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							

II. Course Identification and General Information:

1-	Course Title:	Database Fundamentals				
2-	Course Number & Code:					
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	2		3
4-	Study level/year at which this course is offered:	2nd Level -1st Semester				
5-	Pre –requisite (if any):	None				
6-	Co –requisite (if any):	None				
7-	Program (s) in which the course is offered	IS,IT,CS				
8-	Language of teaching the course:	English/Arabic				
9-	System of Study:	Term based System				
10-	Mode of delivery:	Full Time				
11-	Location of teaching the course:	Faculty of Computer and Information Technology				

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IV. Intended learning outcomes (ILOs) of the course:

a1.Explain the role of database users and features of database systems, and architecture of database systems.

a2.Explain the main issues related to the design and use of structured data.

b1.Construct conceptual (E/R & EER) and logical data models applying database design principles.

b2.Evaluate data redundancy levels and their impact on database integrity and maintainability.

b3.Distinguish between good and bad database design.

c1.Implement a database using commercial DBMS.

c2.Implement queries, using SQL, to search, update and delete information in such databases.

d1. Exhibit self-learning abilities in data management and analysis.

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d2.Work as an effective member or leader of diverse teams, communicating effectively and operating within cross-disciplinary and cross-cultural contexts in the workplace.

V.	Course Content:			
A – Theoretical Aspect:				
Order	**Units/Topics List**	**Topics List**	**Week Due**	**contact hours**
1	Introduction to Databases	- Characteristics of the Database Approach - Advantages of Using the DBMS Approach - When Not to Use a DBMS - Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Classification of Database Management Systems	1st,2nd	4
2	The Relational Data Model and Relational Database Constraints	- Relational Model Concepts. - Relational Model Constraints - and Relational Database Schemas	3rd	2
3	SQL	- SQL Data Definition and Data Types - Specifying Constraints in SQL - Basic Retrieval Queries in SQL - INSERT, DELETE, and UPDATE Statements in SQL.	4th-6th	6

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		- Complex SQL Retrieval Queries - Comparisons Involving NULL and Three-Valued Logic - Nested Queries		
4	The Relational Algebra and Relational Calculus	- Unary Relational Operations: SELECT and PROJECT - Relational Algebra Operations from Set Theory - Binary Relational Operations: JOIN and DIVISION	7th	2
5	Data Modeling Using the Entity–Relationship (ER) Model	- Database design process - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Relationship Types of Degree - Higher than Two	8th ,9th	4
6	Midterm Exam	- Midterm exam	10th	2
7	The Enhanced Entity–Relationship (EER) Model	- Subclasses, Superclasses, and Inheritance - Specialization and Generalization - Constraints and Characteristics of Specialization and Generalization Hierarchies - Modeling of UNION Types - Using Categories	11th	2
8	Relational Database Design by ER- and EER-to-Relational Mapping	- Relational Database Design Using ER-to-Relational Mapping - Mapping EER Model Constructs - to Relations	12th,13th	4
9	Functional Dependencies and Normalization	- Functional Dependencies - Normal Forms Based on Primary Keys	14th ,15th	4

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	for Relational Databases			
10	Final Exam	Final Exam	16th	2
Number of Weeks /and Units Per Semester			**16**	**32**

B – Practical Aspect: *(if any)*				
Order	**Topics List**	**Week Due**	**Contact Hours**
1	**Install ORACLE**	1st	**2**
2	**Creating & managing tables**	2nd	**2**
3	**Writing Basic SELECT statements**	3th	**2**
4	**Restricting and sorting data**	4th	**2**
5	**Single-Row Functions**	5th	**2**
6	**Including Constraints**	6th	**2**
7	**Displaying data from multiple tables**	7th	**2**

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8	Mid Exam	8th	2
9	Manipulating Data	9th, 10th	4
10	Aggregating Data	11th, 12th	4
11	Creating Views	13th	2
12	Subqueries	14th, 15th	4
13	Final Exam	16th	2
Number of Weeks /and Units Per Semester		**16**	**32**

V. Teaching strategies of the course:

- Lectures
- Class discussions
- Laboratory work
- Group projects
- Presentation

VI. Assignments:

No	Assignments	Week Due	Mark
1	Data Requirements	4th	2
2	E/R Diagram	9th	2
3	Relational Diagram	12th	2
4	Final project Discussion	15th	4

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VII. Schedule of Assessment Tasks for Students During the Semester:

Assessment	Type of Assessment Tasks	Week Due	Mark	Proportion of Final Assessment
1	Project	4th, 9th ,12th ,15th	10	10%
2	Mid Term Exam practical	8th	5	5%
3	Mid Term Exam Theoretical	10th	10	10%
4	Final Exam (practical)	16th	10	10%
5	Final Exam (theoretical)	16th	60	60%
	Total		**100**	**100%**

VIII. Learning Resources:

- Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).

1- Required Textbook(s) (maximum two).

1. Ramez Elmasrim & Shamkant B. Navathe – 2016 - "Fundamentals of Database Systems" – 7th edition – USA -PERSON

2- Essential References.

1. Thomas Connoll & Carolyn Begg – 2015 – *"Database Systems A Practical Approach to Design, Implementation, and Management"* - 6th edition – USA –PERSON.
2. Jeffrey D. Ullman – *"A First Course in Database Systems"*- 3rd edition – USA –PERSON.

3- Electronic Materials and Web Sites *etc*.

1- http://infolab.stanford.edu/~ullman/fcdb.html

2- https://15415.courses.cs.cmu.edu/fall2016/

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	X. Course Policies:
	Unless otherwise stated, the normal course administration policies and rules of the Faculty of Computer and Information Technology apply. For the policy, see: ----------------------------------- The University Regulations on academic misconduct will be strictly enforced. Please refer to -----------
1	**Class Attendance:** A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2	**Tardy:** For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3	**Exam Attendance/Punctuality:** A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam.
4	**Assignments & Project** The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time.
5	**Cheating:** For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty.
6	**Plagiarism:** Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.
7	**Other policies:** - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. - Lecture notes and assignments my given directly to students using soft or hard copy

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اللجنة الإشرافية

م.	الاســـم	الصـــــــفة	التوقيع
١	أ.م.د. عبد الماجد الخليدي	نائب عميد الكلية للشؤون الأكاديمية	
٢	أ.م.د. احمد مجاهد	نائب عميد مركز التطوير الأكاديمي وضمان الجودة	
٣	د. حسين الأشول	ممثل المركز في الكلية	
٤	أ.د. إبراهيم المطاع	نائب رئيس الجامعة للشؤون الأكاديمية	

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