

#### **I. COURSE INFORMATION COURSE CODE** COMP3205 **COURSE TITLE DATABASE SYSTEMS OMAN QUALIFICATION** 7 FRAMEWORK (OQF) LEVEL **CREDIT HOURS** 3 4 **CONTACT HOURS PRE-REQUISITES** COMP3203 and LANC2058 **CO-REQUISITES** \_ **EQUIVALENT COURSES COMP4201 INCOMPATIBLE COURSES** -□ University Requirement □ University Elective College Requirement □ College Elective Department Requirement □ Department Elective **COURSE CATEGORY** Major Requirement □ Major Elective □ Specialization Requirement □ Specialization Elective $\Box$ Other (specify): Department: Computer Science **College: Science COURSE OWNER** Center: Unit: **DELIVERY MODE** □ Blended □ Online $\boxtimes$ Face to Face □ Lecture ⊠ Lecture/Lab □ Lecture/Studio □ Lecture/Seminar **COURSE TYPE** □ Lecture/Lab/Tutorial or □ Lecture/Tutorial Seminar

□Tutorial	□ Laboratory (Practical)
$\Box$ Field or Work Placement	□ Studio
□Seminar	□ Internship

			Project			
	□ Thesis		$\Box$ Other (specify):			
LANGUAGE OF Instruction	English					
Course Description	This course introduces fundamental concepts of database systems, namely structural and functional architectures, data modeling, entity-relationship model, relational model, normalization, database query languages (relational algebra, relational calculus, SQL), physical data storage (file structures and organizations, and indexing), and an introduction to the functionality of database management systems such as transaction management.					
		ed Reality		□ Flipped C	lassroom	
	□ Blended Learning		☑ Problem-Based Learning		ning	
TEACHING AND LEARNING Stratecies	□ Discovery-Based Learning		⊠ Project-Based Learning			
SIRAIEGIES	□ Student-Led Learning		⊠ Team-Based Learning		ng	
	□ Work-Ba	sed Learning		□ Other (specify):		
	$\square$ In-term examination(s) ( 20 %)		□ Quizzes (	%)	⊠Other	
Assessment Component	$\Box$ Homework assignments (%)		Project (20	)%)	(Lab	
AND WEIGHT	$\boxtimes$ Final examination ( 40 %)		<ul><li>☑ Practical/</li><li>(20%)</li></ul>	Lab	Exercise : (%))	
TEXTBOOKS AND Educational Material	Database Sy Programmin Edition, 201	e Systems: Models, Languages, Design, and Application nming, by Ramez Elmasri and Shamkant B. Navathe, , 6th 2011.				
GRADING METHOD	□ A-F Scale □ Pass/Not Pass		□ Other	(specify):		
GRADING METHOD DESCRIP	GRADING METHOD DESCRIPTION					
	Range	Letter Grade		Desc	ription	
	90 - 100	А	Exce	Exceptional performance: All course		All course
A-F GRADING SCALE:	86 – 89.9	A-	objec cons	objectives achieved and met in a consistently outstanding manner.		n a ner.
	81-85.9	B+	Very	y Good Perfor	rmance: T	ne
	77 - 80.9	В				

	73 – 76.9	В-	majority of the course objectives achieved (majority being at least twothirds) and met in a consistently thorough manner.
	68 - 72.9	C+	Satisfactory Performance: At least
	64 - 67.9	С	most of course objectives have been
	60 - 63.9	C-	achieved and met satisfactorily.
	55 – 59.9	D+	
	50 – 54.9	D	Minimally Acceptable Performance: The course objectives met at a minimally acceptable level.
	0 – 49.9	F	<b>Unacceptable performance:</b> The course objectives not met at a minimally acceptable level.
PASS/NOT PASS:		·	
OTHER:			

II. SEMESTER INFORMATION					
Semester/Year	Spring 2025	Section(s)	01		
Day and Time	Monday and Wednesday 8:00 – 9:50	Venue(s)	SCI/0018S		
COURSE COORDINATOR	Dr. Hanaa AlZadjali	COURSE TEAM			
COORDINATOR OFFICE	0013	OFFICE HOURS	SUN: 11:30AM – 12:30PM WED: 10:00-11:00AM		
<b>COORDINATOR EXTENSION</b>	1418	COORDINATOR EMAIL	hanaa@squ.edu.om		

III. ALIGNMENT OF COURSE LEARNING OUTCOMES (CLO), PROGRAM LEARNING OUTCOMES (PLO), GRADUATE ATTRIBUTES (GA), AND OMAN QUALIFICATION FRAMEWORK (OQF) CHARACTERISTICS				
CLO	PLO / SO	SQU Graduate Attributes	OQF Characteristics	
<ol> <li>Demonstrate an understanding of the fundamental concepts and principles of database management systems and their real-world applications.</li> </ol>	1	A	1	
<ol> <li>Describe ethical issues in database design and evaluate their impacts on individuals, organizations, and society.</li> </ol>	4	E	5	
<b>3.</b> Design database applications using the conceptual modeling techniques such as ER and EER models.	1, 2, 6	А, В	1, 3	
<ol> <li>Construct relations and constraints of the relational model for a given database application by mapping ER and EER diagrams.</li> </ol>	2, 6	А, В	1	
<ol> <li>Use SQL statements to generate, manipulate, and retrieve data from a database system.</li> </ol>	2, 4, 5	А, В	1, 6	
<ol> <li>Formulate database queries using the relational algebra operations and expressions.</li> </ol>	1, 2	А, В	1	
<b>7.</b> Apply normalization concepts and normal forms on the relations of a given database application.	2, 6	А, В	1	
<b>8.</b> Evaluate the basic concepts of indexing and query processing techniques.	2	A	1	
<b>9.</b> Collaborate efficiently in teams to design and implement a complete database application.	3, 4, 5, 6	A, B, C, D	3, 4, 5, 6	

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)

B)

system

**CLO1:** Demonstrate an understanding of the fundamental concepts and principles of database management systems and their real-world applications.

Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods			
A)	Discuss the main concepts and architectures for Database Management Systems	Midterm, Final			
B) Apply database concepts for a given real-world system		Project			
CLO2: De	CLO2: Describe ethical issues in database design and evaluate their impacts on individuals, organizations,				
and socie	ety.				
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods			
A)	List ethical issues for a given database system	Midterm, Final			
	Describe ethical issues and the impact for a given database				

**CLO3:** Design database applications using the conceptual modeling techniques such as ER and EER models.

Project

Assessme	Assessment Criteria (to achieve this objective, the student must)		Assessment Methods		
A)	Expressing requirements for a given database application in English.	Tutorial	Il session, m, Final	Project,	
В)	Draw ER and EER diagrams for specific database requirements.	Midtorm			
C)	Use appropriate modeling tools to design a given database system	- Midterm			

**CLO4:** Construct relations and constraints of the relational model for a given database application by mapping ER and EER diagrams.

Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods
A)	Use steps to map ER/EER diagrams to relational model	Tutorial Project Midtorm
B)	Apply the mapping algorithm to express all constraints in a given ER/EER diagram to relations	Final

**CLO5:** Use SQL statements to generate, manipulate, and retrieve data from a database system.

Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods
A)	Express SQL statements in English for a specific database application	
B)	Specify SQL query that corresponds to a given database requirement.	Tutorial, Project, Lab Test,
C)	Implement Complete database system using a specific database management system.	i inai
CLO6: Fo	rmulate database queries using the relational algebra operations	and expressions.

Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods	
A)	Demonstrate an understanding of the main relation algebra operations and expressions	Tutorial, Project, final	
B)	Express database queries using relational algebra expressions.		
<b>CLO7:</b> Ap	ply normalization concepts and normal forms on the relations of	a given database application.	
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods	
A)	Discuss the update anomalies and normal forms		
В)	Identify the possible update anomalies for a given database relation.	Tutorial Drojact final	
C)	Validate if a given relation is in a specific normal form	Tutorial, Project, Illia	
D)	Implement normalization to achieve specific normal forms in a given relation.		
CLO8: Eva	aluate the basic concepts of indexing and query processing techn	iques.	
Assessme	NT <b>C</b> RITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods	
A)	Use indexing techniques to improve a database performance	Tutovial Dusiant final	
В)	Use heuristics to formulate the best query tree for a given SQL query	Tutorial, Project, final	
C)	Estimate the cost to a given query tree		
<b>CLO9:</b> Co	llaborate efficiently in teams to design and implement a complet	e database application.	
Assessme	NT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)	Assessment Methods	
A)	Effectively communicate both orally and in writing the specifications and query details for a specific database application.	Project	
В)	Collaborate proficiently within a team to successfully implement a comprehensive database application.		

V. COURSE CONTENT AND SCHEDULE				
WEE K	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	Remarks (e.g., Assessments)
1	1	Introduction to Databases:	Chapter 1	Final

Database Overview and History,	
Motivation for Database Systems, Database	
Users, Ethical Issues, and Impacts of Database	
Systems.	

2	1	Database Management System Concepts and Architecture.	Chapter 2	Midterm
3	1	<b>Conceptual Modeling - ER Model:</b> The Entity-Relationship (ER) and constructing ER diagrams.	Chapter 7	Project, Midterm and Final
4	2	<b>Conceptual Modeling - EER Model:</b> Enhanced Entity-Relationship (EER) Models, and constructing EER diagrams.	Chapter 7	Project, Midterm and Final
5	3	<b>Conceptual Modeling - EER Model:</b> Enhanced Entity-Relationship (EER) Models, and constructing EER diagrams.	Chapter 7	Project, Midterm and Final
6	1	Relational Model: Relational Model Concepts and Constraints	Chapter 3	Project, Midterm and Final
7	1	Relational Database Design: Mapping ER/EER Model into Relational Model	Chapter 8	Project, final
8	1	Database Query Languages: Structured Query Language (SQL) Basics: Data Definition and Constraints, Basic Retrieval Queries, Manipulation Queries	Chapter 4	Project, Lab Test and/or Final
9	2	Database Query Languages- More SQL: Complex Queries and Nested Queries	Chapter 5	Project, Lab Test and/or Final
10	1	Relational Algebra: Relational Algebra operations, expressions and constraints; Query Tree; Query Graph	Chapter 6	Project, final
11	1	Query Processing and Optimization: Translating SQL Queries into RA expressions, Implementing RA operations, Heuristics for Query Optimization	Chapter 10	Project, final
12	1	Relational Database Design Theory: Functional Dependencies	Chapters 14 and 15	Final
13	2	<b>Relational Database Design Theory:</b> Normalization, Formal Forms	Chapters 14 and 15	Final

14	1	Fundamentals of Transaction Management:		
		Introduction, Transaction Controls, Desirable		
		Properties, and Transaction Scheduling Physical	Chapter 17	Drojact final
		Storage and Indexes:	Chapter 20	Project, final
		Overview of Physical Storage, and Blocking		
		Factor, Single-Level Indexes, Multi-level Indexes		
15		Project Presentations		Project

# VI. ADDITIONAL INFORMATION (e.g., RUBRICS, etc.)

# ASSESSMENT PLAN:

# PROJECT (20%), MIDTERM (20%), LAB TEST (20%) AND FINAL (40%).

Assessment Component	DUE DATE	WEIGHT
PROJECT - PART 1 PROJECT PROPOSAL	WEEK 4 (1/03/2025)	3%
PROJECT - PART 2 Conceptual Model	WEEK 7 (21/03/2025)	5%
<b>PROJECT - PART 3</b> EER Mapping and DB CONSTRUCTION	WEEK 11 (17/04/2025)	5%
<b>PROJECT - PART 4 DB</b> Manipulation and Query processing	WEEK 14 (5/05/2025)	4%
<b>Project – Part 5</b> Presentation	Week 15	3%
MIDTERM	WEEK 8 – Mon 24/03/2025	20%
LAB TEST	WEEK 13 – MON 28/004/2025	20%
FINAL	MON 26/05/2025	40%

Copy policy and late submission policy are strictly applied:

#### **Department's Late Submission Policy:**

(a) 1-24 hours: 25% of the mark will be deducted.

(b) > 24 hours: Not accepted.

#### **Department's Policy for Dealing with Cheating:**

It is essential that each student solves all programming assignments, lab tests and exams individually unless instructed otherwise, e.g., for group projects. Copying, plagiarism, collusion, switching, and falsification are violations of the university academic regulations. Students involved in such acts will be severely penalized. The department has adopted a firm policy on this issue. A zero mark will be assigned the first time a student is caught involved in copying and his/her name will be added to a watch list maintained by the Head of Department. Further repeated involvements in copying will cause the student to get an F grade in that course. This is in line with the university academic regulations.

### VII. STUDENTS RESPONSIBILITIES

It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirements and student academic code of conduct.

Academic Integrity	The University expects the students to approach their academic endeavors with the highest academic integrity. Please refer to the <b>Undergraduate Academic Regulations</b> .
ADD AND DROP	Students who wish to drop or add the course should review the Undergraduate Academic Regulations.
ATTENDANCE	Sultan Qaboos University has a clear requirement for students to attend courses, detailed in the <b>Undergraduate Academic Regulations</b> .
Assessment and Grading	To ensure the provision of a sound and fair assessment and grading, please review the <b>Undergraduate Academic Regulations</b> .
GRADE APPEAL	Students who wish to appeal their grades should review the Undergraduate Academic Regulations.
CLASSROOM POLICIES	Students are expected to dress professionally during class time as required by the University. Use of phones or any other electronic devices in the classroom during class time is strictly prohibited. Unauthorized use may lead to faculty member confiscation of the device for the remainder of the class. Behavior that persistently or grossly interferes with classroom activities is considered disruptive behavior and may be subject to disciplinary action. A student responsible for disruptive behavior may be required to leave the class.
Late and Make-Up Work	Students are required to meet the course objectives by submitting coursework no later than the assigned due date. Students may be allowed to submit late work if approved by the course coordinator. Assignments submitted after the due date may be penalized.
MISSED EVALUATIONS	All quizzes, tests, clinical evaluations, and exams must be completed by the date they are assigned. If a quiz, test, or exam is missed due to a documented emergency situation (e.g., medical emergency, death in the immediate family), it is the student's responsibility to contact the instructor.
OTHER	

# **Course Outline Appendix**

1.	SQU Graduate Attributes and	<b>Competencies for</b>	Undergraduate Studies
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GRADUATE ATTRIBUTES	<b>GRADUATE</b> COMPETENCIES FOR
	Undergraduate Studies
<b>A. Cognitive Capabilities:</b> The graduate has sufficient general and specialized theoretical knowledge that enables him/her to deal well	1. Demonstrates familiarity and works with advanced specialized knowledge in the area of specialization.
with his/her specialty and other related fields.	2. Demonstrates a general understanding of the relationship of advanced specialized knowledge with knowledge in other relevant professional fields and aspects.
	3. Demonstrates a comprehensive understanding of the theories, principles, and methods used in his/her specialty, and how to create and apply new knowledge.
	4. Demonstrates general knowledge of the legal environment and necessary relevant regulatory frameworks.
	5. Shows awareness of contemporary literature and research.
<b>B. Skill and Professional Capability:</b> The graduate has sufficient skill and practical experience that enables him/her to perform all	1. Applies concepts, theories, and investigative methods to synthesize and interpret information to evaluate conclusions.
tasks related to the specialization and other related fields.	2. Applies appropriate research methods and techniques and employs digital knowledge
	3. Evaluates and critiques information independently
	4. Uses cognitive and technical skills to analyze complex issues and develop appropriate solutions.
	5. Initiates new ideas or processes in the professional, educational or research context.
<b>C. Effective Communication:</b> The graduate has the ability to communicate effectively with	1. Explains, presents, and adapts information to suit the recipients.
others to achieve the desired results	2. Employs appropriate information and communication technology to collect and analyze information.

D. Autonomy and Leadership: The graduate	1. Performs advanced professional activities
has the ability to lead, make decisions and take	independently.
responsibility for decisions.	2. Demonstrates leadership skills.
	3. Takes professional responsibility.
	4. Assumes full accountability for the tasks and their output.
E. Responsibility and Commitment: The	1. Manages time and other resources assigned to
graduate appreciates the importance of	accomplishing tasks effectively and responsibly.
available resources and deals with them	2. Demonstrates effective practices when working in
effectively and is committed to the ethics of	teams.
the profession and society.	3. Demonstrates advanced levels of understanding
	of values and ethics relevant to the specialization,
	profession and local and international society and
	promotes them among others.
	4. Works within the professional, institutional, and
	specialization guiding frameworks and strategic
	plans.
	5. Interacts with community affairs positively and
	preserves national identity.
F. Development and Innovation: The	1. Demonstrates the ability to independently manage
graduate has a passion for development and	learning tasks, with an awareness of how to
innovation in the field of specialization.	develop and apply new knowledge.
	2. Utilizes specialized knowledge and skills for
	entrepreneurship.
	3. Utilizes creative and innovative skills in the field
	of specialization.

## 2. **OQF** Characteristics

- 1. Knowledge
- 2. Skills
- 3. Communication, Numeracy, and Information and Communication Technology Skills.
- 4. Autonomy and Responsibility
- 5. Employability and Values
- 6. Learning to learn