SULTAN QABOOS UNIVERSITY

COLLEGE OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE OUTLINE

I. COURSE INFORMATION			
COURSE CODE	COMP4202		
COURSE TITLE	Database Development		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**8**		
CREDIT HOURS	3		
CONTACT HOURS	4		
PRE-REQUISITES	COMP3205 or COMP4201		
CO-REQUISITES	-		
EQUIVALENT COURSES	-		
INCOMPATIBLE COURSES	-		
COURSE CATEGORY	☐ University Requirement	☐ University Elective	
	☐College Requirement	☐ College Elective	
	☐ Department Requirement	☐ Department Elective	
	☐ Major Requirement	☐ Major Elective	
	☐ Specialization Requirement	☒ Specialization Elective	
	☐ Other (specify):		
COURSE OWNER	College: Science	Department: Computer Science	
	Center:	Unit:	
DELIVERY MODE	☒ Face to Face	☐ Blended	☐ Online
COURSE TYPE	☐Lecture	☒ Lecture/Lab	
	☐ Lecture/Seminar	☐ Lecture/Studio	
	☐ Lecture/Tutorial	☐ Lecture/Lab/Tutorial or Seminar	

	☐Tutorial	☐ Laboratory (Practical)	
	☐ Field or Work Placement	☐ Studio	
	☐Seminar	☐ Internship	
	☐ Workshop	☐ Project	
	☐ Thesis	☐ Other (specify):	
LANGUAGE OF INSTRUCTION	English		
COURSE DESCRIPTION	The main objective of this course is to introduce the environment of database developing tools/packages such as Oracle, and use it towards implementing real life database applications. Emphasis is centered on providing students with skills needed to design, develop and maintain database applications using Structured Query Language (SQL), programming languages that hosts SQL such as PL/SQL, and tools such as SQL Plus or SQL Developer, Forms and Reports		
TEACHING AND LEARNING STRATEGIES	☐ Augmented Reality	☐ Flipped Classroom	
	☐ Blended Learning	☒ Problem-Based Learning	
	☐ Discovery-Based Learning	☒ Project-Based Learning	
	☐ Student-Led Learning	☒ Team-Based Learning	
	☐ Work-Based Learning	☐ Other (specify):	
ASSESSMENT COMPONENT AND WEIGHT	☒In-term examination(s) (20 %)	☐ Quizzes (%)	☒Other (Lab Exercise: (5%))
	☐ Homework assignments (%)	☒Project (15%)	
	☒ Final examination (40 %)	☒ Practical/ Lab (20%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	• R1 - Oracle SQL and PL/SQL by Joel Murach, Murach, 3rd Edition, 2024. • R2 - Master the advanced concepts of PL/SQL for professional-level certification and learn the new capabilities of Oracle Database 12c • R3 - Oracle Database 11g SQL, Jason Price, McGraw-Hill, 2008 • Website: https://www.oracle.com		
GRADING METHOD	☒ A-F Scale	☐ Pass/Not Pass	☐ Other (specify):

GRADING METHOD DESCRIPTION

	Range	Letter Grade	Description
A-F GRADING SCALE:	90 – 100	A	**Exceptional performance:** All course objectives achieved and met in a consistently outstanding manner.
	86 – 89.9	A-	
	81– 85.9	B+	**Very Good Performance:** The majority of the course objectives achieved (majority being at least two-thirds) and met in a consistently thorough manner.
	77 – 80.9	B	
	73 – 76.9	B-	

	68 – 72.9	C+	**Satisfactory Performance:** At least most of course objectives have been achieved and met satisfactorily.
	64 – 67.9	C	
	60 – 63.9	C-	
	55 – 59.9	D+	**Minimally Acceptable Performance:** The course objectives met at a minimally acceptable level.
	50 – 54.9	D	
	0 – 49.9	F	**Unacceptable performance:** The course objectives not met at a minimally acceptable level.
PASS/NOT PASS:			
OTHER:			

II. SEMESTER INFORMATION			
SEMESTER/YEAR	Spring/2025	**SECTION(S)**	10
DAY AND TIME	TBA	**VENUE(S)**	SCI/0018
COURSE COORDINATOR	Dr. Abdullah Al-Hamdani	**COURSE TEAM**	-
COORDINATOR OFFICE	0014	**OFFICE HOURS**	TBA
COORDINATOR EXTENSION	24142221	**COORDINATOR EMAIL**	abd@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
1. Demonstrate an understanding of the main DBMS architectures and development tools, focusing on SQL and PL/SQL.	1	A	1
2. Use SQL to create, modify, and manage relational databases, with an emphasis on retrieving data, writing summary queries, subqueries, and modifying data.	1, 2, 6	A, B	1, 2, 5
3. Design and implement a complete database system, utilizing SQL and PL/SQL skills, including database design, creation, and views management.	1, 2, 6	A, B	1, 2, 5
4. Manipulate databases using PL/SQL constructs such as blocks, exceptions, functions, and triggers to enhance database functionality.	1, 2, 6	A, B	1, 2, 5
5. Apply advanced PL/SQL features like collections and object-oriented techniques to improve database performance and scalability.	1, 2, 6	A, B	1, 2, 5

6. Implement SQL security measures, manage user privileges, and control transactions to ensure data protection and compliance.	1, 2, 6	A,B	1, 2, 5
7. Perform essential database administration tasks, including backup, recovery, and high availability management, as well as cloud hosting.	1, 2, 6	A, B	1, 2, 5
8. Use Oracle GUI tools such as SQL Developer and Oracle Forms for database development and management tasks.	2, 6	A, B	2, 5
9. Collaborate in teams to design, develop, and deploy comprehensive database applications, integrating skills learned across SQL and PL/SQL.	2, 5, 6	C, D, E	3, 4, 5

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: DEMONSTRATE AN UNDERSTANDING OF THE MAIN DBMS ARCHITECTURES AND DEVELOPMENT TOOLS, FOCUSING ON SQL AND PL/SQL.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Explain and Compare DBMS Architectures	Midterm, Final
B)	Identify and Use SQL and PL/SQL Development Tools	
C)	Analyze the Role of SQL and PL/SQL in Database Systems	
CLO2: Use SQL to create, modify, and manage relational databases, with an emphasis on retrieving data, writing summary queries, subqueries, and modifying data.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Evaluate the correctness and efficiency of SQL queries in retrieving and summarizing data from relational databases.	Lab Exercises, Project, Lab Test, Final
B)	Assess the ability to design and execute subqueries to extract and manipulate data accurately.	
C)	Verify the proper use of SQL commands to create, modify, and maintain database structures while ensuring data integrity.	
CLO3: Design and implement a complete database system, utilizing SQL and PL/SQL skills, including database design, creation, and views management.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Evaluate the correctness and efficiency of the designed relational schema, ensuring proper relationships, constraints, and indexing.	Lab Exercises, Project, Lab Test
B)	Assess the accuracy and effectiveness of SQL and PL/SQL scripts in creating, modifying, and managing tables, views, and relationships.	
C)	Measure the completeness, optimization, and functionality of the implemented database system, including the use of views for data abstraction and security.	
CLO4: MANIPULATE DATABASES USING PL/SQL CONSTRUCTS SUCH AS BLOCKS, EXCEPTIONS, FUNCTIONS, AND TRIGGERS TO ENHANCE DATABASE FUNCTIONALITY.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Evaluate the ability to create and efficiently use anonymous and named PL/SQL blocks to solve real-world database manipulation problems.	Lab Exercises, Project, Lab Test
B)	Assess the application of proper exception handling mechanisms to manage errors and ensure smooth database operations in PL/SQL.	Project, Lab Test
C)	Evaluate the proficiency in writing and applying triggers and functions to automate and enhance database functionality.	Midterm, Lab test and Final

CLO5: Apply advanced PL/SQL features like collections and object-oriented techniques to improve database performance and scalability.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Evaluate the implementation of PL/SQL collections.	Project, Lab Test, Final
B)	Assess the design and implementation of object-oriented techniques in PL/SQL for modularity, reusability, and maintainability of database code.	
CLO6: IMPLEMENT SQL SECURITY MEASURES, MANAGE USER PRIVILEGES, AND CONTROL TRANSACTIONS TO ENSURE DATA PROTECTION AND COMPLIANCE.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Evaluate the effectiveness of SQL security measures by assessing the implementation of roles, privileges, and access controls.	Lab Exercises, Project, Lab Test, Final
B)	Assess the ability to manage user privileges and ensure proper access management through SQL commands like GRANT and REVOKE.	
C)	Test the implementation of transaction control mechanisms.	
CLO7: Perform essential database administration tasks, including backup, recovery, and high availability management, as well as cloud hosting.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate the ability to perform full, incremental, and point-in-time database backups and recovery procedures effectively.	Project, Lab Test, Final
B)	Implement strategies for database replication, failover, and disaster recovery to ensure continuous database availability.	
CLO8: Use Oracle GUI tools such as SQL Developer and Oracle Forms for database development and management tasks.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Proficiency in using Oracle SQL Developer to create, modify, and manage database objects such as tables, views, and indexes.	Lab Exercises, Project, Lab Test
B)	Ability to design and implement interactive forms using Oracle Forms to facilitate data entry and retrieval.	
C)	Effective use of Oracle GUI tools for troubleshooting, query optimization, and performance tuning tasks in database management.	
CLO9: Collaborate in teams to design, develop, and deploy comprehensive database applications, integrating skills learned across SQL and PL/SQL.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Prepare a technical report detailing the project development process.	Project
B)	Deliver a clear and professional oral presentation of the project.	
C)	Respond to questions and critiques in a group setting.	

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1	1	Review of Relational Databases, SQL Query Language, and the architecture of used DBMS Tools	**1**	Midterm

2	2	SQL Basic Statements: SQL Developer Environment, Data Description Statements, Data Manipulation Statements, Transaction Statements,	2-10	Project, Midterm, Lab Test
3	3	Simple Built-in Functions, Sequences, Indexes and Views	11	Project, Midterm, Lab Test, Final
4	4	PL/SQL Basics: Development Environment, Basic PL/SQL Blocks, Declaring Variables	14	Project, Midterm, Lab Test, Final
5	4	PL/SQL Basics: Records, and Cursors, Control Structures and Exceptions	14	Project, Midterm, Lab Test, Final
6	5	PL/SQL: Functions & Procedures	16	Project, Midterm, and Lab Test
7	6	PL/SQL: Triggers	17	Project, Midterm, Lab Test, Final
8	7	PL/SQL: Advanced PL/SQL – Collections and Object-Oriented Features	Handout	Project, Midterm, Lab Test, Final
9	8	SQL Security and Transaction Management	12	Project, Lab Test, Final
10	9	Database Administration – Backup, Recovery, and High Availability	Handout	Project, Lab Test, Final
11	10	Introduction to Big Data and NoSQL: Big Data concepts and technologies, NoSQL database types, Advantages and limitations of NoSQL databases compared to SQL, Common NoSQL systems, Basic operations in NoSQL databases	Handout	Project, Lab Test, Final
12	11	Advanced NoSQL and Big Data: Aggregation frameworks, Map-reduce, Hadoop, Spark, NoSQL with SQL, Hybrid systems, Big Data, NoSQL applications	Handout	Project, Lab Test, Final
13	12	Database Development: Working with SQL Developer for database management, Designing and implementing forms using Oracle Forms	Handout	Project, final
14	12	Database Development: Designing and implementing forms using Oracle Forms	Handout	Project
15	13	Project Presentation, Case-study report submission & presentation	-	Project

VI. Additional Information (e.g., Rubrics, etc.)

Assessment Plan:

Lab Exercises (5%), Project (15%), Lab Test (20%), Midterm (20%) and Final (40%).

Assessment Component	Posted Date	Due Date	Weight
Lab Exercises	**Week 2**	**Week 14**	**5%**

PROJECT - PART 1 *PROJECT PROPOSAL AND GOOGLE SITE WEBSITE*	**WEEK 2**	**WEEK 4**	**1.5%**
PROJECT - PART 2 *HTML & CSS*	**WEEK 6**	**WEEK 8**	**2.5%**
MIDTERM	**WEEK 8 - TUESDAY**		**20%**
PROJECT - PART 3 *JAVASCRIPT*	**WEEK 9**	**WEEK 12**	**4%**
PROJECT - PART 4 *PHP/MYSQL*	**WEEK 12**	**WEEK 14**	**4%**
LAB TEST	**WEEK 14 – TUESDAY**		**20%**
PROJECT – PART 5 *PRESENTATION*	**WEEK 15**		**3%**
FINAL	**AS PER A&R TIMETABLE**		**40%**

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 **Undergraduate Academic Regulations**.
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 **Undergraduate Academic Regulations**.
ASSESSMENT AND GRADING	To ensure the provision of a sound and fair assessment and grading, please review the **Undergraduate Academic Regulations**.
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. PROGRAM LEARNING OUTCOMES / STUDENT OUTCOMES

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.

4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

2. SQU Graduate Attributes and Competencies for Undergraduate Studies

GRADUATE ATTRIBUTES	GRADUATE COMPETENCIES FOR UNDERGRADUATE STUDIES
A. Cognitive Capabilities: The graduate has sufficient general and specialized theoretical knowledge that enables him/her to deal well with his/her specialty and other related fields.	1. Demonstrates familiarity and works with advanced specialized knowledge in the area of specialization.
	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. Skill and Professional Capability: The graduate has sufficient skill and practical experience that enables him/her to perform all tasks related to the specialization and other related fields.	1. Applies concepts, theories, and investigative methods to synthesize and interpret information to evaluate conclusions.
	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.

GRADUATE ATTRIBUTES	GRADUATE COMPETENCIES FOR UNDERGRADUATE STUDIES
C. Effective Communication: The graduate has the ability to communicate effectively with others to achieve the desired results	1. Explains, presents, and adapts information to suit the recipients.
	2. Employs appropriate information and communication technology to collect and analyze information.
D. Autonomy and Leadership: The graduate has the ability to lead, make decisions and take responsibility for decisions.	1. Performs advanced professional activities independently.
	2. Demonstrates leadership skills.
	3. Takes professional responsibility.
	4. Assumes full accountability for the tasks and their output.
E. Responsibility and Commitment: The graduate appreciates the importance of available resources and deals with them effectively and is committed to the ethics of the profession and society.	1. Manages time and other resources assigned to accomplishing tasks effectively and responsibly.
	2. Demonstrates effective practices when working in teams.
	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 graduate has a passion for development and- innovation in the field of specialization.	1. Demonstrates the ability to independently manage learning tasks, with an awareness of how to develop and apply new knowledge.
	2. Utilizes specialized knowledge and skills for entrepreneurship.
	3. Utilizes creative and innovative skills in the field of specialization.

3. 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