	**SULTAN QABOOS UNIVERSITY** **COLLEGE OF SCIENCE** **DEPARTMENT OF COMPUTER SCIENCE** **BACHELOR OF SCIENCE IN COMPUTER SCIENCE** **COURSE OUTLINE**

I. COURSE INFORMATION			
COURSE CODE	COMP4402		
COURSE TITLE	**SOFTWARE TESTING**		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**7**		
CREDIT HOURS	3		
CONTACT HOURS	4		
PRE-REQUISITES	COMP3401		
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	This course will address topics in software testing. It addresses issues related to whether the system is correct (with respect to some specification), and the question whether the right system was built, also a depth study of strategies and techniques used in software testing. Topics included are introduction to software		

	testing, role of testing in SDLC, software testing standards and metrics, testing levels, testing types, test management, testing tools and testing object oriented software.		
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) (15%)	☐ Quizzes (%)	☐Other (specify): (%)
	☐ Homework assignments (%)	☐Project (25%)	
	☐ Final examination (40%)	☐ Practical/ Lab (20%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	- Software Testing Foundations by Andreas Spillner, Tilo Linz and Hans Schaefer, Rocky Nook Computing, 3rd edition (2011) - Instructor Handouts		
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	Fall 24	**SECTION(S)**	1
DAY AND TIME	MON/WED 10:00-11:50	**VENUE(S)**	Lab 22
COURSE COORDINATOR	Youcef Baghdadi	**COURSE TEAM**	

COORDINATOR OFFICE	0023	**OFFICE HOURS**	WED 12:00-13:00
COORDINATOR EXTENSION	1492	**COORDINATOR EMAIL**	ybaghdadi@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. Understand the testing concepts, goals, and principle.	SO6	A	**1**
2. Recognize the necessity of software testing.	SO2	A	**1**
3. Apply software testing processes and tools to build quality software systems	SO2	B	**2**
4. Verify and validate all aspects of a software system, including its requirements, its design, and its implementation.	SO2	B	**2**
5. Use tools to assist the software testing activities.	SO2	B	**2**
6. Communicate orally and in writing a software system testing plan.	SO3	C, D, E	**3, 4**

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: Understand the testing concepts, goals, and principle.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Be able to understand the concepts of the testing	Midterm, Final
B)	Be able to understand the goals of the testing	Midterm, Final
C)	Be able to understand the principles of the testing	Midterm, Final
CLO2: Recognize the necessity of software testing.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Be able to recognize the necessity of software testing	Project
CLO3: Apply software testing processes and tools to build quality software systems		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Apply the software testing processes	Midterm, Final, Project
B)	Use software testing tools	Project
CLO4: Verify and validate all aspects of a software system, including its requirements, its design, and its implementation		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Be able to apply correctly the process	Midterm, Final, Project
B)	Be able to validate a software system	Midterm, Final, Project
CLO5: Use tools to assist the software testing activities.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Apply verification techniques	Final, Project

B)	Apply validation techniques	Final, Project
CLO6: Communicate orally and in writing a software system testing plan.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Write a software testing report	Project
B)	Present a software testing report	Project

V. COURSE CONTENT AND SCHEDULE				
WEEK	**LECTURES #**	**TOPICS/ SUBJECTS**	**READINGS/ CHAPTERS**	**REMARKS (e.g., ASSESSMENTS)**
1	L1	- ***Overview of Software Testing*** Definitions; Goals; Principles &Ethics; Types; Methods; Approaches; Levels; Artifacts; Process (STLC); Tools; and Management	Chapters 1 & 2	Midterm & Final Exams
2	L2	- ***Review of the Software Process Models Focusing on Testing*** Planned (V-Model) and Agile (xP); Requirement Engineering Process: Functional Requirements + Quality + Constraints	Handout	Midterm & Final Exams
3	L3	- ***Definitions; Goals; Principles & Ethics; Types*** General Definitions; ANSI/IEEE Definitions; Failure/Fault/Defect/Bugs; Verification vs Validation; 7 Principles, Software Engineer Code of Ethics (ACM/IEEE)- Manual vs Automatic Testing	Chapter 2	Midterm & Final Exams
4	L4	- ***STLC (Testing in the Software Lifecycle) & Management*** - ***Testing Tools*** Benefits-Features-Purpose (Agile Testing/Automation Testing/Mobile Testing/Load Testing/Test Management) - Categorization (Static/Dynamic; Open-source/Out-sourcing/In-sourcing); Popular Tools-How to Choose	Chapter 2	Midterm & Final Exams and Project
5	L5	- ***Testing Artifacts & Tools*** Strategy; Plan; Scenario; Case; Data; Script; Incident Reports; Metrics; Summary; Requirements Tractability Matrix	Hangout Chapter 7	Midterm & Final Exams

6	L6	- ***Levels of Testing*** Unit (Component); Integration; System; Acceptance; Regression	Handout	Midterm & Final Exams & Project
7	L7	- ***Static Testing*** Review; Inspection; Walkthrough; Compiler as Static; Data Flow; Control Flow **Midterm**	Chapter 4	Midterm & Final Exams
8	L8	- ***Dynamic Testing: White Box; Black Box; Grey Box; Tools*** White Box Coverage Techniques: Statement; Decision; Branch; Path White Box Testing Tools	Chapter 5	Project & Final Exam
9	L9			Project & Final Exam
10	L10			Project & Final Exam
11	L11			Project & Final Exam
12	L12	Black Box Techniques: Equivalence Class: Boundary Value Analysis; State Transition; Decision Table; Graph; Error Guessing; Comparison Black Box Testing Tools		Project & Final Exam
13	L13			Project & Final Exam
14	L14	- ***Test Management*** ***Lab test***	Chapter 6	Project & Final Exam
15		Project Presentation		Project

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

Assessment Plan:

Item	Date out	Due date	Weight
Project P1	Week 2	Week 5	5%
Project P2	Week 5	Week 7	2%
Midterm	Week 7		15%
Project P3	Week 7	Week 10	5%
Project P4	Week 11	Week 14	8%
Lab Test	Week 14		20%
Project Presentation	Week 15		5%
Final Exam TBA	30/12/2024 from 8 AM		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

A. Program Learning Outcomes / Student Outcomes

SO1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SO2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

SO3. Communicate effectively in a variety of professional contexts.

SO4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

SO5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

SO6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

B. SQU Graduate Attributes

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.
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.

C. 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