SULTAN QABOOS UNIVERSITY

COLLEGE OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

BACHELOR OF SCIENCE IN ARTIFICIAL INTELLIGENCE

COURSE OUTLINE

I. COURSE INFORMATION

COURSE CODE	COMP4509		
COURSE TITLE	Introduction to Computer Security		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**7**		
CREDIT HOURS	3		
CONTACT HOURS	4		
PRE-REQUISITES	COMP3503 or (COMP3502 and COMP4501)		
CO-REQUISITES			
EQUIVALENT COURSES			
INCOMPATIBLE COURSES			
COURSE CATEGORY	☐ University Requirement	☐ University Elective	
	☐ College Requirement	☐ College Elective	
	☐ Department Requirement	☐ Department Elective	
	☒ Major Requirement	☐ Major 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 provides an introduction to security and privacy issues in various aspects of computing, including programs, operating systems, networks, databases, and Internet applications. It examines causes of security and privacy breaches, and gives methods to help prevent them.		
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 (10%)	☐ Other (specify): (%)
	☒ Homework assignments (15 %)	☒ Project (10%)	
	☒ Final examination (40 %)	☒ Practical/ Lab (5%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	Charles P. Pfleeger, Shari Lawrence Pfleeger, and Jonathan Margulies, Security in Computing, 5th edition, Prentice-Hall, 2015, ISBN 0-13-408504-3. William Stallings, Lawrie Brown, Computer Security: Principles and Practice, Global Edition, 4th edition, Pearson, 2018, ISBN:978-0-13-377392-7.		
GRADING METHOD	☒ **A-F Scale**	☐ Pass/Not Pass	☐ Other (specify):

GRADING METHOD DESCRIPTION

A-F GRADING SCALE:

Range	Letter Grade	Description
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.

OTHER:	

II. SEMESTER INFORMATION			
SEMESTER/YEAR	Spring 2025	**SECTION(S)**	2 & 3
DAY AND TIME	Sec 2, Mon/Wed 16:15–18:05, Sec 3 , Sun/Tues 14:15– 16:05	**VENUE(S)**	Sec2: D12/Lab27 Sec 3: Lab22
COURSE COORDINATOR	Dr. Haleh Amintoosi	**COURSE TEAM**	-
COORDINATOR OFFICE	2230	**OFFICE HOURS**	Sun/Tues - 10-14
COORDINATOR EXTENSION	2227	**COORDINATOR EMAIL**	h.amintoosi@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	SQU GA	OQF CHARACTERISTICS
1. Comprehend fundamental security concepts including models, attacks, and mechanisms	SO1, SO2	A, B	1, 2
2. Understand authentication concept, techniques and their use to protect systems	SO1, SO2	A, B	1, 2
3. Understand access control concepts, different mechanisms and their application	SO1, SO2	A, B	1, 2
4. Understand the cryptography concept, types and techniques to secure the system and data	SO1, SO2	A, B	1, 2
5. Explain software security and its challenges and issues	SO1, SO2	A, B	1, 2

6. Evaluate the impact of the different network security threats and intrusion detection systems	SO2, SO6	A, B, F	2, 6
7. Describe security requirements for databases	SO1, SO2	A, B	1, 2
8. Understand and apply the risk management techniques	SO1, SQ2, SO6	A, B, E, F	1, 2, 6
9. Grasp the security issues related to the new emerging technology	SO1, SO2	A, B	1, 2
10. Communicate effectively orally and in writing about topics related to cyber security	SO3, SO5, SO6	C, D, E, F	3,4,5, 6

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: Comprehend fundamental security concepts including models, attacks, and mechanisms		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Explain the concepts of security model, security attacks, security mechanisms	Midterm, Final Exam
B)	Explain the fundamental principles of secure computer design	
CLO2: Understand the authentication concept, attacks, and countermeasures		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the difference between identification and authentication	Lab test, Midterm, Final Exam

B)	Discuss the different authentication techniques including biometrics.	
C)	Describe authentication attacks and countermeasures	
CLO3: Understand the access control concept, models and attacks		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Describe the concept of access control and its importance	Lab test, Midterm, Final Exam
B)	Describe different techniques of access control,	
C)	Discuss Unix access control	
CLO4 Understand cryptographic concepts such as private/public keys, digital signatures, and certificates.		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Differentiate between public and private key	Assignment, quiz, Midterm, Final Exam
B)	Recognize buffer overflow	
C)	Distinguish between the buffer overflow and stack overflow attacks	

CLO5: Explain software design and security issues		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Understand software vulnerabilities	Assignment, Midterm, Final Exam
B)	Recognize buffer overflow	
C)	Distinguish between the buffer overflow and stack overflow attacks	

CLO6: Describe security requirements for databases		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Investigate security threats to conventional databases	Assignment, Midterm, Final Exam
B)	Understand security protection mechanisms for conventional databases	

CLO7: Describe the Intrusion and Intrusion Detection Systems		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the Intrusion and intrusion detection techniques.	Midterm, quiz, Final Exam
B)	Distinguish between Host-based IDS and Network-based IDS.	
C)	Describe honeypots.	

CLO8: Describe security management techniques		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Understand security policies	Midterm, Final Exam
B)	Distinguish different risk management techniques	

CLO9: Understand the security of voting systems		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the security requirements for voting systems	Midterm, Final Exam
B)	Describe security attacks on voting systems and various secure voting systems	

CLO10: Communicate effectively orally and in writing about topics related to cyber security		
ASSESSMENT CRITERIA		**ASSESSMENT METHODS**
A)	Present finding related to a research/development project	Project
B)	Write an extensive report related to the research/development project	

V. COURSE CONTENT AND SCHEDULE				
WEEK	**LECTURES #**	**TOPICS/ SUBJECTS**	**READINGS/ CHAPTERS**	**REMARKS (e.g., ASSESSMENTS)**
1	1 2	**Introduction:** What Is Computer Security? Attacks and Attacker	Ch1	midterm, final
2	1 2	Principles of Security Design	Ch1	midterm, final
3	1 2	**User Authentication:** Principles, password authentication, attacks and countermeasures, Biometric authentication	Ch3	Lab test, midterm, final
4	1 2	**Access Control**: Principles, entities, and models	Ch4	Lab test, midterm, final
5	1 2	**Encryption:** Symmetric encryption, DES, AES, RC4	Ch2, Ch20	HW1, midterm, final
6	1 2	**Encryption:** Asymmetric Encryption, RSA, Key distribution	Ch2, Ch21	HW1, quiz, midterm, final
7	1 2	**Encryption:** Digital Signature, Man in the middle attacks and Public key certificate	Ch2, Ch21	HW1, midterm, final

8	1 2	**Software Security:** Handling Program Input, Buffer overflow Attack, Stack overflow attack .	Ch10, Ch11	HW2, midterm, final
9	1 2	**Database Security:** Database Management System, Relational Database, SQL injection,	Ch5	HW3, midterm, final, project
10	1 2	**Database Security:** Database access control, Inference, Database Encryption	Ch5	HW3, midterm, lab test, final
11	1 2	**Intrusion Detection Systems:** intruders, Analysis Approaches, Host based Intrusion Detection, Hybrid Intrusion Detection	Ch8	Quiz, midterm, final
12	1 2	**Intrusion Detection Systems:** Network based intrusion detection, Anomaly vs signature based intrusion detection, honeypots, snort.	Ch8	final
13	1 2	**Risk Analysis and Management:** IT security management, risk analysis techniques, detailed risk analysis, security controls and safeguards	Ch14, Ch15	final
14	1 2	**Voting Systems:** security requirements of voting systems, security attacks on voting systems, secure voting protocols	Related research papers	final
15	1 2	Lecture: Review Project Presentations		final

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

ASSIGNMENTS (15 MARKS), QUIZ#1 (5 MARKS), QUIZ#2 (5 MARKS), PROJECT (15 MARKS), MID (20 MARKS), FINAL (40 MARKS)

ASSESSMENT COMPONENT	POSTED DATE	DUE DATE	WEIGHT
ASSIGNEMNT#1	WEEK5	WEEK7	5%
QUIZ#1	WEEK6		5 %
ASSIGNEMNT#2	WEEK8	WEEK9	5%
MID-EXAM	WEEK8		20%
ASSIGNEMNT#3	WEEK9	WEEK11	5%
PROJECT+LAB	WEEK9	WEEK13	15%
QUIZ#2	WEEK11		5%
FINAL EXAM	WEEK16: 27/05/2025, 8:00-10:00		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

Course Outline Appendix

1. PROGRAM LEARNING 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

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.
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