I. COURSE INFORMATION

COURSE CODE	COMP5400
COURSE TITLE	Software Architecture and Design
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**8**
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	The course presents an introduction to the fundamentals of Software Architecture and design concepts. Topics covered include: Relationship between software requirements and Architecture, Design patterns, Architecture Design Space, Techniques and tools for describing Software Architecture, Major software

	architectural styles (such as Layered, MVC, Distributed). Students participate in group projects on software architecture and design.		
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) (25 %)	☐ Quizzes (%)	☐ Other (specify): (%)
	☐ Homework assignments (%)	☒ Project (20 %)	
	☒ Final examination (40%)	☒ Practical/ Lab (15%)	
TEXTBOOKS AND EDUCATIONAL MATERIAL	**Textbook** • Kai Qian, Xiang Fu, Lixin Tao, Chong-wei Xu, and Jorge Diaz-Herrera. "**Software Architecture and Design Illuminated**", Jones and Bartlett Publishers, 2010, ISBN: 9780763754204 **References** • Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "**Design Patterns: Elements of Reusable Object-Oriented Software**", Addision Wesley, 1995, ISBN: 978-0201633610 • Eric J. Braude. "**Software Design: From Programming to Architecture**" . John Wiley & Sons, 2006, ISBN: 0 - 471- 42920 -1.		
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		**SECTION(S)**	
DAY AND TIME		**VENUE(S)**	
COURSE COORDINATOR		**COURSE TEAM**	
COORDINATOR OFFICE		**OFFICE HOURS**	
COORDINATOR EXTENSION		**COORDINATOR EMAIL**	

III. ALIGNMENT OF COURSE LEARNING OUTCOMES (CLO), PROGRAM LEARNING OUTCOMES (PLO), GRADUATE ATTRIBUTES (GA), AND OMAN QUALIFICATION FRAMEWORK (OQF) CHARACTERISTICS

CLO	PLO / SO	Error! Reference source not found.	Error! Reference source not found.
1. Recognize and apply key software architecture design principles.	**6**	**A**	**1,2**
2. Describe and document software architectures using formal description techniques.	**2, 6**	**A**	**1,2**
3. Understand and evaluate widely used software architecture styles and their trade-offs.	**2, 6**	**A**	**1,2**
4. Identify and apply appropriate architectural styles to solve specific problems.	**2, 6**	**A**	**1,2**
5. Explore and leverage valuable design patterns for effective software architecture.	**6**	**A**	**1,2**

IV. COURSE LEARNING OUTCOMES (CLOs) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)		
CLO1: Recognize and apply key software architecture design principles.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate understanding of fundamental design principles such as modularity, scalability, and maintainability.	Homework, Midterm and/or Final
B)	Apply these principles to analyze and critique given software designs.	Homework and/or Project and/or Final
CLO2: Describe and document software architectures using formal description techniques.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Ability to use architectural description languages (ADLs) or UML diagrams to model software systems.	Homework and/or Project, Lab test, Final
B)	Effectively create and interpret component and connector diagrams.	Homework and/or Project, Lab test, Final
CLO3: Understand and evaluate widely used software architecture styles and their trade-offs.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Identify major software architectural styles (e.g., layered, microservices, client-server).	Homework and/or Project, Midterm, Lab test, and/or Final
B)	Discuss the strengths, weaknesses, and trade-offs of different	

	styles.	

CLO4: Identify and apply appropriate architectural styles to solve specific problems.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Match given problem scenarios with suitable architectural styles.	Midterm, Project and or Final
B)	Justify the choice of an architecture based on the problem requirements.	

CLO5: Explore and leverage valuable design patterns for effective software architecture.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate knowledge of key design patterns (e.g., Singleton, Observer, MVC).	Homework and/or Project, Midterm, Lab test, and/or Final
B)	Integrate appropriate patterns into architectural designs to solve specific challenges.	

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	LAB TOPICS
1	1	Introduction to Software Architecture and Design (Quality attributes, Relationship between software requirements and Architecture)	1.1-1.5	-
2	1	Software Architecture Design Space (Types of Software Structures, Software Elements, Software Connectors)	2.1-2.4	Rational Software Architect
3	1	Models for Software Architecture (Architecture View Models, Architectural Description Languages)	3.1, 3.3-3.4	AcmeStudio
4 & 5	1	Design principles and Introduction to a set of adapted architectural patterns	4.5 & Lect. notes	Rational Software Architect
6	1	Classical Architecture (Layered, Data-centered)	Lect. notes	Visual Studio
7	1	Data Flow Architecture (Batch Sequential, Pipe & Filter Architecture, Process-Control Architecture)	5.1-5.4	WCF-WF
8 & 9 &10	1	Interaction Oriented Software Architecture (Model-View-Controller, Presentation-Abstraction-Control (PAC) Architecture)	9.1-9.3	MVC
11	1	Distributed Architecture (Client/Server, Multi-tier, Service-Oriented Architecture)	10.1-10.5	DCOM
12 & 13	1	Component-Based Software Architecture (Principles of Component-Based Design)	11.1-11.3	EJB / .Net
14	1	Heterogeneous Architecture (Methodology of Architecture Decision, Quality Attributes, Selection of Architecture Styles)	12.1-12.6 & 14.2	AcmeStudio

| 15 | 1 | Project presentations | - | |

A- ASSESSMENT PLAN

Project – 4 parts (20%), Midterm (25%), Lab Test (15%), and Final Exam (40%)

Items	Date Out	Due Date	Weights
Project Part1	Week 2 - Tuesday	Week 4- Saturday	4%
Project Part2	Week 5 - Sunday	Week 7 - Saturday	4%
Midterm	Week 8/Tuesday		25%
Project Part3	Week 10 - Sunday	Week 12 - Saturday	4%
Lab Test	Week 12/Tuesday		15%
Project Part4	Week13 - Sunday	Week 14 - Saturday	4%
Presentation	Week15/Sunday		4%
Final Exam	26 – May – 2025 / Mon @ 8:00		40%

B- **Department's Late Submission Policy:**

(a) 1-24 hours: 25% of the mark will be deducted.
(b) > 24 hours: Not accepted.

C- **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.
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