SULTAN QABOOS UNIVERSITY

COLLEGE OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

COURSE OUTLINE

I. COURSE INFORMATION			
COURSE CODE	COMP4701		
COURSE TITLE	Web Application Development		
OMAN QUALIFICATION FRAMEWORK (OQF) LEVEL	**8**		
CREDIT HOURS	3		
CONTACT HOURS	4		
PRE-REQUISITES	COMP3700 and COMP3205		
CO-REQUISITES	-		
EQUIVALENT COURSES	COMP3702		
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 introduces Web application concepts, architectures and models. It discusses the main building blocks (structure, navigation, and presentation), and Web application architectures such as .Net framework and J2EE Framework. It discusses the main Web architectural design patterns such as Multilayer and Model-View-Controller (MVC). It emphasizes on generating dynamic Web		

<table>
<tr><td></td><td colspan="3">contents using advanced server-side programming techniques and tools, database connectivity and Web security. It provides an overview about advanced Web application techniques such as AJAX and Web Services.</td></tr>
<tr><td rowspan="5">TEACHING AND LEARNING STRATEGIES</td><td>☐ Augmented Reality</td><td colspan="2">☐ Flipped Classroom</td></tr>
<tr><td>☐ Blended Learning</td><td colspan="2">☐ Problem-Based Learning</td></tr>
<tr><td>☐ Discovery-Based Learning</td><td colspan="2">☐ Project-Based Learning</td></tr>
<tr><td>☐ Student-Led Learning</td><td colspan="2">☐ Team-Based Learning</td></tr>
<tr><td>☐ Work-Based Learning</td><td colspan="2">☐ Other (specify):</td></tr>
<tr><td rowspan="3">ASSESSMENT COMPONENT AND WEIGHT</td><td>☒In-term examination(s) (15%)</td><td>☐ Quizzes (%)</td><td rowspan="3">☒Other (Lab Exercises and Guided Projects): (10%)</td></tr>
<tr><td>☐ Homework assignments (%)</td><td>☒Project (15 %)</td></tr>
<tr><td>☒ Final examination (40%)</td><td>☒ Practical/ Lab (20%)</td></tr>
<tr><td>TEXTBOOKS AND EDUCATIONAL MATERIAL</td><td colspan="3">• Textbook:
o Beginning ASP.Net 4.5 in C#, Matthew MacDonald, Apress, 2012.
• References:
o Develop ASP.NET Core apps, Microsoft, link: https://learn.microsoft.com/en-us/aspnet/core
o Pro ASP.NET Core 6: Develop Cloud-Ready Web Applications Using MVC, Blazor, and Razor Pages, Ninth Edition by Adam Freeman, 2022.
o ASP.NET Core in Action, Third Edition, 2023 by Andrew Lock.
o Pro ASP.Net Core MVC, sixth Edition, by Adam Freeman.</td></tr>
<tr><td>GRADING METHOD</td><td>☒ A-F Scale</td><td>☐ Pass/Not Pass</td><td>☐ Other (specify):</td></tr>
<tr><td colspan="4">GRADING METHOD DESCRIPTION</td></tr>
<tr><td rowspan="11">A-F GRADING SCALE:</td><td>Range</td><td>Letter Grade</td><td>Description</td></tr>
<tr><td>90 – 100</td><td>A</td><td rowspan="2">Exceptional performance: All course objectives achieved and met in a consistently outstanding manner.</td></tr>
<tr><td>86 – 89.9</td><td>A-</td></tr>
<tr><td>81– 85.9</td><td>B+</td><td rowspan="3">Very Good Performance: The majority of the course objectives achieved (majority being at least two-thirds) and met in a consistently thorough manner.</td></tr>
<tr><td>77 – 80.9</td><td>B</td></tr>
<tr><td>73 – 76.9</td><td>B-</td></tr>
<tr><td>68 – 72.9</td><td>C+</td><td rowspan="3">Satisfactory Performance: At least most of course objectives have been achieved and met satisfactorily.</td></tr>
<tr><td>64 – 67.9</td><td>C</td></tr>
<tr><td>60 – 63.9</td><td>C-</td></tr>
<tr><td>55 – 59.9</td><td>D+</td><td rowspan="2">Minimally Acceptable Performance: The course objectives met at a minimally acceptable level.</td></tr>
<tr><td>50 – 54.9</td><td>D</td></tr>
<tr><td>0 – 49.9</td><td>F</td><td>Unacceptable performance: The course objectives not met at a minimally acceptable level.</td></tr>
<tr><td>PASS/NOT PASS:</td><td colspan="3"></td></tr>
<tr><td>OTHER:</td><td colspan="3"></td></tr>
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II. Semester Information			
Semester/Year	Fall 2024	**Section(s)**	1
Day and Time	Monday & Wednesday @ 12:00 – 13:50	**Venue(s)**	Lab 19B
Course Coordinator	Dr. Abdullah Al-Hamdani	**Course Team**	-
Coordinator Office	0014	**Office Hours**	Sunday & Wednesday @ 9:30 – 10:30
Coordinator Extension	2414-2221	**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 web application frameworks and architectures.	1	A	1
2. Demonstrate an understanding of core C# programming concepts necessary for ASP.NET Core web application development.	1	A	1
3. Develop ASP.NET Core web applications, including form design, data handling, layout, and validation.	1, 2, 6	A, B	1, 2
4. Access and manipulate data using ADO.NET, LINQ, and Entity Framework in ASP.NET Core applications.	1, 2, 6	A, B	1, 2
5. Apply state management techniques to effectively handle sessions, cookies, and cache in ASP.NET Core applications.	1, 2, 6	A, B	1, 2
6. Develop Web APIs and MVC-based applications using the ASP.NET Core framework.	1, 2, 6	A, B	1, 2
7. Demonstrate an understanding of essential security practices in web applications.	1	A	1
8. Apply at least one advanced web application technique and/or framework that is not covered in class.	1, 6	A, B, E	1, 2, 6
9. Collaborate effectively in a team to design and develop a complete web application.	3, 5	C, D	3, 4

IV. Course Learning Outcomes (CLOs) and Assessment Criteria and Methods (for each CLO)

CLO1: 1. Demonstrate an understanding of web application frameworks and architectures.

Assessment Criteria (to achieve this objective, the student must)		Assessment Methods
A)	Ability to identify and describe various web application frameworks and their purposes.	Midterm, Final
B)	Effectively compare and contrast different web architectures in terms of benefits and drawbacks.	

CLO2: Demonstrate an understanding of core C# programming concepts necessary for ASP.NET Core web application development.

Assessment Criteria (to achieve this objective, the student must)		Assessment Methods
A)	Demonstrate a solid understanding of fundamental C# features and constructs.	Midterm, Lab test, Project, Final.
B)	Utilize C# fundamentals and collections within ASP.NET Core applications.	

CLO3: Develop ASP.NET Core web applications, including form design, data handling, layout,

AND VALIDATION.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Design and Implement Interactive Web Forms	Project, Lab Test, Final
B)	Processing and maintaining the received data from Web forms.	
C)	Apply Layout and Validation Techniques in Web Applications.	
CLO4: ACCESS AND MANIPULATE DATA USING ADO.NET, LINQ, AND ENTITY FRAMEWORK IN ASP.NET CORE APPLICATIONS.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate and understanding of the fundamental concepts in ADO.NET, LINQ, and Entity Framework.	Project, Lab Test and Final
B)	Formulate appropriate database queries for specific requirements using ADO.Net, LINQ and Entity Framework.	
C)	Develop an ASP.NET Core application with a fully functional data access layer using ADO.NET, LINQ, and/or Entity Framework.	
CLO5: APPLY STATE MANAGEMENT TECHNIQUES TO EFFECTIVELY HANDLE SESSIONS, COOKIES, AND CACHE IN ASP.NET CORE APPLICATIONS.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the fundamental state management techniques for web applications	Midterm, Final
B)	Integrate state management techniques into a complete web application.	Project, Lab test
CLO6: DEVELOP WEB APIS AND MVC-BASED APPLICATIONS USING THE ASP.NET CORE FRAMEWORK.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the fundamental concepts of MVC and Web API frameworks	Final
B)	Implement a complete web application using ASP.NET Core MVC framework	Project, Lab test
C)	Develop Web API applications to support communication between different systems and applications.	
CLO7: DEMONSTRATE AN UNDERSTANDING OF ESSENTIAL SECURITY PRACTICES IN WEB APPLICATIONS.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the main security practices in web applications.	Project, final
B)	Identify common web security vulnerabilities.	
C)	Build an ASP.Net core web application that adheres to essential security practices.	
CLO8: APPLY AT LEAST ONE ADVANCED WEB APPLICATION TECHNIQUE AND/OR FRAMEWORK THAT IS NOT COVERED IN CLASS.		
ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		**ASSESSMENT METHODS**
A)	Demonstrate an understanding of the selected technique/framework.	Guided Readings, Project
B)	Applying the selected technique/framework in a complete Web application.	
CLO9: COLLABORATE EFFECTIVELY IN A TEAM TO DESIGN AND DEVELOP A COMPLETE WEB APPLICATION.		

ASSESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT MUST)		ASSESSMENT METHODS
A)	Communicate the specifications and implementation details of a web application clearly, both in written and oral formats.	Project
B)	Collaborate effectively within a team to design and implement a complete web application.	

V. COURSE CONTENT AND SCHEDULE

WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)
1 – 2	1	**Introduction:** Introduction to Web Applications, Web Application Frameworks, Web Application Architectures such as .Net framework Core, Common Language Runtime (CLR), Common Intermediate Language (CIL) and Web Development Environment	Chapter 1	Midterm
3	2	**C# Language Basics:** Variables and Data Types, Input/Output, Formatting Output, Selections, and Repetitions.	Chapter 2	Midterm, Project and/or Final.
4	2	**C# Language Basics:** Objects, Dynamic Arrays and Collections, Methods, Classes, Exceptions, Namespaces and File Processing.	Chapters 3 and 17	Project, Lab Exercise, Midterm, and Final
5	3	**Web Application Fundamentals:** Web Application Development Models (Web Page, Web Forms and MVC). Designing and Creating ASP.Net Core Web Pages, Razor Pages, and Razor Syntax	Handout	Project, Midterm and/or Final
6	3	**Web Application Fundamentals:** HTML Forms, Data Sharing, Page Layouts and Form Validations	Handout	Project, Lab Exercise, Midterm and/or Final
7	4	**State Management:** Application Life Time, Page Navigation, Query String, Cookies, Temp Data, Session State, Application State, and Cache State.	Handout	Project, Lab Exercise, Midterm and/or Final
8	4	**Data Access:** Database Construction using SQL Server, ADO.Net Fundamentals, Direct Data Access	Handout	Project, Lab Exercise, Lab Test and/or Final
9	4	**Data Access:** LINQ (Language Integrated Query), Lambda Expressions and Entity Framework	Handout	Project, Lab Exercise, Midterm, Lab Test and/or Final
10	5	**Model View Control (MVC) Framework:** MVC Model, Creating Simple MVC Web Application, Routing System, Sharing Information, and Razor Syntax.	Handout	Project, Midterm, Lab Test and/or Final

11	5	**Model View Control (MVC) Framework:** Form Validations, MVC using Entity Framework, and Blazar Pages.	Handout	Project, Lab Exercise, Lab Test and/or Final
12	6	**Web Services and Web API:** ASP.Net Core Web API, Creating Web API Applications, and Invoking Web API	Handout	Project, Lab Exercise, Lab Test and/or Final
13	7	**Web Security Fundamentals:** Security Requirements, Security Model, Forms, Authentication, and/or Windows Authentication.	Chapter 19	Project, Lab Test and/or Final
14	8	**ASP.Net Web Security:** Membership, Profiles, and/or Identify Framework, and protection against common threats.	Chapters 20 and 21	Project, Lab Test and/or Final
15		Oral Presentation		Project

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

Course Assessment:

Lab Exercises (5%), Coursera Guided Projects (5%), Project (15%), Midterm (15%), Lab Test (20%) and Final Exam (40%)

Items	Date Out	Due Date	Weights
Lab Exercises	Lab Sessions		5%
Coursera Guided Reading Projects	Readings with Online Quizzes		5%
Project – Phase 1 Proposal and Initial Web Application	Week 5 – Monday	Week 8 - Monday	**4%**
Midterm	Week 9 – Wednesday		**15%**
Project – Phase 2 ASP.Net Core Application	Week 9 – Monday	Week 11 - Monday	**4%**
Lab Test	Week 13 – Wednesday		**20%**
Project – Phase 3 Advanced ASP.Net Application	Week 12 – Monday	Week 14 - Thursday	**4%**
Project –Presentation	Week 15		**3%**
Final Exam			**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

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.

B. 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	1. Explains, presents, and adapts information to suit the recipients.

GRADUATE ATTRIBUTES	GRADUATE COMPETENCIES FOR UNDERGRADUATE STUDIES
communicate effectively with others to achieve the desired results	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