COURSE OUTLINE TEMPLATE



I. COURSE INFORMATION			
COURSE CODE	COMP4605		
COURSE TITLE	Computer Vision		
OMAN QUALIFICATION	7		
FRAMEWORK (OQF) LEVEL	1		
CREDIT HOURS	3		
CONTACT HOURS	4		
PRE-REQUISITES	COMP4603		
Co-Requisites			
EQUIVALENT COURSES			
INCOMPATIBLE COURSES			
	University Requirement	University Elective	
	□ College Requirement □ College Elective		
COURSE CATEGORY	Department Requirement Department Elective		
	x Specialization Requirement	Specialization Elective	
	□ Other (specify):	Major Elective	
COURSE OWNER	College: Science	Department: Computer Science	
COURSE OWNER	Center:	Unit:	
Delivery Mode	x Face to Face	□ Blended	Online
	□ Lecture	x Lecture/Lab	
	Lecture/Seminar	Lecture/Studio	
COURSE TYPE	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 focuses on designing an automating image and video understan to image analysis and understanding to problems such as inspection, detection with the effectiveness of implemented a specialized development environmen	nd implementing computer nding tasks. The course introd ools that allow them to solve se n, tracking, and recognition. T solutions, the students will be t (such as MATLAB and OpenC	programs for luces students veral practical Fo experiment introduced to V, etc.)	
	Augmented Reality	x Flipped Classroom		
TEACHING AND I FADMING	Blended Learning	Problem-Based Learning		
STDATECIES	Discovery-Based Learning x Project-Based Learning			
STRATEOILS	x Student-Led Learning			
	□ Work-Based Learning	□ Other (specify):		
A SSESSMENT COMPONENT AND	x In-term examination(s) (15%)	x Quizzes (5%)	□ Other	
ASSESSMENT COMPONENT AND	x Homework assignments (10%)	x Project (15 %)	(specify):	
WEIGHT	x Final examination (40 %)	x Practical/ Lab (15%)	(%)	
TEXTBOOKS AND EDUCATIONAL	1. Online version 2022, Springer		1	
MATERIAL	2. Francois Chollet, Deep Learning with Python, 1 st Edition, Online version, 2018, Manning.			
CRAPHIC METHOD	x A-F Scale	Pass/Not Pass	□ Other	
GRADING METHOD			(specify):	

GRADING METHOD DESCRIPTION

	Range	Letter Grade	Description
A-F GRADING SCALE:	90 - 100	А	Exceptional performance: All course
	86 – 89.9 A-	A-	objectives achieved and met in a consistently outstanding manner.
	81-85.9	B+	Very Good Performance: The majority of
	77 - 80.9	В	the course objectives achieved (majority
	73 – 76.9	B-	being at least two-thirds) and met in a consistently thorough manner.
	68 - 72.9	C+	Satisfactory Performance: At least most
	64 - 67.9	С	of course objectives have been achieved and
	60 - 63.9	C-	met satisfactorily.
	55 - 59.9	D+	Minimally Acceptable Performance: The
	50 - 54.9	D	course objectives met at a minimally acceptable level.
	0-49.9	F	Unacceptable performance: The course objectives not met at a minimally acceptable level.

II. SEMESTER INFORMATION			
SEMESTER/YEAR	Fall 2024	SECTION(S)	01
DAY AND TIME	Mon - Wed	VENUE(S)	Lab 18
COURSE COORDINATOR	Dr. Abdelhamid Abdessalem	COURSE TEAM	
COORDINATOR OFFICE	0008	OFFICE HOURS	Sun, Tue: 11:00- 12:00
COORDINATOR EXTENSION	2462	COORDINATOR EMAIL	
			ahamid@squ.edu.om

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

	PLO	Analyze a complex	OQF Characteristics
		computing	
		problem and	
		to apply	
		principles of	
		computing	
		and other	
		relevant	
CLO		disciplines	
		to identify	
		solutions.	
		1. Design,	
		implemen t_and	
		evaluate a	
		computin	
		g-based	
		solution	
		given set	

		of	
		computin	
		a	
		в	
		requireme	
		nts in the	
		context of	
		the	
		program's	
		discipline.	
		•	
	2.	Communi	
		cate	
		effectively	
		ina	
		variety of	
		profession	
		profession	
		ai	
		contexts.	
	3.	Recognize	
		profession	
		al	
		responsibi	
		lities and	
		mako	
		informed	
		informed	
		Judgments	
		in	
		computin	
		g practice	
		based on	
		legal and	
		ethical	
		principles.	
		Function	
	4.	Function	
		effectively	
		as a	
		member	
		or leader	
		of a team	
		engaged	
		in	

			activities appropriat e to the program's discipline. 5. Apply computer science theory and software developm ent fundamen tals to produce computin g-based solutions. SQU GRADUATE ATTRIBUTES	
1.	Demonstrate an understanding of fundamental knowledge and methods in image processing and computer vision.	1	A1-A3	1
2.	Identify, formulate, analyze, and solve problems in computer vision	1, 2	A1, A2, A3, B1, B2, B3, B4	1, 2, 6
3.	Design and conduct experimental validation for a computer vision method, and assess the performance of the method	1, 2	B1-B4	1, 2
4.	Communicate effectively and work in teams to develop a working computer vision prototype	3, 5	C1, C2	3, 4, 5
5.	Recognize the ethical issues related to designing computer vision solutions	4	A4, E3	5

IV. COURSE LEARNING OUTCOMES (CLOS) AND ASSESSMENT CRITERIA AND METHODS (FOR EACH CLO)

CLO1: Demonstrate an understanding of fundamental knowledge and methods in image processing and computer vision.				
ASSE	ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	ASSESSMENT METHODS		
MUS	Т)			
A)	Describe the image formation process and related challenges on Developing Computer Vision applications			
B)	Demonstrate understanding of applications of point, filtering, Fourier Transform, Morphological operations on images	nding of applications of point, filtering, Fourier ical operations on images		
C)	Demonstrate understanding of common image classification techniques	Quizzes, MT, Final		
D)	Demonstrate understanding of common segmentation techniques			
E)	Demonstrate understanding of common matching techniques			
F)	Demonstrate understanding of common object tracking techniques			
G)	Demonstrate understanding of common image stitching techniques			
CLO	2: Formulate, and analyze problems in the computer vision field			
ASSE MUS	ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T)	ASSESSMENT METHODS		
A)	Formulate the problem			
B)	B) Identify and state the problem requirements HWs, Project			
CLC	f 3: Design a solution to the computer vision problem, implement it and evaluat	e its performance		
CLC Asse	O3: Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT	e its performance		
CLO Asse MUS	D3: Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T)	e its performance ASSESSMENT METHODS		
CLC Asse MUS ⁷ A)	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution 	e its performance ASSESSMENT METHODS		
CLC Asse MUS A) B)	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset 	e its performance ASSESSMENT METHODS		
CLC ASSE MUS A) B) C)	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics 	e its performance ASSESSMENT METHODS HWs, LT, Project		
CLO ASSE MUS ⁷ A) B) C) D)	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning 	e its performance ASSESSMENT METHODS HWs, LT, Project		
CLO ASSE MUS ⁷ A) B) C) D) E)	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics 	e its performance ASSESSMENT METHODS HWs, LT, Project		
CLC ASSE MUS A) B) C) E) CLC	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics 4: Communicate effectively and work in teams to develop a working-computer 	e its performance ASSESSMENT METHODS HWs, LT, Project vision prototype.		
CLO ASSE MUS ⁷ A) B) C) C) E) CLO ASSE MUS ⁷	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics Q4: Communicate effectively and work in teams to develop a working-computer ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) 	e its performance ASSESSMENT METHODS HWs, LT, Project vision prototype. ASSESSMENT METHODS		
CLO ASSE MUS ⁷ A) B) C) C) C) CLO ASSE MUS ⁷	 Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics O4: Communicate effectively and work in teams to develop a working-computer ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Clearly describe, orally and in writing, the addressed problem 	e its performance ASSESSMENT METHODS HWs, LT, Project vision prototype. ASSESSMENT METHODS		
CLO ASSE MUS A) B) C) C) C) CLO ASSE MUS A) B)	 D3: Design a solution to the computer vision problem, implement it and evaluat D3: Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics D4: Communicate effectively and work in teams to develop a working-computer ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Clearly describe, orally and in writing, the addressed problem Explain, orally and in writing, the functionality of the proposed solution 	e its performance ASSESSMENT METHODS HWs, LT, Project vision prototype. ASSESSMENT METHODS Project		
CLO ASSE MUS A) B) C) D) E) CLO ASSE MUS A) B) C)	 D3: Design a solution to the computer vision problem, implement it and evaluat D3: Design a solution to the computer vision problem, implement it and evaluat ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Describe the computer vision & image processing algorithms constituting the proposed solution Prepare an adequate dataset Identify appropriate performance measure metrics Conduct training and parameter tuning Evaluate the performance of the developed solution based on the identified metrics D4: Communicate effectively and work in teams to develop a working-computer ESSMENT CRITERIA (TO ACHIEVE THIS OBJECTIVE, THE STUDENT T) Clearly describe, orally and in writing, the addressed problem Explain, orally and in writing, the functionality of the proposed solution 	e its performance ASSESSMENT METHODS HWs, LT, Project vision prototype. ASSESSMENT METHODS Project		

A)	Clearly describe, orally and in writing, the addressed problem	
B)	Explain, orally and in writing, the functionality of the proposed solution	Project
C)	Discuss, orally and in writing, the limitations of the proposed solution	

V. Cou	V. COURSE CONTENT AND SCHEDULE				
WEEK	LECTURES #	TOPICS/ SUBJECTS	READINGS/ CHAPTERS	REMARKS (e.g., ASSESSMENTS)	
1	Lecture 1	Introduction to Computer Vision	Chap 1	Quiz1, MT, Final	
2	Lecture 2	Image Formation	Chap 2	Quiz1, MT, Final	
3	Lecture 3	Image Processing: Point Operations HW1 out	Chap 3	Quiz1, HW1, MT, PRJ, Final	
4	Lecture 4	Image processing: Image Filtering	Chap 3, Chap 7	Quiz1, HW1, MT, PRJ, Final	
5	Lecture 5	Image Processing: Fourier Transformation HW2 out, Quiz1	Chap 3	Quiz2, HW1, MT, PRJ, Final,	
6	Lecture 6	Morphological Operations	Instructor materials	Quiz2, HW2	
7	Lecture 7	Classical Image Classification Techniques	Chap 5	Quiz2, HW2, MT, PRJ, Final	
8	Lecture 8	Classical Image Segmentation Techniques Project out	Chap 5, Chap 7	Quiz2, HW2, PRJ, Final	
9	Lecture 9	CNN-based Image Classification MT	Chap 5	Quiz2, LT, PRJ, Final	
10	Lecture 10	CNN-based Object Detection Project Part 1 in	Chap 6	Quiz2, LT, PRJ, Final	
11	Lecture 11	CNN-Based Image Segmentation Quiz2	Chap 6	LT, PRJ, Final	
12	Lecture 12	Feature Detection & Matching	Chap 7	LT, PRJ, Final	
13	Lecture 13	Object Tracking	Chap 7	LT, PRJ, Final	
14	Lecture 14	Computer Vision & Ethics LT	Instructor's materials	PRJ, Final	
15		Project Part 2 (Presentations)			

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

Assessment Plan:

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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	The University expects the students to approach their academic endeavors with the
INTEGRITY	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	To ensure the provision of a sound and fair assessment and grading, please review
AND GRADING	the Undergraduate Academic Regulations.
GRADE APPEAL	Students who wish to appeal their grades should review the Undergraduate
	Academic Regulations.
CLASSROOM	Students are expected to dress professionally during class time as required by the
POLICIES	University. Use of phones or any other electronic devices in the classroom during

OTHER	
	responsibility to contact the instructor.
	situation (e.g., medical emergency, death in the immediate family), it is the student's
EVALUATIONS	they are assigned. If a quiz, test, or exam is missed due to a documented emergency
MISSED	All quizzes, tests, clinical evaluations, and exams must be completed by the date
	be penalized.
WORK	approved by the course coordinator. Assignments submitted after the due date may
MAKE-UP	later than the assigned due date. Students may be allowed to submit late work if
LATE AND	Students are required to meet the course objectives by submitting coursework no
	may be required to leave the class.
	may be subject to disciplinary action. A student responsible for disruptive behavior
	or grossly interferes with classroom activities is considered disruptive behavior and
	confiscation of the device for the remainder of the class. Behavior that persistently
	class time is strictly prohibited. Unauthorized use may lead to faculty member

Course Outline Appendix

1. PROGRAM LEARNING OUTCOMES

- **6.** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
- **7.** Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
- 8. Communicate effectively in a variety of professional contexts.
- **9.** Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
- **10.** Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
- **11.** 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	1. Demonstrates familiarity and works with
sufficient general and specialized theoretical	advanced specialized knowledge in the area of
knowledge that enables him/her to deal well	specialization.
with his/her specialty and other related fields.	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	1. Applies concepts, theories, and investigative
graduate has sufficient skill and practical	methods to synthesize and interpret information
experience that enables him/her to perform all	to evaluate conclusions.
tasks related to the specialization and other	2. Applies appropriate research methods and
related fields.	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	1. Explains, presents, and adapts information to suit
has the ability to communicate effectively with	the recipients.
others to achieve the desired results	2. Employs appropriate information and
	communication technology to collect and analyze
	information.
D. Autonomy and Leadership: The graduate	1. Performs advanced professional activities
has the ability to lead, make decisions and take	independently.
responsibility for decisions.	2. Demonstrates leadership skills.
	3. Takes professional responsibility.
	4. Assumes full accountability for the tasks and their
	output.
E. Responsibility and Commitment: The	1. Manages time and other resources assigned to
graduate appreciates the importance of	accomplishing tasks effectively and responsibly.
available resources and deals with them	2. Demonstrates effective practices when working in
effectively and is committed to the ethics of	teams.
the profession and society.	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.	 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