Course Specification

(Postgraduate Programs)

Course Title	Computer Vision
Course Code:	MSCS 721
Program:	Master Programme in Computer Science
Department:	Computer Science
College:	Computer Science and Information Technology
Institution:	King Faisal University
Version:	*Course Specification Version Number*
Last Revision Date:	*Pick Revision Date.*

Table of Contents

A. General information about the course:

1. Course Identification:

1. Credit hours: 3 (3-0-6)				
2. Course type				
A.	☐University	☒ College	☐Department	☐Track
B.	☐ Required		☒ Elective	
3. Level/year at which this course is offered: : Level 2 , 3 or 4				
4. Course General Description:				
This course includes basic and advanced topics of computer vision. This course will cover such topics as image formation, basics of image processing, feature extraction and matching, homographies, camera models, image transformations, image warping, multiple view geometry, stereo vision, image mosaics, structure from motion, image based rendering, object recognition and object tracking. Applications may include face recognition, biometrics, surveillance, movies special effects, photorealistic rendering and human computer interaction with computer as robots.				
5. Pre-requirements for this course (if any)**:**				
NA				
6. Pre-requirements for this course (if any)**:**				
NA				
7. Course Main Objective(s):				
This course aims to introduce the advanced topics of Computer Vision to extract semantic and three dimensional information from two-dimension images to automatically understand contents of images				

2. Teaching Mode: (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	E-learning		
3	Hybrid • Traditional classroom • E-learning	45	100%

No	Mode of Instruction	Contact Hours	Percentage
4	Distance learning		

3. Contact Hours: (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	-
3.	**Field**	-
4.	**Tutorial**	-
5.	**Others (specify)……**	-
	Total	45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods:

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Know the basic concepts in computational vision	K1	Lectures	- Quizzes - Exams - Assignments
1.2	Have an understanding of image processing for computer vision	K1	Lectures	- Quizzes - Exams - Assignments
1.3	Have knowledge of processing of images and determination of various structures	K1	Lectures	- Quizzes - Exams - Assignments
2.0	**Skills**			
2.1	Apply skills in recognizing three dimensional objects	S1, S2	- Lectures	- Quizzes - Exams - Assignments
3.0	**Values, autonomy, and responsibility**			
3.1	Implement computer vision Techniques on real world problems	V1	- Lectures - Case studies -Research assignment	Project Report and Presentation
...				

C. Course Content:

No	List of Topics	Contact Hours
1	Introduction and recent advancements of Computer Vision	3.0
2	Review of Matrices and Linear Algebra	3.0
3	Image formation, Basics of Image Processing.	3.0
4	Introduction to Python and Computer Vision toolbox: OpenCV Library	3.0
5	2D Projective Geometry, Homogeneous coordinate system, Homogrphies	3.0
6	3D Projective Geometry	3.0
7	Estimation – 2D Projective Transformations	3.0
8	Camera Models	3.0
9	Camera Matrix Computation	3.0
10	Epipolar Geometry, Stereo Vision, Image Mosaicing	3.0
11	Tracking and Motion (Corner Detections, Feature extraction and matching)	3.0
12	Camera Calibration and 3D Reconstruction of Scene	3.0
13	Pose Estimation	3.0
14	Transformation techniques, Scaling, Translation, Rotation, Warping, Morphing	3.0
15	Object recognition (Face Detection, Recognition and Machine Learning).	3.0
Total		**45**

D. Students Assessment Activities:

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	Continuous	5%
2.	Quiz	Continuous	10%
3.	Mid Term	8^{th}- 9^{th}	15%
4	Capstone Project	15^{th}	30%
5	Final Exam	16^{th}- 17^{th}	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

E. Learning Resources and Facilities:

1. References and Learning Resources:

Required Textbook	• Multiple View Geometry in Computer Vision by Richard Hartley and Andrew Zisserman, Cambridge University Press, 2^{nd} ed., 2004. • Computer Vision: Algorithms and Applications by Richard Szeliski, Springer, 2010. (PDF available online)..
Essential References	• Learning OpenCV: Computer Vision with the OpenCV Library, by Gary Bradski and Adrian Kaehler, O'Reilly, 2008. • W. B. Thompson, Fleming R, Regehr Stefanucci, Visual Perception from a Computer Graphics Perspective, CRC Press, T&F, 2011, ISBN13 978-1-4665-0275-8. • Digital Image Processing by Rafael C. Gonzalez, Richard E. Woods, Pearson, 4th Edition, 2017, ISBN-10: 0133356728, ISBN-13: 978-0133356724.
Supportive References	
Electronic Materials	• IEEE journals, • ACM digital library • www.opencv.org • www.kaggle.com
Other Learning Materials	• Python • Matlab • OpenCV

2. Educational and Research Facilities and Equipment Required:

Items	Resources
facilities	Sufficient seats (typically 20) as per student registration required in the lecture

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	
Technology equipment (Projector, smart board, software)	Sufficient computer terminals with required setup having the necessary software installed and configured for the students to complete assignments and projects. Data show is needed to demonstrate in the class
Other equipment (Depending on the nature of the specialty)	Not Required

F. Assessment of Course Quality:

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect Assessment through Teaching Evaluation
Effectiveness of students' assessment	Faculty	Indirect assessment through Course Evaluation Survey
Quality of learning resources	Students	Indirect Assessment through Learning Resources Survey
The extent to which CLOs have been achieved	**Faculty**	Direct assessment through Rubrics analyses
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data:

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	