University of Petra		
Faculty of Information Technology		كلية تكنولوجيا المعلومات
Department of Data Science and Artificial Intelligence		قسم علم البيانات والذكاء الاصطناعي

Course Syllabus

Year: 2024/2025   **Semester: 2**

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / Lab.	Equivalent hours in NQF	Course level according to NQF
606384	Computer Vision	606361	-	3:3-0	54	7

Course Form		Course Model		
☒ Blended	☐ Online	☒ 2+1	☐ 1+1	☐ 1+2

Learning Management System Platform	**Moodle**
URL to access the platform	**Moodle** https://lms.uop.edu.jo/moodle/ **Microsoft Teams** https://www.microsoft.com/en-us/microsoft-teams/
Link to tutorial videos to access the platform and technical help	**Moodle Tutorial:** https://lms.uop.edu.jo/oldmoodle/course/view.php?id=345 **Moodle Mobile Tutorial:** https://lms.uop.edu.jo/moodle20213/mod/page/view.php?id=78 **Microsoft Teams Tutorial:** https://lms.uop.edu.jo/moodle20213/course/view.php?id=13

Instructor Name	e-mail	Office No.	Office ext.
Dr Hussam Fakhouri	Hussam.fakhouri@uop.edu.jo	7308	12-1 Sunday, 12-1 Tuesday

Office Hours	Platform used	Link to office hours platform
12-1 Sunday,	Teams	https://teams.microsoft.com/l/channel/19%3a2dIGAHRX6Thm-S1ZT8Mtq8RUinDYRTxI8BWnzGj1iA81%40thread.tacv2/General?groupId=f7d18527-4154-4d7e-9d3f-4cd94e9ef28f&tenantId=97e5760c-fa12-4aae-b4e4-31b43f04e79d
12-1 Tuesday	Teams	https://teams.microsoft.com/l/channel/19%3a2dIGAHRX6Thm-S1ZT8Mtq8RUinDYRTxI8BWnzGj1iA81%40thread.t

		acv2/General?groupId=f7d18527-4154-4d7e-9d3f-4cd94e9ef28f&tenantId=97e5760c-fa12-4aae-b4e4-31b43f04e79d

Coordinator's Name: (if applicable)	Dr Hussam Fakhouri

Course Description	This course presents an introduction to Computer Vision. Topics covered: basic principles of image formation, imaging processing algorithms, different algorithms for 3D reconstruction and recognition from single or multiple images (video). This course emphasizes the core vision tasks of scene understanding and recognition. Applications to 3D modelling, video analysis, video surveillance, object recognition and vision-based control will be discussed.

> **Commented [MA1]:** This is the original short description of the course. Kindly check if the topics covered abide by this!!
> Topics has been modified

Course Objectives

(a) Demonstrate a solid understanding of image sensing, pixel arrays, and digital image representations.
(b) Effectively apply image processing techniques for image enhancement and analysis.
(c) Implement computer vision algorithms for feature extraction, image classification, image retrieval, object detection, feature extraction, and image generation.
(d) Apply computer vision and image processing methods to solve real-world problems.
(e) Recognize and evaluate the significance of deep learning applications in computer vision.

Course Intended Learning Outcomes (ILOs) and their Alignment with Program ILOs, Teaching and Learning Methods, and Assessment Methods:

Upon successful completion of this course, students are expected to achieve the following learning outcomes:

Course ILOs	Program ILOs	Teaching and Learning Method	Assessment Method
Knowledge (K)			
K1. Identify the different concepts of computer vision , and get familiar with image processing and computer vison programming.	7.2	Interactive lectures	Midterm Exam
intellectual skill(I)			
I1: Design and use image segmentation and feature extraction techniques	2.1	Interactive lectures	Midterm Exam
Practical skills (P)			
P1. Apply Deep neural network techniques to in computer vison and object detection	DS&AI 6.1	Interactive lectures	Assignments, quiz
Transferable Skills (T)			
T1 Demonstrate effective written skills through writing a report on program for a computer vision, object detection.	3.2	Project	report evaluation rubric

> **Commented [MA2]:** This course requires 2 Transferable skills: T1 for oral presentation and T2 for Select and evaluate technical literature and other sources of information to address problems. Please include both

T2 for Select and evaluate technical literature and other sources of information to address problems.	3.3	Project	report evaluation rubric
Competencies (C)*			
C1. Solution development	C2	Interactive lectures	Midterm Exam
C2. Communication Skills	C3	Project	report evaluation rubric
C3. Data Analysis Proficiency, AI Expertise.	DS-C6:	Interactive lectures + Project	Project
C4. Knowledge integration	C7	Interactive lectures	Midterm Exam

Commented [MA3]: This course requires 2 Transferable skills: T1 for oral presentation and T2 for Select and evaluate technical literature and other sources of information to address problems. Please include both

* Competencies :knowledge,skills,and behaviors that lead to successful professional performance

Course Schedule:

Topic No.	Week	Topics	Topics Details	Reference	ILO No.	Tasks required from students	Teaching activities *
1	1	Introduction to Computer Vision	Introduction to Computer Vision Introduction to Human Visual System	Lecture notes	**K1**	Interactive Lectures and Activities	**(Synchronous)** **Asynchronous**
2	2-3	Image Processing Operations	Image Formation and Digital Image Representations Camera Model and Geometry Camera models and pinhole camera geometry Light, color perception, and image formation Fundamental image transformations and manipulations Introduction to spatial filtering, edge detection, and corner detection Gradient-based methods for feature extraction Hands-on practice with software libraries for image processing	Lecture notes	**K1, P1**	Interactive Lectures and Activities	**(Synchronous)** **Asynchronous**

3	4-5	Feature Extraction	Designing Image Descriptors, Feature Descriptors, Global and Local Features, Feature Maps, Feature Aggregation		K1	Interactive Lectures and Activities	**(Synchro nous)** **Asynchr onous**
4	6-7	3D Images s and Videos	<mark>3D reconstruction and recognition from single or multiple images (video)</mark>	Lecture notes	I1, P1	Interactive Lectures and Activities	**(Synchro nous)** **Asynchr onous**
	8-9	<mark>Applications to 3D modelling</mark>	<mark>Applications to 3D modelling, video analysis, video surveillance</mark>				
5	10-11	Introduction to Deep Learning in Vision	Fundamentals of convolutional neural networks (CNNs) Training methods and popular CNN architectures (AlexNet, VGG, ResNet)	Lecture notes	P1	Interactive Lectures and Activities	**(Synchro nous)** **Asynchr onous**
	12-13	Deep learning for object detection	Deep learning for object detection: R-CNN variants, YOLO, SSD				
6	14	project submission and Presentation Discussion					**(Synchro nous)**
	15-16	**Final exam**					

Assessment Methods and Grading System:

Assessment method	Grade	Metrics/ Rubrics/ Expected performance
I. Individual Work		
Quizzes / Assignments/Activities	**15%**	Assignments, Discussions, Online Quizzes, Online Asynchronous Activities
Code and report	**15%**	Report discussion rubric
Mid Exam	**30%**	Online exam.
Final exam	**40%**	Online exam.
Total		
	100%	

Learning References:

1- Textbook (s):
Forsyth, David A. and Ponce, Jean, Computer Vision: A Modern Approach, 2nd Edition, Pearson, 2019. Szeliski, Richard, Computer Vision: Algorithms and Applications (2nd Ed.), Springer, 2022.
2- References:
Gonzalez, Rafael and Woods, Richard, Digital Image Processing, 4th Edition, 2018.
3- Other Resources:
Lectures Notes

Requirements of the Course
Taken the course 606361
Course Policies[1]

- Attendance Policy: University regulations apply to attendance.

- Academic Honesty: Academic dishonesty is an unacceptable mode of conduct, and will not be tolerated in any form at the University of Petra. All persons involved in academic dishonesty and plagiarism in any form will be disciplined in accordance with university rules and regulations.