هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA

T15

Course Specifications
(Postgraduate Degree)

Course Title:	Computer Vision
Course Code:	512PMAI-3
Program:	Professional Master of Artificial Intelligence (PMAI)
Department:	Computer Science
College:	Computer Science and Information Systems
Institution:	Najran University

Table of Contents

A. Course Identification

1. Credit hours: 3 Credit hours (2 lecture + 2 Laboratory)
2. Course type ☐ Required ☒ Elective
3. Level/year at which this course is offered: Year 5/ Level 2
4. Pre-requisites for this course (if any)**:** N/A
5. Co-requisites for this course (if any)**:** N/A

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	50	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
1	**Lecture**	30
2	**Laboratory/Studio**	20
3	**Seminars**	
4	**Others** (specify)	
Total		50

B. Course Objectives and Learning Outcomes

1. Course Description

In this course students will gain knowledge of theory and practice in Computer Vision, and by the end will have demonstrable ability to implement a working solution for real-world problems in image and video analysis. Students will get hands-on experience in deriving the mathematical underpinnings as well as the programmatic implementation of classical vision problems such as image classification, object detection and tracking, pose estimation, Structure-from-Motion, localization and mapping and more. Students will additionally learn how to train a deep neural network, write a GPU-optimized algorithm, evaluate their implementations on standard vision datasets, and compare their results to the state-of-the-art work of computer vision laboratories worldwide.

2. Course Main Objective

1- Students should be able to identify what aspect of computer vision (low-level, mid-level, and/or high-level) should be focused on when a particular research question is faced.
2- Students should understand how to evaluate the feasibility and performance of solutions proposed for certain computer vision problems.
3- Students should understand the computational details behind the numerical methods discussed in class, when they apply, and what their pros/cons are.
4- Students should be able to implement the numerical methods discussed in class and verify their theoretical properties in practice.
5- Students should be able to apply the learned techniques and analysis tools to problems arising in their own research

3. Course Learning Outcomes

Course Learning Outcomes (CLOs)		Aligned PLOs*
1	**Knowledge and Understanding**	
1.1	Understanding of the theoretical and practical capabilities of Computer Vision.	K1
1.2	Recognize the essential of design and implementation of Computer Vision based systems	K1
1.3	Recognize the common Computer Vision and Image Interpretation algorithms	K1, K2
1...	An ability to recognize the use of Computer Vision in solving real life problems.	K1, K2
2	**Skills :**	
2.1	Design and implement fundamental spatial filtering algorithms using correlation and convolution techniques	S2
2.2	Solve problems using the appropriate technologies, algorithms, and approaches for the related issues.	S1,S3
2.3	Design and implement an Computer Vision based system	S1
2...	Investigate real world problems in the context of Computer Vision and design innovative solutions	S4
3	**Values:**	
3.1		
3.2		
3.3		
3...		

* Program Learning Outcomes

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Computer Vision	1
2	low-level Vision: Optics, Light, Color, Human Vision, Cameras	4
3	low-level Vision: Image Formation	4
4	low-level Vision: Linear and Nonlinear Filtering	4
5	low-level Vision: Edges, Interest Points, Corners and Descriptors	4

6	Camera Model and Calibration	4
7	Epipolar Geometry and Photometric Stereo	4
8	Structure from Motion and SLAM	4
9	Mid-level Vision: Clustering	4
10	Mid-level Vision: Segmentation	4
11	High-level Vision: Object Recognition	4
12	High-level Vision: Object Detection	4
13	High-level Vision: Visual Object Tracking	4
Total		50

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Understanding of the theoretical and practical capabilities of Computer Vision.	Lectures, Lab	Quiz, Assignments, Midterm Examination, Final Examination
1.2	Recognize the essential of design and implementation of Computer Vision based systems	Lectures, Lab, project	Assignments, Midterm Examination, Final Examination
1.3	Recognize the common Computer Vision and Image Interpretation algorithms	Lectures, Lab, Case studies	Quiz, Assignments, Midterm Examination, project report and presentation, Final Examination
1.4	An ability to recognize the use of Computer Vision in solving real life problems.	Lectures, Lab, Case studies, project	Assignments, project report and presentation
…			
2.0	**Skills**		
2.1	Design and implement fundamental spatial filtering algorithms using correlation and convolution techniques	Lectures, Lab, Case studies	Quiz, Assignments, Midterm Examination, Final Examination
2.2	Solve problems using the appropriate technologies, algorithms, and approaches for the related issues.	Lectures, Lab, Case studies, project	Assignments, Midterm Examination, Final Examination, project report and presentation
2.3	Design and implement an Computer Vision based system	Lectures, Lab, Case studies, project	Assignments,

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			Midterm Examination, Final Examination, project report and presentation
2.4	Investigate real world problems in the context of Computer Vision and design innovative solutions	Lectures, Lab, Case studies, project	Assignments, Midterm Examination, Final Examination, project report and presentation
…			
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz1	3rd week	5%
2	Midterm	6th week	20%
3	Theory Assignments	2th , 5th , 8th , 10th weeks	5%
4	Lab Assignments	7th week	10%
5	Quiz2	10th week	10%
7	Project	11th week	10%
8	Final Exam	12th or 13th week	40%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

- Weekly office hours for student counseling and support
- Weekly academic advising hours
- Extra weekly 2 office hours prior to exams.
- Tutorials are also provided to the students

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1- Prince, Simon JD. Computer vision: models, learning, and inference. Cambridge University Press, latest edition.

	2- Forsyth, David, and Jean Ponce. Computer vision: a modern approach. Upper Saddle River, NJ; London: Prentice Hall, latest edition. 3- Szeliski, Richard. Computer vision: algorithms and applications. Springer Science & Business Media, latest edition.
Essential Reference Materials	Recent Papers in Computer Vision related journals
Electronic Materials	
Other Learning Materials	MATLAB, Python or similar software

2. Educational and research Facilities and Equipment Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	One classroom One Laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, PCs, Whiteboard, Internet connection, Anti-plagiarism software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Instructor	Direct
Extent of achievement of course learning outcomes	Instructor	Direct

Evaluation Areas/Issues (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Computer Science Departmental Council
Reference No.	14440203-0185-00002
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