Course Outline

Program	BCS	**Semester**	7
Course Title	Fundamentals of Computer Vision	**Course Code**	CS4059
Pre-requisite		**Course Teacher**	Dr. Hafeez Anwar

Attributes of Complex Computing Problems/Activities targeted in the course. (if yes, provide short description)	1- Image data collection 2- Image Classification applied to real-life problems 3- Presenting the results in the form of a technical report and class presentation
Complex Computing Problems included. (if yes, provide short description)	The course is targeted at the fundamentals of computer vision which is used to solve many real-life problems such as object recognition, face detection, person identification et. Hence, the goal is to apply those learned concepts to the problems of the real-life in order to enable the students with the skill of problem solving using computer vision methods.

Learning Materials

Text Books: Computer Vision: Algorithms and Applications, 2nd ed. by Richard Szeliski, 2022
Freely available: https://szeliski.org/Book/
Reference Books: 1. Computer Vision: A Modern Approach (2nd edition), by D.A. Forsyth and J. Ponce, Prentice Hall, 2011. 2. Learning OpenCV, by Gary Bradski & Adrian Kaehler, O'Reilly Media, 2008. 3. Visual Object Recognition by Kristen Grauman and Bastian Leibe, 2011

Assessment Plan

Formative Assessment	**30%**
Quizzes	4%
Assignments	4%
Presentations/Project	22%
Summative Assessment	**70%**
Sessional I	10%
Sessional II	10%
Final Exams	50%

Course Learning Outcomes

CLO No.	CLO Statement	Domain (Cognitive, Affective and Phychomotor)	Taxonomy Level	Mapped with PLO	Assessment Tool
CLO 1	Understanding basics of image filtering	Cognitive	C1	PLO-1	A, Q, P, S, F

CLO 2	Applying image filters for corner and edge detections	Cognitive	C1	PLO-2	A, Q, P, S, F
CLO 3	Design of object recognition algorithms using principles of Computer Vision	Cognitive	C2	PLO-3	P, F

A=Assignment, Q=Quiz, P=Project, S=Sessional, F=Final

Course Content

Week No.	Course Content	CLO
I	Introduction to Computer Vision and its application	1
II	Image formation, camera and color	1
III	Image filters – I	1
IV	Image filters – II	1
V	Edge detection	2
VI	Corner detection	2
VII	Scale-invariant Features Transform (SIFT)	2
VIII	Histogram of Oriented Gradients (HoG)	2
IX	Bag of Visual Words (BoVWs)	3
X	Support Vector Machine (SVM)	3
XI	Image Classification using BoVWs	3
XII	Image Classification using Convolutional Neural Networks	3
XIII	Project Presentations	1, 2, 3
XIV	Project Presentations	1, 2, 3
XV	Project Presentations	1, 2, 3
XVI	Project Presentations	1, 2, 3