

Branch Name:	Artificial Intelligence & Data Science
Program Code:	ET108
Semester/Year:	Semester VI/ Third Year
Course Title:	Computer Vision and Image Processing Practical
Course Code:	2ET1080602P
Pre-Requisite:	Basic of mathematics: calculus, linear algebra and probability. Ability to program in C/C++/MATLAB and algorithms., Some back ground knowledge of image

Course Objective:

1. To make the students aware and have some expertise with various facets of advance research in computer vision in various subareas such as reconstruction, segmentation and grouping, object and activity recognition, scene understanding, and vision and language.
2. To present various learning approaches from image and video data will be covered and include topics from convolutional neural networks, recurrent neural networks, structured predictions and others.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1	-	-	2	2	-	-	-	-	10	25	10	25	50

Sr. No	List of Practical	Content Hours
1.	Introduction to CVIP lab/ Open CV.	2
2.	Two-dimensional fast transforms - Fourier (FFT), cosine (DCT), Haar, Walsh, Hadamard, wavelet transforms.	2
3.	Feature extraction-binary, RST-invariant, histogram, spectral and texture object features.	2
4.	Pattern classification-nearest neighbor, K-nearest neighbor and nearest centroid.	2
5.	Edge/Line detection and edge linking - Kirsch, pyramid, Sobel, Prewitt, Roberts, Laplacian, FreiChen, Hough transform.	2
6.	Histogram Thresholding Segmentation	2
7.	To perform arithmetic and logic operations, spatial filters on an image.	2
8.	To perform motion analysis using differential method and optical flow by Lucas-Kanade method.	2
9.	Image segmentation - fuzzy mean, histogram thresholding, median-cut, principal components transform/median cut, spherical coordinate	2

	transform/center split, gray level quantization, split and merge.	
10.	Histogram-based image enhancement - histogram equalization, histogram slide, histogram shrink/stretch, local equalization, histogram hyperbolization, histogram specification, adaptive contrast filters (standard, logarithmic, exponential), gray-scale piecewise linear modification.	2
11.	Morphological filters - binary iterative morphology, gray-scale and color erosion, dilation, opening, and closing.	2
12.	Image sharpening using gradient mask.	2
13.	Open Experiment (Student have to identify the simple problem and try to implement it-if possible)-	2

List of Reference books:

1. Computer Vision: Algorithms and Applications by Richard Szeliski 2010.
2. Computer Vision: A Modern Approach by Forsyth and Ponce 2nd 2015.
3. Probabilistic Graphical Models by Koller and Friedman 2009.
4. Dictionary of Computer Vision and Image Processing, by Fisher et al.
5. Deep Learning, by Goodfellow, Bengio, and Courville 2016.
6. Machine Learning: A Probabilistic Perspective by Murphy 2012.

e-Resources (If any):

1. <http://szeliski.org/Book/>
2. <http://www.cs.rochester.edu/u/cxu22/t/577F16/>
3. <http://cs.brown.edu/courses/csci1430/>
4. <http://luthuli.cs.uiuc.edu/~daf/CV2E-site/cv2eindex.html>
5. http://www.siue.edu/~sumbaug/438_syl.html
6. <http://luthuli.cs.uiuc.edu/~daf/CV2E-site/cv2eindex.html>
7. <http://www.cs.ubc.ca/~murphyk/MLbook/>
8. <http://pgm.stanford.edu/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand and master basic knowledge, theories and methods in image processing and computer vision	1 Remembering 2 Understanding
CLO2	Analyse, evaluate and examine existing practical computer vision systems.	2 Understanding 4 Analyze
CLO3	Design and develop practical and innovative image processing and computer vision applications or systems	3 Applying
CLO4	Learn depth understanding of Understand Image formation process and develop computer vision applications.	3 Applying
CLO5	Learn depth understanding of color transformation and color segmentation.	2 Understanding 3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CLO1	H	M	H	L	L	M			L				H	L		
CLO2		L	M	H	L	L					L	L	M	L		
CLO3	M	H	M	L	M	H		M		L			M	L		
CLO4	M	M	L	L	M	H		M	L				M	L		
CLO5	M	L	L	L	M	H		M		L			H	L		

H:High, M:Medium, L:Low