

Branch Name:	Computer Engineering (Software Engineering)
Program Code:	ET203
Course Title:	Computer Vision and Applications
Course Code:	2ET2030306T
Pre-requisite Course:	- - -

Course Objectives: The core objective of this course is 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. This course aims 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. This course shall act as platforms for the students wishing to carry out further research in methods of models in images, depth recovery from stereo, camera calibration, image stabilization, automated alignment, tracking, boundary detection, and recognition

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	Introduction to Computer Vision: History, Area of applications, Three 'R's of Computer Vision – reconstruction, recognition and (re)organization, 3D from images, Special effects	04	10
2	Image Formation and Filtering: Light and Color, Convolution, Image Pyramids, Image Filtering and Hybrid Images, Thinking in Frequency	06	15
3	Feature Detection and Matching: Edge Detection, Interest Points and Corners, Local Image Features, Feature Matching, Model Fitting and RANSAC	08	15
4	Cameras, Multiple Views and Motion: Cameras and Optics, Stereo Introduction, Camera Calibration, Epipolar Geometry and Structure from Motion, Feature Tracking and Optical Flow	10	20
5	Recognition: Recognition Overview and Bag of Features, Large-scale Instance Recognition, Large-scale Category Recognition and Advanced Feature Encoding, Detection with Sliding Windows: Viola Jones and Dalal Triggs, Pascal VOC and Big Data, Human Computation and Crowdsourcing, Modern Boundary Detection and Sketches, Context, Spatial Layout, and Scene Parsing	12	25
6	Deep Learning: Neural Networks, Convolutional Networks for Recognition, Object Detectors Emerge in Deep Scene CNNs, Deep Geolocalization, MS COCO and Deeper	08	15

	Deep Architectures, Structured Output from Deep Learning, Unsupervised Learning and Style Transfer, Generative Networks – Colorization.		
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Reference Books:

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

List of Open-Source Software/learning website:

7. <http://szeliski.org/Book/>
8. <http://www.cs.rochester.edu/u/cxu22/t/577F16/>
9. <http://cs.brown.edu/courses/csci1430/>
10. <http://luthuli.cs.uiuc.edu/~daf/CV2E-site/cv2eindex.html>
11. <http://www.cs.ubc.ca/~murphyk/MLbook/>
12. <http://pgm.stanford.edu>

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
COL1	Object and scene recognition and categorization from images	Understanding (2) Applying (3)
COL2	Practically hands-on aspects of computing with images.	Applying (3)
COL3	Geometric relationships between 2D images and the 3D world.	Applying (3)
COL4	Understand image formation, measurement, and analysis.	Understanding (2)
COL5	Image matching methods	Understanding (2)

Mapping of CLO with PO and PSO

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M		M											
CLO2	H	M			M							L				
CLO3	H	M	M		M											
CLO4	M	M	M		M							L				
CLO5	M	M										L				

H: High, M: Medium, L: Low