



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
CEE92C	Machine Vision(MV)	3	--	--	3	--	--	3
		Examination Scheme						
		ISE			MSE		ESE	
		10			30		100 (60% Weightage)	

Pre-requisite Course Codes	Digital Image Processing	
At the end of successful completion of the course, students will be able to		
Course Outcomes	CO1	Understand the concepts of recognition methodology and image enhancement in frequency domain.
	CO2	Analyze the various methods of digital manipulation of images.
	CO3	Analyze the various image compression techniques.
	CO4	Understand the Projective geometry

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Recognition Methodology and Image Enhancement in Frequency Domain		05
	1.1	Recognition Methodology: Conditioning, Labeling, Grouping, Extracting, And Matching.	1	1
	1.2	Frequency domain: Introduction to the Fourier transform and frequency domain concepts,	2	1
	1.3	Filters: Smoothing frequency-domain filters, Sharpening frequency domain filters. (Ideal, Butterworth and Gaussian). Homomorphic Filtering	2	3
2		Image Segmentation and Region Analysis		08
	2.1	Edge Linking using Hough Transform, Thresholding (Otsu's method), and Region growing Segmentation, Split and Merge Technique.	1,2,3,4	04
	2.2	Connected Component Labeling: Iterative Algorithm and Classical Algorithm	1	02
	2.3	Region Analysis: Region properties, External points, Spatial moments, Mixed spatial gray-level moments, Boundary analysis: Signature properties.	1	02
3		Morphological Image Processing		08
	3.1	Binary Morphological Operators, Opening ,Closing	2,5	02
	3.2	Hit-or-Miss Transformation, Boundary Extraction, Region Filling, Thinning and Thickening,	5,7	04
	3.3	Morphological algorithm operations on Gray scale Images	2,5	02
4		Image Representation and Description		06
	4.1	Image Representation: Chain Code, Polygonal approximations,	2,5	02



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		Boundary Segments		
	4.2	Boundary and Regional Descriptors: Shape Numbers, Fourier Descriptors, Topological Descriptors	2,5	02
	4.3	Use of Principal components for Description.	2	02
5		Image Compression		09
	5.1	Introduction, Redundancy, Fidelity Criteria, Elements of Information theory.	2,3	03
	5.2	Lossless Compression Techniques : Huffman Coding, Run Length Coding, Arithmetic Coding, LZW Coding, Differential PCM,	5,6	03
	5.3	Lossy Compression Techniques: Improved Gray Scale Quantization, Transform Coding, Vector Quantization, JPEG, MPEG-1.	2,3	03
6		Geometry for 3-D Vision and Knowledge-Based Vision		06
	6.1	3D vision tasks: Marr's theory, The 3D representation	3	01
	6.2	Geometry for 3-D Vision: Projective geometry, camera calibration, Stereo vision	3,7	03
	6.3	Control strategies: Hierarchical control , Heterarchical Control	1,3	02
		Total		42

References:

- [1] Robert Haralick and Linda Shapiro, "*Computer and Robot Vision*", Vol I, II, Addison Wesley, 1993.
- [2] Rafael C. Gonzalez and Richard E. Woods, "*Digital Image Processing*", Pearson Education Asia, Third Edition, 2009,
- [3] Milan Sonka ,Vaclav Hlavac and Roger Boyle," *Image Processing, Analysis, and Machine Vision* ", Thomson, Second Edition.
- [4] B. Chandra and D. Dutta Majumder, "*Digital Image Processing and Analysis*", Prentice Hall of India Private Ltd
- [5] S Jayaraman, S Esakkirajan, and T Veerakumar "*Digital Image Processing* ", Tata McGraw-Hill Education Private Limited
- [6] Khalid Sayood , "*Introduction to DATA COMPRESSION*", ELSEVIER, Third Edition.
- [7] Ramesh Jain, Rangachar Kasturi, and Brian G. Schunck, "*MACHINE VISION*", McGraw-Hill INTERNATIONAL EDITIONS.
- [8] Anil K. Jain, "*Fundamentals and Digital Image Processing*", Prentice Hall of India Private Ltd, Third Edition
- [9] S. Sridhar, "*Digital Image Processing*", Oxford University Press.