



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
ETC701	Image and Video Processing	4	--	--	4	--	--	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% Weightage)		

Pre-requisite Course Codes	ETC 405: Signals and Systems ETC 602: Discrete Time Signal Processing
After successful completion of the course, student will be able to	
Course Outcomes	CO1 To cover the fundamentals and mathematical models in digital image and video processing.
	CO2 To develop time and frequency domain techniques for image enhancement.
	CO3 To expose the students to current technologies and issues in image and video processing.
	CO4 To develop image and video processing applications in practice.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	Image Fundamentals		1,2	04
	1.1	Image acquisition, sampling and quantization, image resolution, basic relationship between pixels, color images, RGB, HSI and other models		
2	Two Dimensional Transforms		3	06
	2.1	Discrete Fourier Transform, Discrete Cosine Transform, KL Transform, and Discrete Wavelet Transform		
3	Image Enhancement		1,4	08
	3.1	Spatial Domain Point Processing: Digital Negative, contrast stretching, thresholding, gray level slicing, bit plane slicing, log transform and power law transform. Neighborhood Processing: Averaging filters, order statistics filters, high pass filters and high boost filters		
	3.2	Frequency Domain: DFT for filtering, Ideal, Gaussian and Butterworth filters for smoothing and sharpening, and Homomorphic filters		
	3.3	Histogram Modeling: Histogram equalization and histogram specification.		
4	Image Segmentation and Morphology		2,3	07
	4.1	Point, line and edge detection, edge linking using Hough transform		



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		and graph theoretic approach, thresholding, and region based segmentation.		
	4.2	Dilation, erosion, opening, closing, hit or miss transform, thinning and thickening, and boundary extraction on binary images		
5	Image Restoration:		1,2,3	07
	5.1	Degradation model, noise models, estimation of degradation function by modeling, restoration using Weiner filters and Inverse filters .		
6	Video Formation, Perception and Representation		1,2	08
	6.1	Digital Video Sampling, Video Frame classifications, I, P and B frames, Notation, ITU-RBT 601 Digital Video formats, Digital video quality measure.		
	6.2	Video Capture and display: Principle of colour video camera, video camera, digital video		
	6.3	Sampling of video Signals: Required sampling rates, sampling in two dimensions and three dimensions, progressive virus interlaced scans .		
7	Two Dimensional Motion Estimation		2,3	12
	7.1	Optical Flow: 2-D motion Vs optical flow, optical flow equations, motion representation, motion estimation criteria, optimization method.		
	7.2	Pixel based motion estimation: Regularization using motion smoothing constraints, using multipoint neighborhood.		
	7.3	Block Matching Algorithms: Exhaustive block matching algorithms, phase correlation method, Binary feature matching.		
	7.4	Multi resolution Motion Estimation: General formulation, Hierarchical blocks matching Algorithms.		
			Total	52

References:

1. Gonzales and Woods, —*Digital Image Processing*|| , Pearson Education, India, Third Edition,
2. Anil K.Jain, —*Fundamentals of Image Processing*|| , Prentice Hall of India, First Edition, 1989.
3. Murat Tekalp, —*Digital Video Processing*|| , Pearson, 2010.
4. John W. Woods, —*Multidimensional Signal, Image and Video Processing*|| , Academic Press 2012
5. J.R.Ohm , —*Multimedia Communication Technology*", Springer Publication.
6. A.I.Bovik, —*Handbook on Image and Video Processing*", Academic Press.