Course Code	PIT21E102J	Course Name	DIGITAL IMAGE PROCESSING	Course Category	D	Discipline Elective Courses	L	T	P	C
							3	0	2	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering	Department: Computer Science		Data Book / Codes/Standards		

Course Learning Rationale (CLR):	The purpose of learning this course is to:
CLR-1 :	To become familiar with digital image fundamentals
CLR-2 :	To get exposed to simple image enhancement techniques in Spatial and Frequency domain
CLR-3 :	To learn concepts of degradation function and restoration techniques
CLR-4 :	To study the image segmentation and representation techniques
CLR-5 :	To learn about color image processing

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning 1 Level of Thinking (Bloom)	Learning 2 Expected Proficiency (%)	Learning 3 Expected Attainment (%)	PLO 1 Fundamental Knowledge	PLO 2 Application of Concepts	PLO 3 Link with Related	PLO 4 Procedural Knowledge	PLO 5 Skills in Specialization	PLO 6 Ability to Utilize	PLO 7 Skills in Modeling	PLO 8 Analyze, Interpret Data	PLO 9 Investigative Skills	PLO 10 Problem Solving Skills	PLO 11 Communication Skills	PLO 12 Analytical Skills	PLO 13 ICT Skills	PLO 14 Professional Behavior	PLO 15 Life Long Learning
CLO-1 :	Have a thorough understanding of steps involved in Image Processing	3	80	70	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	Perform Image processing using MATLAB	3	85	75	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	Operate on images using the techniques of smoothing, sharpening and enhancement. Understand the restoration concepts and filtering techniques.	3	75	70	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	Apply Image Compression techniques	3	85	80	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	Learn the basics of segmentation, features extraction, and recognition methods for color models	3	85	75	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	What is Digital Image Processing	Frequency Domain Overview	Introduction Constrained least squares	Wavelets	Gray scale morphology,
	SLO-2	Digital Image Processing Techniques	Filtering in the Frequency domain	Constrained least squares filtering	Wavelets in image processing,	Introduction to Segmentation
S-2	SLO-1	Origin Uses of DIP	Obtaining frequency domain	non-linear restoration	Image compression	Point, line
	SLO-2	Image Processing System	Frequency domain filters from spatial filters	Iterative non-linear restoration	Background	edge detection
S-3	SLO-1	Fundamental Steps in DIP	Generating filters directly in the frequency domain	Iterative non-linear restoration using the Lucy-Richardson algorithm	Inverse wavelet transform,	Line detection
	SLO-2	Components of Image Processing System	Sharpening frequency domain filters	Blind deconvolution	Coding redundancy	Line detection using the Hough transform
S 4-5	SLO-1	**Laboratory 1**:The MATLAB Desktop-Using Mat lab Editor Debugger- getting help-saving and Retrieving work session data	**Laboratory 4**: Computing and Visualizing the 2-D DFT in MATLAB	**Laboratory 7**: Non Linear filtering using convolutional masks	**Laboratory 10**:To perform the following morphological operations in an image. (a) erosion, (b) dilation (c) opening, (d) closing.	**Laboratory 13**:Image filtering in spatial and frequency domain.
	SLO-2					
S-6	SLO-1	Image Sampling and Quantization,	The image degradation	Color Image Processing	Irrelevant information	Thresholding,
	SLO-2	Relation Ship Between Pixels	restoration process	converting to other color spaces	Redundancy	region-based segmentation using the watershed transform
S-7	SLO-1	Image Sampling	A model of the image degradation	The basics of color image processing	Spatial redundancy	Segmentation
	SLO-2	Mathematical Tool used In DIP	Noise models	Other basics of color Spaces	jpeg Overview	The Use of Motion in Segmentation

S-8	SLO-1	Background	Restoration	Color transformation,	jpeg compression	Background-Representation
	SLO-2	Intensity transformation	Restoration in the presence of noise only	Spatial filtering of color images	Compression and Decompression	Boundary Descriptors
S 9-10	SLO-1	**Laboratory 2**:Experiment to illustrates the relationship among the intensities (gray levels) of an image and its Histogram.	**Laboratory 5**:Linear filtering using convolution. Highly selective filters	**Laboratory 8**:Morphological operations using a small structuring element on simple binary images	**Laboratory 11**:To perform image compression and decompression	**Laboratory 14**:Morphological operations in analyzing image structures.
	SLO-2					
S-11	SLO-1	Mathematical Tools	Periodic noise reduction	Working directly in a RGB vector space	Morphological image processor:-	Boundary descriptors
	SLO-2	Mathematical Tool used in DIP	Periodic noise reduction by frequency domain filtering	Wavelets:-Background	Morphological preliminaries	Analysis of image Structures
S-12	SLO-1	histogram processing and function Plotting	Modeling in degradation function	The fast wavelet transform	labeling connected components	regional descriptors
	SLO-2	Spatial filtering	Direct inverse	Working with wavelet	Dilation and erosion-combining	Use of Principal Components
S-13	SLO-1	Image processing toolbox	Direct inverse filtering	decomposition structures	dilation and erosion	Principal Components for Description
	SLO-2	standard spatial filters	Wiener filtering	The inverse wavelet transform	Morphological reconstruction	Relational Descriptors

S14-15	SLO-1	**Laboratory 3**:Experiment to show image rotation scaling, and translation	**Laboratory 6**:To perform the Two-dimensional Fourier transform operation in an image.	**Laboratory 9**:Edge detectors and their operation in noisy images	**Laboratory 12**:Perform Color Image Segmentation	**Laboratory 15**:Segmentation using region growing algorithms
	SLO-2					

Learning Resources	1. Rafael C.Gonzalez, Richard E.Woods, Steven L.Eddins, Image Processing, 3rd Edition, Pearson, 2010. 2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002	3. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011

Learning Assessment											
Bloom's Level of Thinking		Continous Learning Assessment(50% Weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4# (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	Create										
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Short Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc

Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
Mr. S. Karthik, IT Analyst, Tata Consultancy Services	Dr. Neelanarayanan,, Professor, School of Computer Science and Engineering, VIT Chennai	Dr. S. P. Angelin Claret
		Dr. P.J.Arul Leena Rose