Programme	**Bachelor of Technology in Electronics and Communication Engineering**				Year of Regulation		**2018-19**
Department	**Electronics and Communication Engineering**				Semester		**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EC 323	**Image Processing**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To study fundamentals of digital image processing.		CO1	Ability to understand the fundamentals of digital image processing.
	To study the various image enhancement techniques in spatial and frequency domain		CO2	Ability to analyse the different enhancement techniques of images in spatial and frequency domain.
	To study different causes for image degradation and image restoration techniques.		CO3	Ability to understand the different causes for image degradation and image restoration techniques.
	To study the morphological operations used in image processing.		CO4	Ability to analyze the various morphological operations used in image processing.
	To study the image segmentation techniques		CO5	Ability to analyse the various techniques employed for images segmentation.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CO1	3	1	1	-	1	-	-	-	1	-	-	-	3	1	1	-
2	CO2	3	3	3	2	3	-	-	-	2	-	-	-	3	2	2	-
3	CO3	3	2	2	-	2	-	-	-	2	-	-	-	3	1	2	-
4	CO4	3	3	3	2	3	-	-	-	2	-	-	-	3	2	2	-
5	CO5	3	3	3	2	3	-	-	-	2	-	-	-	3	2	2	-

SYLLABUS			
No.	Content	Hours	COs
I	Digital Image Fundamentals Digital Image, Image Processing Origins; Fundamentals of Image Processing; Components of Image Processing Systems. Visual Perception, Human Eye, Brightness Adaptation and Discrimination, Image Sensing and Acquisition, Image Formation Models; Image Sampling and Quantization Basic Concepts, Representation Of Image, Special and Gray Level Resolution, Aliasing, Zooming and Shrinking; Relationships Between Pixels, Nearest Neighbour, Adjacency, Connectivity, Regions, And Boundaries; Distance Measures; Image Operations On A Pixel Basis; Linear And Nonlinear Operations.	7	**CO1**
II	Image Enhancement in Spatial Domain and Frequency Domain Gray Level Transformations - Image Negatives, Log, Power-Law and Piecewise Linear Transformation Functions; Histogram Processing, Equalization, Matching; Enhancement Operations - Arithmetic, Logic, Subtraction and Averaging; Spatial Filtering, Linear and Order-Statistics For Smoothing, First and Second Derivatives/Gradients for Sharpening, 2-D Fourier Transform, its Inverse and Properties; Discrete and Fast Fourier Transform; Convolution and Correlation Theorems; Filtering in Frequency Domain - Low Pass Smoothing, High Pass Sharpening, Homomorphic Filtering.	10	**CO2**
III	Image Restoration Image Degradation and Restoration Processes; Noise 'Models - Spatial Properties, Noise Probability Density Functions, Periodic Noise, Estimation of Noise Parameters; Restoration in the Presence Of Noise and Mean Filters, Order-Statistics Filters, Adaptive Filters; Linear Position-Invariant Degradations and Estimation.	6	**CO3**
IV	Morphological Image Processing Preliminaries-Set Theory And Logic Operations In Binary Images; Basic Morphological Operations - Opening, Closing Operators, Dilation and Erosion; Morphological Algorithms - Boundary Extraction, Region Filling, Extraction Of Connected Components, Convex Hull, Thinning, Thickening, Skeletons.	6	**CO4**
V	Image Segmentation Detection of Discontinuities Point, Line And Edges; Edge Linking and Boundary Detection - Local Processing, Global Processing Using Hough Transform; Thresholding - Local, Global And Adaptive; Region-Based Segmentation - Region Growing, Region Splitting And Merging.	7	**CO5**
Total Hours		36	

Essential Readings

1. Gonzalez R. C. and Woods R. E, "Digital Image Processing", Pearson Prentice Hall, 2nd edition, 2002.

Supplementary Readings

1. Sonka M. Hlavac V., Boyle R., "Image Processing, Analysis and Machine Vision", Cengage Learning, 3rd edition, 2007.
2. Gonzalez R. C, Woods R. E and Eddins S. L "Digital Image Processing using MATLAB", McGraw Hill Education, 2nd edition, 2017.