Course Objective: To introduce to the concepts of digital image processing. The students will learn image transforms, image enhancement,restoration, morphological operations, edge detection, and segmentation algorithms.

S. NO	Course Outcomes (CO)
CO1	Understand the fundamental concepts of digital image representation, sampling, quantization, and basic image relationships.
CO2	Apply spatial domain techniques, including gray level transforms, histogram operations, and fuzzy logic, for enhancing digital images.
CO3	Utilize frequency domain techniques, including Fourier transforms, for image enhancement through filtering, smoothing, and sharpening.
CO4	Implement noise removal algorithms and color models to restore degraded images and enhance color images.
CO5	Apply morphological operations such as dilation, erosion, and boundary extraction to process and analyze digital images.
CO6	Detect edges, points, and lines using various operators, and apply image segmentation techniques for partitioning digital images.

S. NO	Contents	Contact Hours
UNIT 1	**Introduction And Digital Image Fundamentals:** Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital image processing systems, Sampling and quantization, some basic relationships like neighbours, connectivity, Distance measure between pixels, Imaging Geometry.	**6**
UNIT 2	**Image Enhancement (Spatial Domain):** Gray level transforms, histogram equalization, histogram specification, basics of the spatial filtering, smoothing operators, image gradients, sharpening operators **Fuzzy logic:** basic definitions, fuzzy operations, fuzzy inference, application of fuzzy logic in image processing.	**7**
UNIT 3	**Image Enhancement (Frequency domain):** Two-Dimensional Fourier transform and its properties, basics of frequency domain filtering, smoothing and sharpening in frequency domain	**7**

UNIT 4	**Image Restoration:** modelling of image degradations, noise models, noise removal algorithms for impulse and Gaussian noise, Adaptive filtering, estimation of degradation function, inverse filtering. **Color Image Processing:** Color models, conversion between different models, color transforms, color smoothing and sharpening.	**8**
UNIT 5	**Morphological Image Processing:** Dilation, Erosion, opening and closing, hit and miss transform, boundary extraction, region filling, thinning, thickening, skeletons, pruning, Gray scale image dilation and erosion.	**6**
UNIT 6	**Discontinuity Detection:** point, line and edge detection, Sobel, Canny, and LoG edge detectors, edge linking. **Image Segmentation:** Thresholding, optimal and global thresholding, multiple thresholding, region growing, region splitting and merging, dam construction watershed segmentation algorithm, spatial techniques, frequency domain techniques.	**8**
	TOTAL	**42**

REFERENCES		
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing', 3rd Edition, Pearson Education	2008
2	Anil K. Jain, Fundamentals of Digital Image Processing', Pearson	2002
3	William K. Pratt, Digital Image Processing' 6th Edition, John Wiley	2002
4	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB, Pearson	2004

B.Tech. Information Technology				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
	L	**T**	**P**	Probability and statistics