

<b>CS410: Digital Image Processing</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Nil</b>
	<b>3</b>	<b>0</b>	<b>2</b>	

**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.

<b>S. No.</b>	<b>Course Outcomes (CO)</b>
<b>CO1</b>	Describe digital image representation and basic processing concepts.
<b>CO2</b>	Apply gray level transforms, histogram techniques, and spatial filtering.
<b>CO3</b>	Implement Fourier Transform and frequency domain filtering for enhancement.
<b>CO4</b>	Apply noise removal algorithms and perform color model conversions.
<b>CO5</b>	Execute dilation, erosion, and image segmentation techniques.

<b>S. No</b>	<b>Contents</b>	<b>Contact Hours</b>
<b>UNIT 1</b>	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.	<b>6</b>
<b>UNIT 2</b>	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.	<b>7</b>
<b>UNIT 3</b>	Image Enhancement (Frequency domain): Two-Dimensional Fourier transform and its properties, basics of frequency domain filtering, smoothing and sharpening in frequency domain.	<b>7</b>

<b>UNIT 4</b>	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	<b>8</b>
<b>UNIT 5</b>	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.	<b>6</b>
<b>UNIT 6</b>	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	<b>8</b>
	<b>Total</b>	<b>42</b>