

BCSE0101: DIGITAL IMAGE PROCESSING

Credits: 03

L-T-P: 3-0-0

Module No.	Content	Teaching Hours
I	<p>Introduction and Fundamentals: Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels.</p> <p>Intensity Transformations and Spatial Filtering: Introduction, Some Basic Intensity Transformation Functions, Histogram Processing, Histogram Equalization, Histogram Specification, Local Enhancement, Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing - Mean Filter, Order Statistics Filters, Sharpening – The Laplacian.</p>	14
II	<p>Filtering in the Frequency Domain: Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain.</p> <p>Morphological Image Processing: Introduction, Logical Operations involving Binary Images, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.</p>	13
III	<p>Image Segmentation: Point, Line & Edge detection, Thresholding, Region-based Segmentation, Region Extraction - Pixel Based Approach & Region Based Approach, Edge and Line Detection - Basic Edge Detection, Canny Edge Detection, Edge Linking - Hough Transform.</p> <p>Representation & Description: Representation - Boundary Following, Chain Codes; Boundary Descriptors – Shape Numbers.</p>	13

Text Books:

- R. C. Gonzalez and R. E. Woods (2011), “Digital Image Processing”, Prentice Hall, 3rd Edition,

Reference Books:

- Bhabatosh Chanda and D. Dutta Majumder (2011), “Digital Image Processing and Analysis”, PHI.
- S. Sridhar (2011), “Digital Image Processing”, Oxford University Press.

Outcome: After completion of course, student will be able to:

- CO1: Understand mathematical formulation of an image, its processing steps and relationship between image pixels.
- CO2: Apply Image enhancement using intensity transformations and spatial filtering.
- CO3: Analyze image enhancement for frequency domain using Fourier transform.
- CO4: Formulate region of interest through morphological operations.
- CO5: Evaluate strongly co-related regions obtained through Segmentation using discontinuity and homogeneity based segmentation techniques
- CO6: Represent and Describe an object of an image using Shape Number and Boundary descriptors.