

Course Type	Course Code	Name of Course	L	T	P	Credit
DC (Hons)	NCSH301	DIGITAL IMAGE PROCESSING	3	1	0	3
Course Objective						
To provide basic and fundamental knowledge on different phases of digital image processing. The proposed syllabus is designed to cover the image analysis part in detail to provide better practical and research understanding for students.						
Learning Outcomes						
Enhance the ability to understand different phases of digital image processing and also to provide better understanding about their uses in real world applications.						
Unit No.	Topics to be Covered	Lecture+ Tutorial	Learning Outcome			
1	Introduction: Image Model, Basic Phases, History, Human Visual System, Image Sampling and Quantization; Image Representation; Image Formats; Pixel Geometry; Mathematical Operators used in Image Processing.	5+1	Understanding of the fundamentals of digital image processing and pixel geometry.			
2	Image Enhancement: Contrast Enhancement, Histogram Processing, Point Processing, Spatial Domain Filtering, Edge Sharpening, Basics of Discrete Fourier Transform, Frequency Domain lowpass and highpass Filtering.	6+2	To understand different image enhancement techniques used in spatial and frequency domain.			
3	Image Restoration: Noise Models, Image Restoration Filtering, Notch Filter, Image Estimation, Geometric Transformation.	4+1	To understand fundamental knowledge about image restoration techniques used in digital image processing.			
4	Image Morphology: Fundamental Operations; Morphological Algorithms; Mathematical Examples.	3+1	Understanding of different operations used in image morphology and corresponding mathematical examples.			
5	Image Segmentation: Pixel-based Segmentation, Multilevel and Adaptive Thresholding, Optimal Thresholding, Region-based Segmentation, Point, Line, and Edge detection; Canny Edge Detector, Hough Transform, Edge Linking.	8+3	To understand the basic principle of image segmentation, different types of segmentation methods and their use in real applications.			
6	Image Compression: Error Criterion, Redundancy and Compression Models, Lossless Compression: Run-length Coding, Shannon-Fano Coding, Huffman Coding, Arithmetic Coding, Lossy Compression: Graylevel Run-length Coding, Block Truncation Compression; Vector Quantization Compression, JPEG2000.	8+3	To understand the basics of image compression and different lossy and lossless compression techniques.			
7	Image Representation and Description: Binary Tree and Quad Tree Coding, Freeman Chain Coding, Polygonal Approximation, Boundary Segments, Medial Axis Generation and Thinning, Boundary Descriptors, Regional Descriptors, Topological Descriptors, Relational Descriptors.	4+2	Understanding of different techniques used for image representation as well as description.			
8	Multiresolution Analysis and Wavelet: Pyramidal Coding; Subband Coding; Application of Wavelets.	4+1	Understanding the effect of multiresolution analysis and its different techniques used in digital image processing.			
Total: 42 (L) + 14 (T)						

Textbooks:

1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing", Pearson Education.

Reference Books:

1. B. Chanda and D. Dutta Mazumdar, "Digital Image Processing and Analysis", PHI.
2. W. K. Pratt, "Digital Image Processing", Wiley-Interscience.
3. A. K. Jain, "Fundamentals of Digital Image Processing", Pearson India Education.