

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: I

Signal Processing and VLSI Technology(EC)

Subject Name: **Digital image processing & pattern recognition**

Sr.No	Course content
1.	Introduction to Image processing, Applications, Image processing system components, Image sensing and acquisition, Image sampling and Quantization, Resolution, classification of Digital Images, Image types, Image file formats, Neighbors of pixel adjacency connectivity, regions and boundaries, Distance measures.
2.	Image Transforms, Need for transform, Fourier Transform, 2D- DFT, Properties of 2D-DFT, Importance of phase, Walsh Transform, Hadamard transform, Discrete Cosine Transform (DCS).
3.	Image Enhancement, Image enhancement in spatial domain, Enhancement through point operation, Types of point operation, Histogram, Histogram Equalization, Linear-nonlinear gray level transform, Image sharpening and smoothing, Bit-plane slicing, Image enhancement in frequency domain, Image arithmetic
4.	Image Restoration and De-noising, Noise models, mean, order—statistics, adaptive filters, Band reject, Band pass and notch filters, Inverse filtering, Wiener Filtering.
5.	Colour Image Processing, Colour models, Pseudo colour, Image processing, colour transformation.
6.	Wavelets and Multi-resolution Processing, Image pyramids, sub-band coding, Harr transform, 1D and 2D Wavelet transforms.
7.	Image Compression, Fundamentals, models, Fundamental coding theorem - Lossless Compression: Huffman Coding- Arithmetic coding - Bit plane coding - Run length coding ,lossy compression, compression standards.
8.	Morphological Image Processing, Erosion and Dilation, Opening and Closing, Hit-or-Miss transformation: Boundary extraction; Hole Filling, connected component extraction, convex hull, Thinning, Thickening, skeletons, pruning.
9.	Image Segmentation, Fundamentals, Detection of Point, Line and edge, Region based segmentation, Image representation, Object recognition, patterns and patterns classes.
10.	Image processing applications: Medical Imaging such as MRI, Computer Tomography and industrial applications, Introduction to video processing and machine vision, Video coding standards

Reference Books:

1. R. C. Gonzalez R. E. Woods, Digital Image Processing, 3/e Pearson Education, New Delhi, 2008
2. S Jayaraman S Esakkirajan T veerkumar, Digital Image Processing, TMH, New Delhi, 2009