

PEI205: DIGITAL IMAGE PROCESSING AND ANALYSIS

L	T	P	Cr
2	1	2	3.5

Course Objectives: To understand the concepts of digital image processing, to enable to design applications of digital image processing.

Fundamentals of image processing : Introduction, Steps in Image Processing Systems, Image Acquisition, Sampling and Quantization Pixel Relationships, Colour Fundamentals and Models, File Formats, Image operations- Arithmetic, Geometric and Morphological.

Image enhancement: Spatial Domain Gray level Transformations Histogram Processing Spatial Filtering – Smoothing and Sharpening. Filtering in Frequency Domain, DFT, FFT, DCT, Smoothing and Sharpening filters, Homomorphic Filtering.

Image segmentation and feature analysis: Detection of Discontinuities, Edge Operators, Edge Linking and Boundary Detection, Thresholding, Region Based Segmentation, Morphological WaterSheds, Motion Segmentation, Feature Analysis and Extraction.

Multi-resolution analysis and compressions: Multi Resolution Analysis: Image Pyramids, Multi resolution expansion, Wavelet Transforms. Image Compression: Fundamentals, Models, Elements of Information Theory, Error Free Compression, Lossy Compression, Compression Standards.

Applications: Image Classification, Image Recognition,/ Image Understanding, Video Motion Analysis, Image Fusion, Steganography, Digital Compositing, Mosaics, Colour Image Processing, etc. in Biomedical, Machine vision/Robotics.

Laboratory work (if any): Experiments around image segmentation, morphological operations, multi resolution analysis and compression, image enhancement and filtering

Course learning outcome (CLO): After the completion of the course the students will be able to:

1. Understand the concept of digital image processing.
2. Apply image smoothing and spatial filtering for images.
3. Study and analyze the performance through frequency domain analysis.
4. Apply image restoration, compression, segmentation and morphological image processing.

Recommended Books:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing” Second Edition, Pearson Education, 2003.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, “Image Processing, Analysis and Machine Vision”, Second Edition, Thomson Learning, 2001
3. Anil K.Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
4. Sanjit K. Mitra, and Giovanni L. Sicuranza, “Non Linear Image Processing”, Elsevier, 2007.

Evaluation Scheme:

Evaluation Elements	Weightage (%)
MST	20
EST	40
Sessionals (May include Assignments/ Projects/ Tutorials/ Quizes/ Lab Evaluations)	40