

Approval: OTA in 2nd Convocation Meeting

Course Name : Digital Image Processing
Course Number : EE-608
Credit : 3

Course Outline:

- 1. Introduction to digital image processing (3hr):** What is image processing, Different types of images, Visual perception, Image sensing and Acquisition, Quantization, Sampling, color image processing, Revision of Mathematical concepts for image processing
- 2. Intensity transformation, Filtering in spatial and Frequency domain (8hr):** Image negatives, Log transformations, Histogram processing, Spatial filter: smoothing and Sharpening, Discrete Fourier transform, properties of 2-D DFT, Image smoothing and Sharpening in Fourier domain
- 3. Image transforms (5hr):** Two-dimensional orthogonal and Unitary transforms, Optimum transform, Properties of Unitary transforms, 2D DFT, Cosine transforms, Hadamard transforms, KL transforms, Comparison of image transforms
- 4. Edge detection (3hr):** Gradient and Laplacian based edge detection, Diffusion based edge detection: Isotropic and anisotropic diffusion.
- 5. Wavelet transform for Image Processing (5hrs):** Multi resolution expansion, Wavelet functions, Wavelet Series expansion, Continuous and Discrete Wavelet transforms, Wavelet transforms for two-dimensional signals (images), Applications of wavelet transforms for edge extraction, noise suppression.
- 6. Image segmentation (5hr):** Thresholding, region-based Morphological Watersheds, Bayesian based image segmentation.
- 7. Image restoration and reconstruction (5hr) :** Models of image degradation, noise models, Spatial and Frequency domain based approaches for image restoration, Inverse filtering, Wiener Filtering, Bayesian denoising.
- 8. Image Compression (4hr):** Spatial and Temporal redundancy, Basic image compression models, compression standards, basic compression methods: Huffman coding, Run-length coding, Block transform coding, Predictive coding

Color Image Processing (4hr): Color Fundamentals, Color Models, Color transformation, smoothing, sharpening and edge detection in color images.