

**Objective(s)**

After learning the course the students should be able to understand the basic image enhancement techniques in spatial & frequency domains, understand the various kind of noise present in the image and how to restore the noisy image, understand the basic multi-resolution techniques and segmentation methods, to apply this concepts for image handling in various fields.

**UNIT I****Digital image fundamentals**

Light and Electromagnetic spectrum, Components of image processing system, Image formation and digitization concepts, Neighbours of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications

**UNIT II****Image Enhancements**

In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters.

**In Frequency domain:** Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.

**UNIT III****Image Restoration:**

Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.

**UNIT IV****Colour Image processing:**

Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation

**Wavelet and Multi-resolution processing**

Image pyramids, Multi-resolution expansion, wavelet transform.

**UNIT V****Image compression**

Introduction, Image compression model, Error-free compression, Lossy compression

**Image segmentation**

Detection of discontinuities, Edge linking and boundary detection, thresholding

**Practical(s)**

Experiments will be based on the topics taught in the theory

**Reference Book(s):**

1. Digital Image Processing, Second Edition by Rafael C. Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI

3. Fundamentals of Digital Image Processing by Anil K Jain, PHI
4. Digital Image Processing Using Matlab, Rafael C. Gonzalez and Richard E. Woods, Pearson Education