

EOPE3003 DIGITAL IMAGE PROCESSING (3-0-0)

Course Objectives:

This course introduces fundamental concepts of digital image processing, covering image representation, enhancement (spatial/frequency domain), restoration, and compression. Students will learn morphological operations, segmentation techniques, and color image processing. Emphasis is placed on practical applications, including noise reduction, edge detection, and recent advancements in the field.

Module-I: (05 hours)

Introduction to image processing: Overview of Image Processing, Image Processing and Related Fields, Digital Image Representation, Types of Images, Digital Image Processing Operations, Fundamental Steps in Image Processing, Image processing Applications.

Digital imaging system: Physical and Biological Aspects of Image Acquisition, Review of Digital Camera, Sampling and Quantization, Image Quality, Image Storage and File Formats.

Module-II: (08 hours)

Image enhancement in spatial domain: Some basic gray level transformations, Histogram processing, Smoothing and Sharpening spatial filters.

Image enhancement in frequency domain: Smoothing and Sharpening frequency domain filters, Homomorphic filtering.

Module-III: (05 hours)

Image restoration: Noise models, Restoration in the presence of noise only-spatial filtering, Estimating the degradation functions, Inverse filtering.

Module-IV: (09 hours)

Image compression: Image compression models, Loss-less and Lossy compression.

Morphological image processing: Dilation and erosion, Opening and closing, some basic morphological algorithms.

Image segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region based segmentation.

Module-V: (04 hours)

Colour image processing fundamentals: Devices for Colour Imaging, Colour Image Storage and Processing, Colour Models, Colour Quantization, Recent developments.

Course Outcome:

Upon completion of the course, the students will be able to:

- CO1: Understand the basics of image processing, image types, digital representation, and applications.
- CO2: Apply spatial and frequency domain techniques for image enhancement.
- CO3: Analyze and implement noise models and restoration techniques for degraded images.
- CO4: Demonstrate understanding of image compression techniques and perform basic morphological and segmentation operations.
- CO5: Explain colour image processing concepts, devices, and recent developments in the field.

Text Books:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, Pearson Education, 2006
2. S. Sridhar, Digital Image Processing, Oxford University Press, 2012

Supplementary Reading:

1. A.K. Jain, Fundamentals of Digital Image Processing, Pearson Education, 2007.