CLUSTER UNIVERSITY OF SRINAGAR

Bachelors in Information Technology
Semester: 7th
Course Type: *MINOR*
Programme: UG

Course Code: UGICT22N701
Credits: 4 (Theory: 3, Practical: 1)
Contact Hrs.: 75 (Theory: 45, Practical: 30)
Max. Marks: 100
Theory External: 60; Min Marks: 24
Theory Internal: 15 Marks, Min Marks: 06
Practical External: 15 Marks, Min. Marks: 06
Practical Internal: 10 Marks, Min. Marks: 04

Title: DIGITAL IMAGE PROCESSING

COURSE OBJECTIVES:

- To introduce the fundamental concepts of digital image processing.
- To understand image acquisition, representation, sampling and enhancement techniques.
- To familiarize students with image transforms, restoration and colour processing.
- To introduce image segmentation, morphology, feature extraction and compression
- To develop basic practical skills in digital image processing

COURSE CONTENT:

UNIT I Digital Image Fundamentals and Enhancement

Introduction to digital image processing, applications and components of a digital image processing system, image acquisition and representation, types of digital images, sampling and quantization, spatial and intensity resolution, basic relationships between pixels, image enhancement, intensity transformations, contrast stretching, histogram processing, histogram equalization, spatial-domain filtering, smoothing and sharpening, spatial correlation and convolution.

UNIT II: Image Transforms, Restoration and Colour Processing

Image transforms and their applications, Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), frequency-domain filtering, smoothing and sharpening in the frequency domain, image degradation and restoration, noise models, noise reduction and basic image restoration techniques, colour image processing, colour models including RGB and HSI, colour transformations and colour enhancement.

UNIT III: Image Segmentation, Morphology, Representation and Compression

Image segmentation, thresholding, edge detection, boundary detection, region-based segmentation, morphological image processing, erosion, dilation, opening and closing, object representation and description, basic feature extraction, image compression, lossless and lossy compression, JPEG and applications of digital image processing

UNIT IV

- Reading, Displaying and Saving Digital Images using suitable image-processing software or programming tools.
- Image Sampling and Quantization and observation of their effects on image quality.
- Histogram Processing and Histogram Equalization for image enhancement.
- Image Smoothing and Sharpening using spatial filters.
- Fourier Transform/FFT for basic frequency-domain image processing.
- Noise Addition and Removal using suitable filtering techniques.
- Edge Detection and Image Segmentation using basic techniques.
- Morphological Operations including erosion, dilation, opening and closing.
- Basic Image Compression using a suitable lossless or lossy technique

COURSE OUTCOMES After completion of the course, students will be able to:

- Explain the fundamental concepts and applications of digital image processing.
- Apply basic techniques for image enhancement and filtering.
- Use image transforms for basic frequency-domain processing.
- Perform basic image restoration, colour processing, segmentation and morphological operations.
- Apply basic image representation, feature extraction and compression techniques.
- Implement basic image-processing operations using suitable software or programming tools.

Text Book

1. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, 4th Edition, Pearson Education.

Reference Books

1. Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall.
2. Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, *Digital Image Processing Using MATLAB*, Pearson Education.