B.Tech III Year II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA
19AEC65c-INTRODUCTION TO IMAGE PROCESSING
(Open Elective-II)

L	T	P	C
3	0	0	3

Course Objectives: The objectives of the course are to make the students learn about
- To learn the fundamentals of Image Processing and learn the different types of image transforms.
- To study different types of filtering techniques for image enhancement.
- To understand various types of image segmentation and thresholding techniques.
- To gain knowledge on wavelets and multi resolution image processing techniques.
- To comprehend various types of image compression and colour image processing methods.

UNIT – I:
Digital Image Fundamentals: Fundamental steps of digital image processing, Components of Digital Image processing, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures. Applications of Digital Image Processing.
Image Transforms: Fourier Transform and its properties in one dimensional and Two dimensional, Discrete Fourier Transform, Discrete Cosine Transform, Discrete Sine transform, Walsh transform, Hadamard transform, Slant transform, KL Transforms and its properties.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the fundamentals of digital image processing.   **L2**
- Analyze the image transforms in one and two dimensions.   **L4**

UNIT – II:
Image Enhancements and Filtering: Gray level transformations, Histogram processing, histogram equalization, Enhancement of Frequency domain, Homomorphic filtering, Filtering in the frequency domain. Image Restoration: A Model of the Image Degradation \ Restoration Process, Noise Models, Inverse filtering, Minimum Mean Square Error (Weiner) Filtering, Constrained least squares filtering.
Learning Outcomes:
At the end of this unit, the student will be able to
- Analyze the filters in spatial and frequency domains.   **L4**
- Understand the image restoration model and various types of noises in image restoration.   **L2**

UNIT – III:
Image Segmentation: Detection of Discontinuities: Point detection, Line detection, Edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation.
Learning Outcomes:
At the end of this unit, the student will be able to
- Learn the concept of image segmentation.   **L1**
- Analyze various types of thresholding techniques.   **L4**

UNIT – IV:
Wavelets and Multi-resolution image processing: Back ground, Image Pyramids, Sub band coding, The Haar Transform.Multi resolution Expansions: Series Expansions, Scaling Functions, Wavelet Functions, Wavelet Transform in One dimension: The wavelet series expansions, The Discrete wavelet transform, The Continuous Wavelet Transform, The Fast wavelet Transform, Wavelet transform in two dimensions, Wavelet Packets.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the wavelets in one dimension and two dimensions.   **L2**
- Explain the multi-resolution expansions and fast wavelet transform.   **L1**

UNIT – V:

Image Compression: Redundancy, coding, inter-pixel and psycho-visual; Loss less compression – Huffmann coding, predictive coding; Lossy Image compression- predictive and transform coding; Image compression standards.

Color Image Processing: Color Fundamentals, Color models–RGB, CMY, HSI; Pseudo color Image Processing, Basics of Full color Image Processing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need for image compression and its types.   **L2**
- Learn the color image processing and various types of color models.   **L1**

Text Books:

1. R.C. Gonzalez and R.E. Woods, "Digital Image Processing", Second Edition, Pearson Education, 2008.
2. Anil Kumar Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2nd edition 2004.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. S Jayaraman, S Esakkirajan and T Veerakumar, "Digital Image processing", Tata McGraw Hill.
3. William K. Pratt, "Digital Image Processing", John Wiley, 3rd Edition, 2004.

Course Outcomes:

At the end of this Course the student will be able to

- Understand the fundamentals of Image Processing and apply different types of image transforms.   **L2**
- Correlate different types of filtering techniques for image enhancement.   **L4**
- Understand various types of image segmentation and thresholding techniques.   **L2**
- Gain knowledge on wavelets and multi resolution image processing techniques.   **L1**
- Summarize different types of image compression and colour image processing methods.   **L2**