

20CS007 FUNDAMENTALS OF IMAGE PROCESSING

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	-	15	30	-	5	5	-

Course Description and Objectives:

To introduce the fundamentals of image processing at Low Level and Mid-Level; and it covers Spatial and Frequency domain image enhancement, Edge detection, Segmentation, image compression and morphological image processing. And to provide the student with programming experience from enhance the image and object recognition applications in MATLAB.

Course Outcomes:

Upon completion of this course, student should able to ::

- ✓ Understand the basic concepts of Image Acquisition system.
- ✓ Describe known techniques of enhancement of image using spatial and frequency domain.
- ✓ Understand the various Segmentation methods based on discontinuity and similarity of pixels.
- ✓ Understand the design of a image compressor system.

SKILLS:

- ✓ Learn about various enhancement techniques using GIMP and MATLAB
- ✓ Analyze both smoothing and sharpening filters.
- ✓ Analyze the various Segmentation techniques for specific applications.
- ✓ Understand the application of various morphological operations.
- ✓ Study and implement of various Image Compressor systems.

Unit-I

Fundamentals of Image Processing: Fundamental steps in digital image processing, components of image processing system. Image sensing and acquisition, A simple image formation model, image sampling and quantization, basic relationships between pixels. Basic geometric transformations- Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms-Walsh – Hadamard – Discrete Cosine Transform.

Unit-II

Image enhancement in the spatial and frequency domains : Basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods, The basics of filtering in frequency domain, smoothing and sharpening Frequency domain filters.

Image Restoration:A model of image degradation/restoration, Noise models, inverse filtering, wiener filtering, Constrained Least Squares Filtering, Geometric Mean Filter.

Unit-III

Image Segmentation :Fundamentals, Basics of Point, Line and Edge detection, Thresholding, Segmentation by region growing, Segmentation by Region splitting, Segmentation by merging, Segmentation using morphological watersheds, Color image segmentation.

Unit-IV

Image Compression: Fundamentals, Huffman coding, Golomb Coding, Arithmetic coding, LZW coding, Run-length coding.

Morphological Image Processing: Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms.

Unit-V

Feature Extraction: Background, Boundary preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principle Components as feature descriptors, Whole-image features.

TEXT BOOKS:

1. Digital Image Processing, RafealC.Gonzalez, Richard E.Woods, Fourth Edition, Pearson Education/PHI.

REFERENCE BOOKS:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing using Matlab, RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.
5. Digital Image Processing, William K. Prat, Wily Third Edition
6. Digital Image Processing and Analysis, B. Chanda, D. Datta Majumder, Prentice Hall of India, 2003.