

MCA 408 Digital Image Processing

Teaching Scheme

Lectures: 3 hrs/Week

Tutorials: 1 hr/Week

Credits: 4

Examination Scheme

Class Test -12Marks

Teachers Assessment - 6Marks

Attendance – 12 Marks

End Semester Exam – 70 marks

Head

Department of Computer Applications
Faculty of Computer Applications
Invertis University, Bareilly (UP)

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Registrar
Invertis University
Bareilly

Dean Academics

Faculty of Computer Applications
Invertis University, Bareilly

Prerequisite: - Basic Logical operations, Computer Graphics.

Course Objectives:

1. To describe and explain basic principles of digital image processing.
2. To study basic image operations.
3. To understand the algorithms that perform basic image processing (e.g. noise removal and image enhancement).
4. To design and implement algorithms for advanced image analysis (e.g. image morphing, image segmentation).
5. To expose students to current applications in the field of DIP.

Detailed Syllabus

UNIT I

Introduction to digital image processing, applications, steps of digital image processing, Components of Image Processing system, Image sampling and Quantization.

UNIT II

Image Enhancement in Spatial Domain: Meaning of spatial domain, image negatives, log transformation, power law transformation, Introduction to histogram Processing, histogram equalization, histogram specification, Enhancement using logical AND and logical OR operator, Image subtraction, Image Averaging.

UNIT III

Image Enhancement in Frequency Domain: meaning of frequency domain, one dimensional Fourier frequency domain and its inverse, Two dimensional Fourier frequency domain and its inverse, filtering in frequency domain, Smoothing Frequency-Domain Filters- Ideal Low pass Filters, Butterworth Low pass Filters, Gaussian Low pass Filters, Sharpening Frequency Domain Filters- Ideal High pass Filters, Butterworth High pass Filters, Gaussian High pass Filters.

UNIT IV

Image Restoration: Introduction to image restoration. Model of the Image Degradation/Restoration Process, Restoration in the Presence of Noise- arithmetic mean filter, geometric mean filter, harmonic mean filter, contra harmonic mean filter, Minimum Mean Square Error (Wiener) Filter, Geometric Mean Filter.

UNIT V

Morphological Image Processing: Basic Concepts from Set Theory, Logic Operations Involving Binary Images, Dilation and Erosion, Opening and Closing, Hit or Miss Transformation, Extensions to Gray-Scale Images- Dilation, Erosion, Opening and Closing.

UNIT VI

Image Segmentation: Detection of Discontinuities- Point Detection, Line Detection, Edge Detection, Global Processing via Graph-Theoretic Techniques, Thresholding- Foundation, Basic Global Thresholding, Basic Adaptive Threshold, Region-Based Segmentation- Basic Formulation, Region Growing, Region Splitting and Merging.

Text and Reference Books

1. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson, 3rd, 2004.
2. Digital Image Processing, Rafael C. Gonzalez & Richard E. Woods, PHI, 10th, 2005.
3. Digital Image Processing using MATLAB, Rafael, Richard & Steven, Pearson, 11nd, 2007.
4. Digital Image Processing, Jayaraman S, Veerakumar T, Esakkirajan S, TMH, 1st, 2009.

Course Outcomes:

After completing the course, students will be able to:

1. Understand general terminology of digital image processing.

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