

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Computer Engg.) (Full Time)			
Subject Code & Name	Instructions Hours per Week			Credits			
CER6E4 Digital Image Processing	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives:

To learn about the basic concepts of digital image processing and various image transforms.
 To familiarize the student with the image enhancement techniques
 To expose the student to a broad range of image processing techniques and their applications.
 To appreciate the use of current technologies those are specific to image processing systems.
 To expose the students to real-world applications of image processing.

Pre requisites:

Linear Algebra. Differential Equations, Probability and Statistics, Calculus, Digital Electronics (just basic), Basic Programming skills (C++, MATLAB or any).

COURSE OF CONTENTS

UNIT I

FUNDAMENTALS OF IMAGE PROCESSING:

Introduction – Applications of Image Processing - Steps in image processing Applications - Digital imaging system- Sampling and Quantization - Pixel connectivity – Distance measures - Color fundamentals and models - File Formats, Image operations.

UNIT II

IMAGE ENHANCEMENT AND IMAGE RESTORATION :

Image Transforms: Fast Fourier Transform and Discrete Fourier Transform. Image Enhancement in Spatial and Frequency domain - Gray level transformations - Histogram processing - Spatial filtering - Smoothing and sharpening - Frequency domain: Filtering in frequency domain. Image Restoration - Image degradation model - Noise modeling – Blur – Order statistic filters – Image restoration algorithms.

UNIT III

MULTI RESOLUTION ANALYSIS AND COMPRESSION :

Multi Resolution analysis: Image pyramids - Multi resolution expansion - Wavelet transforms Image compression : Fundamentals - Models - Elements of information theory - Error free compression - Lossy compression - Compression standards

UNIT IV

IMAGE SEGMENTATION AND FEATURE EXTRACTION :

Image Segmentation - Detection of discontinuities - Edge operators - Edge linking and boundary Detection - Thresholding - Region based segmentation. Image Features and Extraction – Image Features – Types of Features – Feature extraction - Texture - Feature reduction algorithms – PCA – Feature Description.

UNIT V

IMAGE CLASSIFICATION AND APPLICATIONS OF IMAGE PROCESSING :

Image classifiers – Bayesian Classification, nearest neighborhood algorithms - Support Vector Machines - Image Clustering Algorithms – Hierarchical and Partitional clustering algorithms. Case Studies in Image Security - Steganography and Digital watermarking - Visual effects and Digital compositing - Case studies in Medical Imaging and remote sensing.

Learning Outcomes:**On Completion of the course, the students should be able to:**

1. Implement basic image processing algorithms.
2. Design an application that uses different concepts of Image Processing.
3. Apply and develop new techniques in the areas of image enhancement- restoration- segmentation- compression-wavelet processing and image morphology.
4. Critically analyze different approaches to different modules of Image Processing.

TEXT BOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, —Digital Image Processing, Third Edition, Pearson Education, 2009.
2. S.Sridhar, —Digital Image Processing, Oxford University Press, 2011.

REFERENCES:

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, —Image Processing, Analysis and Machine Vision, Second Edition, Thompson Learning, 2007.
2. Anil K.Jain, —Fundamentals of Digital Image Processing, PHI, 2011.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, —Non Linear Image Processing, Elsevier, 2007.