

DIGITAL IMAGE PROCESSING

VII Semester: ECE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEC508	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 45	
<p>OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> I. Understand the image fundamentals and mathematical transforms necessary for image processing. II. Describe the image enhancement techniques. III. Evaluate the image restoration procedures. IV. Analyze the image compression procedures. V. Design the image segmentation and representation techniques. <p>COURSE OUTCOMES (Cos):</p> <p>CO 1: Review the fundamental concepts of a Digital Image Processing System. Analyze general terminology of DIP. Examine various types of Transforms</p> <p>CO 2: Examine various types of images, intensity transforms and Image Enhancement with spatial filtering. Develop FT for Image Enhancement in frequency domain. Analyze images in the frequency domain Using various filters.</p> <p>CO 3: Evaluate the model, approaches, and filtering techniques for image Restoration.</p> <p>CO 4: Interpret Image Segmentation and representation techniques. Evaluate the methodologies for image segmentation, restoration etc.,</p> <p>CO 5: Categorize various Compression techniques and Interpret Image Compression standards.</p> <p>COURSE LEARNING OUTCOMES (CLOs) :</p> <ol style="list-style-type: none"> 1. Understand the image fundamentals, image transforms, relationship between pixels. 2. Explore sampling and quantization in terms of images. 3. Analyze the types of transforms, properties mathematical proofs etc., 4. Determine the Advanced transforms, implementations using software's 5. Explore the Image enhancement in spatial domain, different types of point processing. 6. Understand the Histogram , histogram manipulation, Linear and nonlinear gray level transformation. 7. Analyze the Local or neighborhood operation, median filter processing, Spatial domain high pass filtering etc.. 8. Generating filters directly in the frequency domain, obtaining frequency domain filters from spatial filters. 9. Understand the filtering in frequency domain, smoothing and sharpening filters in frequency domain. 10. Understand the Image restoration degraded model . 11. Determine algebraic approach to restore and inverse filtering. 12. Understand least mean square filters. 13. Determine the constrained least square restoration, restoration, image restoration. 14. Illustrate the Image segmentation detection of discontinuities and edge linking and boundary detection. 15. Determine the threshold and the region oriented segmentation morphological image processing dilation and erosion. 16. Understand structuring element decomposition, the strel function, opening and closing and hit and miss transform 17. Describe the image compression, redundancies and removal methods. 18. Understand fidelity criteria, image compression models, source encoder and decoder, error free compression 19. Determine lossy compression, JPEG 2000 standards 								

UNIT - I	INTRODUCTION	Classes: 10
Digital image fundamentals and image transforms digital image fundamentals, sampling and quantization, relationship between pixels; Image transforms: 2-D FFT, properties, Walsh transform, Hadamard transform, discrete cosine transform, Haar transform, Slant transform, Hotelling transform.		
UNIT - II	IMAGE ENHANCEMENT	Classes: 09
Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing, histogram manipulation, linear and non-linear gray level transformation, local or neighbourhood operation, median filter processing; Spatial domain high pass filtering, filtering in frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, low pass (smoothing) and high pass (sharpening) filters in frequency domain.		
UNIT - III	IMAGE RESTORATION	Classes: 09
Image restoration degradation model, algebraic approach to restoration, inverse filtering. Least mean square filters, constrained least square restoration, interactive restoration		
UNIT - IV	IMAGE SEGMENTATION	Classes: 09
Image segmentation detection of discontinuities, edge linking and boundary detection, threshold, region oriented segmentation morphological image processing dilation and erosion, structuring element decomposition, the Strel function, erosion; Combining dilation and erosion: Opening and closing the hit and miss transformation.		
UNIT - V	IMAGE COMPRESSION	Classes: 09
Image compression: Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression, JPEG 2000 standard.		
Text Books:		
<ol style="list-style-type: none"> 1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", Pearson, 3rd Edition, 2008. 2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, "Digital Image Processing", TMH, 3rd Edition, 2010. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Rafael, C. Gonzalez, Richard E woods, Stens L Eddings, "Digital Image Processing using MAT LAB", Tata McGraw Hill, 2nd Edition, 2010. 2. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, 1st Edition, 1989. 3. Somka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, 1st Edition, 2008. 4. Adrain Low, "Introductory Computer vision Imaging Techniques and Solutions", Tata McGraw-Hill, 2nd Edition, 2008. 5. John C. Russ, J. Christian Russ, "Introduction to Image Processing & Analysis", CRC Press, 1st Edition, 2010. 		