

IMAGE PROCESSING

III Group: CSE / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACS511	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>COURSEOBJECTIVES:</p> <p>The course should enable the students to:</p> <ol style="list-style-type: none"> 1. Understand the concepts of digital image processing methods and techniques. 2. Study the image techniques in spatial and frequency domain for image quality improvement. 3. Learn the image restoration and compression techniques for optimization. 4. Explore on color image features and transformation techniques. 5. Illustrate the techniques of image segmentation to identify the objects in the image. <p>COURSE OUTCOMES(COs):</p> <p>CO 1: To Understand the need for image transforms different types of image transforms and their properties.</p> <p>CO 2: Learn different techniques employed for the enhancement of images</p> <p>CO 3: Learn different causes for image degradation and overview of image restoration techniques.</p> <p>CO 4: Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.</p> <p>CO 5: Learn different morphological algorithms for image analysis and recognition</p> <p>COURSE LEARNING OUTCOMES(CLOs):</p> <ol style="list-style-type: none"> 1. Understand the key concepts of Image Processing. 2. Identify the origins of the Digital image processing Understand instruction types, addressing modes and their formats in the assembly language programs. 3. Demonstrate the scope of the digital image processing in multiple fields 4. Explore on overview of the components contained in the general purpose image processing system and its use in real time applications 5. Describe the concept of elements of visual perception. 6. Use the concept of sampling and quantization in general digital images. 7. Explore on the basic relationships existed between the pixels in the image. 8. Illustrate different mathematical tools used in image intensity transformations for quality enhancement. 9. Use histogram processing techniques in image enhancement and noise reduction. 10. Understand the impact of smoothing and sharpening filters in spatial domain. 11. Apply the Fourier transform concepts on image function in frequency domain filters(low pass/high pass). 12. Describe the concept of image degradation or restoration of images. 13. Understand the various kind of noise present in the image and how to restore the noisy image. 14. Understand the differences of inverse, least square and Wiener filtering in restoration process of images. 15. Understand the color fundamentals and models in image processing 16. Memorize the transformation techniques in pseudo color image processing. 17. Use wavelet concepts in multi-resolution processing. 18. Understand the basic multi-resolution techniques and segmentation methods 								

19. Explore on lossy/lossless compression models using wavelets.		
20. Use morphological operations like dilation and erosion to represent and describe regions, boundaries etc. in identification of the components in images.		
UNIT-I	INTRODUCTION	Classes: 10
Introduction: What is digital image processing, origins of digital image processing, examples of fields that use dip, fundamental steps in digital image processing, components of an image processing system; Digital image fundamentals: Elements of visual perception, a simple image formation model, basic concepts in sampling and quantization, representing digital images, spatial and gray-level resolution, zooming and shrinking digital images, some basic relationships between pixels, linear and nonlinear operations.		
UNIT-II	IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN	Classes: 10
Image enhancement in the spatial domain: Some basic gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatial filtering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods; Image enhancement in the frequency domain: Introduction to the fourier transform and the frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filtering.		
UNIT-III	IMAGE RESTORATION AND FILTERING	Classes: 08
Image restoration: A model of the image degradation/restoration process, noise models, restoration in the presence of noise only spatial filtering, periodic noise reduction by frequency domain filtering, Image filtering: Linear position invariant degradations, estimating the degradation function, inverse filtering, minimum mean square error (wiener) filtering, constrained least square filtering, and geometric mean filter.		
UNIT-IV	IMAGE PROCESSING	Classes: 10
Color fundamentals: Color models, pseudo color image processing, basics of full-color image processing, color transformations, smoothing and sharpening, color segmentation, noise in color images, color image compression; Wavelets and multi resolution processing: Image pyramids, sub band coding, the haar transform, multi resolution expansions, wavelet transforms in one dimension, fast wavelet transform, wavelet transforms in two dimensions, wavelet packets; Image compression: Fundamentals, image compression models, error-free (lossless) compression, lossy compression.		
UNIT-V	MORPHOLOGICAL IMAGE PROCESSING	Classes: 07
Morphological image processing: Preliminaries, dilation and erosion, opening and closing, the hit-or-miss transformation, some basic morphological algorithms; Image segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region-based segmentation.		
Text Books:		
RafaelCGonzalez, RichardE. Woods, -DigitalImageProcessingI, PHI, 2 nd Edition, 2005.		

Reference Books:

1. K.Jain,-Fundamentals of Digital Image Processing, Pearson, 3rd Edition, 2004.
2. Scott.E.Umbaugh,-Digital Image Processing and Analysis, CRC Press, 2nd Edition, 2014.
3. S.Jayaraman, S.Esakkirajan, T.Veerakumar,-Digital Image Processing, McGraw-Hill Education. (India) Pvt. Ltd., 2013.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm.
2. <http://www.ocw.mit.edu/resources/#Mathematics>.
3. <http://www.sosmath.com/>.
4. <http://www.mathworld.wolfram.com/>.

E-Text Books:

1. <http://www.e-booksdirectory.com/details.php?ebook=10166>.
2. <http://www.e-booksdirectory.com/details.php?ebook=7400re>.

Course Home Page: