DIGITAL IMAGE PROCESSING

VI Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AECB35	PE-II	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

COURSE OBJECTIVES:

The students will try to learn:

I The fundamental concepts of digital image processing methods and techniques.

II The image enhancement, image segmentation and compression techniques in spatial and frequency domains.

III The algorithms to solve image processing problems to meet design specifications of various applications of image processing in industry, medicine and defense.

IV Fundamentals of image representation and processing in MATLAB.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1 **Outline** the principles and terminology of digital image processing for describing the features of image.

CO 2 **Demonstrate** 2D Fourier transforms and its properties for frequency domain representation of the image.

CO 3 **Make use of** various image transform techniques like Walsh, Hadamard, Slant, DCT and Haar transforms for analyzing images in transform domain.

CO 4 **Construct** image intensity transformations and spatial filtering for image enhancement in the spatial domain.

CO 5 **Identify** 2D convolution and filtering techniques for smoothening and sharpening of images in frequency domain.

CO 6 **Illustrate** image degradation models, noise models for modeling of degradation function.

CO 7 **Distinguish** the image restoration in the spatial and frequency domains to deal with different types of noise models for removing degradation from given image

CO 8 **Apply** region and edge based image segmentation techniques for detection of objects in images.

CO 9 **Select** morphological operations for removing the imperfections in the structure of the image.

CO10 **Compare** lossy and lossless compression models for achieving image compression.

CO 11 **Explain** the source encoder and decoder techniques for image compression.

CO 12 **Implement** standard image processing algorithms alone or as a member of a small group to meet design specifications.

MODULE -I INTRODUCTION

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, Hoteling transform.

MODULE -II	IMAGE ENHANCEMENT
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 neighborhood 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.	
MODULE -III	**IMAGE RESTORATION**
Image restoration degradation model, algebraic approach to restoration. Inverse filtering, least mean square filters, constrained least square restoration, interactive restoration	
MODULE -IV	**IMAGE SEGMENTATION**
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.	
MODULE -V	**IMAGE COMPRESSION**
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:

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:

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.

Web References:

1. https://imagingbook.com/
2. https://en.wikipedia.org/wiki/Digital_image_processing
3. http://www.tutorialspoint.com/dip/
4. http://www.imageprocessingplace.com

E-Text Books:

1. http://www.sci.utah.edu/~gerig/CS6640-F2010/dip3e_chapter_02.pdf
2. http://www.faadooengineers.com/threads/350-Digital-Image-Processing
3. http://newwayofengineering.blogspot.in/2013/08/anil-k-jain-fundamentals-of-digital.html