Digital Image Processing

CourseCode	23EC4702C	**Year**	IV	**Semester**	I
Course Category	PE–V	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Digital Signal Processing
ContinuousInternal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Understand the fundamentals and advances in Machine vision.	L2
CO2	Apply the mathematical knowledge for image analysis	L3
CO3	Analyse the various restoration techniques on images.	L4
CO4	Analyse various image processing algorithms.	L4
CO5	Apply the image processing algorithms to real time applications.	L3

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3-High, 2: Medium, 1:Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3				2						2	2	
CO2	3				2						2	2	
CO3	3	3			2						2	2	
CO4	3	3			2						2	2	
CO5	3				2						2	2	
Avg.	3	3			2						2	2	

Syllabus		
UnitNo.	**Contents**	**Mapped CO**
1	**Introduction:** Introduction to Image Processing, Examples of fields that use Digital Image Processing, Fundamental steps in digital image processing, components of an image processing system, Elements of Visual Perception, Light and the Electromagnetic Spectrum, Examples of the fields that use Digital Image Processing. Image sensing and acquisition, image sampling and quantization, Some basic relationships between pixels, An introduction to the mathematical tools used in digital image processing. **Image Transforms:** Need for image transforms, Image transforms, Fourier Transform, 2D Discrete Fourier Transform and its properties, Walsh Transform, Hadamard transform, Haar Transform, Discrete Cosine transform, KL Transform, Singular Value Decomposition.	CO1,CO2
2	**Intensity Transformations and Spatial Filtering:** Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, and sharpening spatial filters. **Filtering in the Frequency Domain:** The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering	CO2,CO3
3	**Image Restoration and Reconstruction:** 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, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering	CO2,CO3

4	**Wavelets and Multi resolution Processing:** Image pyramids, sub band coding, Multi resolution expansions, wavelet transforms in one dimensions& two dimensions, Wavelet packets. **Image compression:** Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Block Transform coding, Predictive coding	CO1,CO2, CO4
5	**Image segmentation:** Fundamentals, point, line, edge detection, thresholding, and Region –based segmentation. **Color image processing:** Color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.	CO1,CO4, CO5,

---

Learning Resources
Text Books
1 R. C. Gonzalez and R. E. Woods, "Digital Image Processing, 3rd Ed., Pearson,2008.
Reference Books
1 Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 9th Ed., Indian Reprint, 2002. 2 Jayaraman, S. Esakkirajan, and T. Veerakumar," Digital Image Processing", Tata McGraw-Hill Education, 2009.
e-Resources & other Digital Material
1. http://nptel.iitm.ac.in/video.php?subjectId=117105079