SWE1010	Digital Image Processing	L	T	P	J	C
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Pre-requisite	MAT1011	Syllabus version				
		v. 1.0				

Course Objectives:

1. Introduce the concept of digital image and the fundamental steps in digital image processing
2. Learn applying basic image processing techniques for developing specific image processing systems.
3. Comprehend the steps of experimental design for a particular problem domain and demonstrate the system of image processing.

Expected Course Outcome:

1. Understand the concepts of image acquisition and digitization .
2. Classify image enhancement techniques and apply these techniques in both spatial and frequency domain.
3. Recognize the types of noise present in images and apply appropriate image restoration technique.
4. Categorize image segmentation techniques and apply these techniques
5. Study the importance of image compression and apply basic compression techniques to images.
6. Analyse various image representation techniques & descriptors and understand its importance to computer vision.
7. Implement basic morphological image processing techniques on images and understand color models for images
8. Learn digital image processing stepts and apply appropriate techniques to a specific problem domain.

Student Learning Outcomes (SLO)	1,2,5,6,14,17

Module:1	DIGITAL IMAGE FUNDAMENTALS	6 hours

Introduction, Digital Image Fundamentals, image acquisition and display using digital devices - Human visual perception, properties -Image sampling and quantization-Basic relationship between pixels.

Module:2	IMAGE ENHANCEMENT	8 hours

Image enhancement in the spatial domain: basic grey level transformation, Histogram Processing-Enhancement using arithmetic/Logic operations-Spatial filtering: smoothing and sharpening. Image enhancement in the frequency domain:Introduction to two-dimensional transforms- Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform **-** smoothing frequency domain filtering-sharpening frequency domain filtering

Module:3	IMAGE RESTORATION	5 hours

Noise Models-Restoration in the presence of Noise only-spatial filtering-periodic noise reduction by frequency domain filtering.

Module:4	IMAGE SEGMENTATION	8 hours

Detection of discontinuities, Edge Linking and Boundary Detection, Thresholding Methods, Region Oriented Methods.		
Module:5	**IMAGE COMPRESSION**	**5 hours**
Lossless Image Compression- The Concept of entropy and Huffman coding; Run-length coding for grey images,Lossy Image Compression – Predictive coding, transform coding – JPEG compression standard, Wavelet-based image compression JPEG2000.		
Module:6	**REPRESENTATION AND DESCRIPTION:**	**5 hours**
Chain codes, Polygonal approximation, Signature Boundary Segments, Skeltons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors.		
Module:7	**MORPHOLOGICAL AND COLOR IMAGE PROCESSING**	**6 hours**
Dilation and Erosion-Opening and Closing-Hit or Miss Transformation-Basic morphological algorithms.Color Image processing: Light and color, color formation, Colour models, Histogram of a color Image, Color image filtering, Gamma correction and segmentation of color image.		
Module:8	**Contemporary issues:**Applications of Image Processing in industry	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)

1. R.C. Gonzalez & R.E. Woods,"Digital Image Processing" , Pearson Education, Third Edition,2013

Reference Books

1. S. Jayaraman, S. Esakirajan & T.Veerakumar " Digital Image Processing", Tata Mcgraw-Hill First Edition 2009.
2. A. K. Jain**,** "Fundamentals of Digital Image Processing," Pearson Education (Asia) Pte. Ltd./Prentice Hall of India, 2004.
3. Jhon C Ross, " The Image Processing Hand Book", CRC Press 5th Edition,2006
4. B. Chanda and D. Dutta Majumdar "Digital Image Processing and Analysis", PHI, 2011.

Recommended by Board of Studies	12.06.2015		
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