

IMAGE PROCESSING AND ANALYSIS

V Semester: CSE(DS)									
Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIA	SEE	Total
ACDC08	Elective	3	0	0	3	30	70	100	
		Contact Classes: 45			Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 45		
Prerequisites:									
I. COURSE OVERVIEW:									
The course is deliberate to provide image processing fundamentals, sampling, image acquisition and histogram processing. Image segmentation techniques, restoration models and the applications of enhancement, morphology, and classification, visualization of 2D and 3D images.									
II. COURSE OBJECTIVES:									
The students will try to learn:									
I. Image processing concepts, analysis and techniques									
II. The image analysis and its classifications									
III. Visualization of different kinds of images.									
III. COURSE OUTCOMES:									
After successful completion of the course, students should be able to:									
CO 1	Understand the principles of image processing and techniques for describing the Digital Imaging System (DIS).						Understand		
CO 2	Analyze various techniques for image enhancement and develop image restoration models.						Analyze		
CO 3	Apply image segmentation methods for transforming the image and conduct Image Morphology.						Apply		
CO 4	Apply image segmentation techniques for the classification of image using the features of the image.						Apply		
CO 5	Understand the different techniques for image registration.						Understand		
CO 6	Analyze the Visualization methods and apply them for 2D and 3D images.						Analyze		
IV. SYLLABUS:									
MODULE – I: IMAGE PROCESSING FUNDAMENTALS (09)									
Introduction – The Origins and fields of image processing – Steps in Digital Imaging System – Image Sensing and Acquisition – Sampling and Quantization – Pixel Relationships – File Formats – color images and models - Image Operations – Arithmetic, logical, statistical and spatial operations.									
MODULE – II: IMAGE ENHANCEMENT AND RESTORATION (09)									
Basics of Intensity Transformation and Spatial functions – Intensity Transformation functions -- Histogram Processing – Smoothing and Sharpening – Smoothing and Sharpening spatial filters – Homomorphic Filtering, Noise models, Constrained and Unconstrained restoration models.									
MODULE – III: IMAGE SEGMENTATION AND MORPHOLOGY (09)									
Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Motion Segmentation, Image Morphology: Binary and Gray level morphology operations - Erosion, Dilation, Opening and Closing Operations Distance Transforms- Basic morphological Algorithms.									
Features – Textures - Boundary representations and Descriptions- Component Labeling – Regional descriptors and Feature Selection Techniques.									
MODULE – IV: IMAGE ANALYSIS AND CLASSIFICATION (09)									
Image segmentation- pixel based, edge based, region-based segmentation. Active contour models and Level sets for medical image segmentation, Image representation and analysis, Feature extraction and representation, Statistical, Shape, Texture, feature and statistical image classification. Descriptors, Whole-image Features Object, Scale, Invariant Feature Transform (SIFT).									

MODULE – V: IMAGE REGISTRATION AND VISUALISATION (09)

Rigid body visualization, Principal axis registration, Interactive principal axis registration, feature based registration, Elastic deformation-based registration, Image visualization – 2D display methods, 3D displays methods, virtual reality based interactive visualization.

IV. TEXTBOOKS:

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Pearson Education, 3rd Edition, 2008, New Delhi.
2. S.Sridhar, “Digital Image Processing”, Oxford University Press, 2011.

V. REFERENCE BOOKS:

1. Alasdair McAndrew, “Introduction to Digital Image Processing with Matlab”, Cengage Learning 2011,India
2. Anil J Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
3. KavyanNajarian and Robert Splerstor, “Biomedical signals and Image processing”,CRC – Taylor and Francis, New York, 2006

VI. WEB REFERENCES:

1. https://www.academia.edu/19746149/Digital_Image_Processing_3rd_Edition_Instructors_Manual_Rafael_C_Gonzalez
2. https://www.academia.edu/18324189/Digital_image_processing_using_matlab_gonzalez
3. <https://pdfs.semanticscholar.org/15bd/427a1a5f9bc57a7f67fb1b1fc85c5bb39f46.pdf>
4. <https://www.udemy.com/topic/digital-image-processing/https://www.edx.org/course/image-processing-and-analysis-for-life-scientists>