

## COURSE STRUCTURE

Digital Image Processing SEMESTER – VII			
Course Code:		Course Credits:	03
Teaching Hours / Week(L:T:P):	3:0:0	CA Marks:	40
Total Number of Teaching Hours:	45	END-SEM Marks:	60
Course Pre-requisites: NIL			
Course Description: a. In this course... b. This course provides a complete understanding of the various image processing c. Techniques d. Students’ learn about... e. At the end of this course...			
Course Learning Objectives: This course will enable the students to: 1. Understand the mathematical foundations and core concepts of digital image processing. 2. Apply various spatial and frequency domain techniques to enhance digital images. 3. Implement morphological operations for image preprocessing and analysis. 4. Analyze and apply region and edge-based techniques for effective image segmentation. 5. Develop and evaluate solutions for real-world problems using image processing techniques.			
Course Outcome: CO1 Explain fundamental concepts and components of digital image processing systems. CO2 Apply spatial and frequency domain techniques for image enhancement. CO3 Implement morphological operations for shape and structure analysis in images. CO4 Use segmentation techniques to extract meaningful regions from images. CO5 Design, implement, and evaluate image processing applications in practical contexts.			
UNIT – I	Introduction to Digital Image Processing		9-- Hours
Main Topic-1: Introduction to Image processing: Fundamental steps in image processing; Components of image processing system; Main Topic-2: Pixels; coordinate conventions; Imaging Geometry; Spatial Domain; Frequency Domain; sampling and quantization; Main Topic-3: Basic relationship between pixels; Applications of Image Processing			
Pedagogy	ICT Teaching / Power Point Presentation and Videos		
	Self-study / Do it yourself		
	Experiential Learning Topics:		

	<b>Case Study / PBL - Project Based Learning</b>	
<b>UNIT – II</b>	Image Enhancement in spatial domain	<b>9--Hours</b>
<b>Main Topic-1:</b> Image Enhancement in spatial domain Basic Gray Level Transformation functions – Image Negatives; <b>Main Topic-2:</b> Log Transformations; Power-Law Transformations. Piecewise-Linear Transformation Functions: Contrast Stretching; Gray Level Slicing; Bit Plane Slicing; Histogram Processing–Equalization; Specification. <b>Main Topic-3:</b> Basics of Spatial Filtering – Smoothing: Smoothing Linear Filters; Ordered Statistic Filters; Sharpening		
<b>Pedagogy</b>	<b>ICT Teaching / Power Point Presentation and Videos</b>	
	<b>Self-study / Do it yourself</b>	
	<b>Experiential Learning Topics:</b>	
	<b>Case Study / PBL - Project Based Learning</b>	

<b>UNIT – III</b>	<b>Image Enhancement in Frequency Domain</b>	<b>9--Hours</b>
<p><b>Main Topic-1:</b> Image Enhancement in Frequency Domain Basics of Filtering in Frequency Domain, Filters - Smoothing Frequency</p> <p><b>Main Topic-2:</b> Domain Filters : Ideal Low Pass Filter; Gaussian Low Pass Filter; Butterworth Low Pass Filter;</p> <p><b>Main Topic-3:</b> Sharpening Frequency Domain Filters: Ideal High Pass Filter; Gaussian High Pass Filter; Butterworth High Pass Filter; Homomorphic Filtering</p>		
<b>Pedagogy</b>	<b>ICT Teaching / Power Point Presentation and Videos</b>	
	<b>Self-study / Do it yourself</b>	
	<b>Experiential Learning Topics:</b>	
	<b>Case Study / PBL - Project Based Learning</b>	

<b>UNIT – IV</b>	<b>Morphological Operations</b>	<b>9--Hours</b>
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<b>Main Topic-1:</b> Morphological Operations Basics of Set Theory; Dilation and Erosion - Dilation, Erosion; Structuring Element; <b>Main Topic-2:</b> Hit or Miss Transformation. Representation and Description <b>Main Topic-3:</b> Boundary, Chain codes, Polygonal approximation approaches, Boundary segments.	
<b>Pedagogy</b>	<b>ICT Teaching / Power Point Presentation and Videos</b>
	<b>Self-study / Do it yourself</b>
	<b>Experiential Learning Topics:</b>
	<b>Case Study / PBL - Project Based Learning</b>

<b>UNIT – V</b>	<b>Image Segmentation</b>	<b>9--Hours</b>
<b>Main Topic-1:</b> Image Segmentation: Pixel-Based Approach- Multi- Level Thresholding, Local Thresholding, Threshold Detection <b>Method;</b> <b>Main Topic-2:</b> Region-Based Approach- Region Growing Based Segmentation, Region Splitting, Region Merging, <b>Main Topic-3:</b> Split and Merge, Edge Detection - Edge Operators; Line Detection, Corner Detection.		
<b>Pedagogy</b>	<b>ICT Teaching / Power Point Presentation and Videos</b>	
	<b>Self-study / Do it yourself</b>	
	<b>Experiential Learning Topics:</b>	
	<b>Case Study / PBL - Project Based Learning</b>	

### **Text Books:**

1. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI

### **Reference Books:**

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Introduction to Digital Image Processing with Matlab, Alasdair McAndrew, Thomson Course Technology
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing using Matlab, Rafeal C.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education

### **URLs (Optional) - List of Online Courses**

## ASSESSMENT AND EVALUATION PATTERN

WEIGHTAG  
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## Continuous Assessment (CA)

## End Semester Assessment (ESA)

CA - Assignments (PBL / Case Study / Presentation / Seminar / Group Discussions / Quiz / Test)

**ESA** - Bloom's Taxonomy Levels: Remembering, Understanding, Applying, Analyzing, Evaluating, and Creating

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**Experiential Learning** - Internship (Summer / Winter) / Industry Visit / Site Visit / Field Trips

Project Based Learning – Mini (Minor) Project / Major Project

**Course Articulation Matrix (CO-PO Mapping) [Subject Title–Subject Code]**

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2
CO-1	3	2											3	
CO-2	3	3	2										3	
CO-3	2	3	2										3	2
CO-4	2	2	3	2	2								3	3
CO-5	2	3	3	3	2				2	2		3	3	3

3 – HIGH, 2 – MEDIUM, 1 – LOW

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