



# C. U. SHAH UNIVERSITY - Wadhwan City

## FACULTY OF TECHNOLOGY AND ENGINEERING

### DEPARTMENT OF COMPUTER ENGINEERING

#### B.TECH. SEMESTER: - VIII

**SUBJECT NAME: – Digital Image Processing**

**SUBJECT CODE: - 4TE08DIP1**

#### Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme								
		Th	Tu	Pr	Total		Theory				Practical (Marks)				Total
							Sessional Exam		University Exam		Internal		University		
							Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr		
4TE08DIP1	Digital Image Processing	3	0	2	5	4	30	1.5	70	3.0	-	20	30	150	

#### Objectives:

The learning objectives of this course are to:

- Introduce students to the fundamentals of digital image processing covering following topics: image models and physical imaging systems, visual perception, rendering systems, linear filtering, linear trans-forms, mathematical morphology, compression, and inverse problems in imaging, image enhancement, image segmentation, feature extraction and geometric diffusion.

#### Prerequisites:

- Since Digital Image processing is a subfield of signals and systems, so it would be good if students already have some knowledge about signals and systems, but it is not necessary. Students must have some basic concepts of digital electronics.

#### Course outline:

Sr. No.	Course Contents	Total Hrs.
1	<b>Introduction:</b> The Origins Of Digital Image Processing, Example Of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System	<b>04</b>

2	<b>Digital Image Fundamentals:</b> Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels Linear and Nonlinear Operations	06
3	<b>Image Enhancement in The Spatial Domain:</b> Background, Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods	07
4	<b>Image Enhancement in the Frequency Domain:</b> Introduction to the 2D Fourier transform, Smoothing frequency-domain filters, Sharpening frequency domain filters, Homomorphic filtering, Implementation	07
5	<b>Image Restoration:</b> A model of the image degradation/Restoration Process, Noise Models, Restoration in the process of noise only-spatial filtering, Periodic Noise Reduction by Frequency domain filtering, Linear Position invariant degradation and Estimation, Inverse filtering and Minimum mean square error (Wiener) filtering, Constrained Least square filtering, Geometric Mean filtering, Geometric transformation.	08
6	<b>Introduction to Color Image Processing:</b> Color Models and its Fundamentals Pseudo color Image Processing, Basics of Full-color Image Processing, Color Transformation, Smoothing and Sharpening, Noise in Color Images	06
7	<b>Morphological Image Processing:</b> Introduction and preliminaries, Dilation and Erosion Opening and closing, The hit or miss transformation, Basic morphological operation.	06
8	<b>Image Segmentation:</b> Detection of discontinuity, Edge linking and boundary detection, Thresholding, Region based segmentation	04
	<b>Total</b>	<b>48</b>

### Learning Outcomes:

This course is designed to help the students to:

- Apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
- Analyze and implement image processing algorithms.
- Gain hands-on experience in using software tools for processing digital images.

### Books Recommended:

1. Digital Image Processing”, Third Edition by Gonzalez & Wood.
2. Fundamentals of digital image processing”, by A. K. Jain PHI Publication.
3. Digital Image Processing” by Sanjay Sharma, S K Katariya & Sons
4. Digital Image Processing”, First Edition by S Jayaraman, Tata Mcgraw Hill