GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Computer Science & Engineering (CBA/BDA/CS/CSE)
Semester	VI	Version	1.1.0.1
Effective from Academic Year	2024-25	Effective for the batch Admitted in	June 2022
Subject code	2CSE60E20	Subject Name	Image Processing

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	0	1	0	3	Theory	40	60	100
Hours	2	0	2	0	4	Practical	30	20	50

Pre-requisites:

Engineering Mathematics, Algorithms

Objectives of the Course:

- Understand image formation and the role human visual system plays in perception of grey and colour image data.
- Describe various applications of image processing in various sectors like medical, defence, etc.
- Learn the signal processing algorithms and techniques in image enhancement and image restoration.
- Apply various image processing techniques to solve real world problems.

Theory Syllabus

Unit	Content	Hrs
1.	**Introduction and Digital Image Fundamentals:** Digital Image Fundamentals, Human visual system, Image as a 2D data, Image representation – Gray scale and Color images, image sampling and quantization	3
2.	**Image enhancement in Spatial domain:** Basic gray level Transformations, Histogram Processing Techniques, Histogram equalization, Histogram Matching, Spatial Filtering, Low pass filtering, High pass filtering, Mexican Hat Transformation,	5
3.	**Filtering in the Frequency Domain:** Introduction to the Fourier transform and frequency domain concepts, Extension to functions of two variables, low pass filter, high pass filter, Laplace transformation, Image Smoothing, Image Sharpening, Homo-morphic filtering	5
4.	**Image Restoration and Reconstruction:** Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.	5
5.	**Colour Image Processing:** Colour Fundamentals, Colour Models, Pseudo colour image processing	4
6.	**Image Compression:** Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, Error free compression, Lossy compression. LZW coding, JPEG Compression standard	4
7.	**Morphological Image Processing:** Erosion, dilation, opening, closing, Basic Morphological Algorithms: hole filling, connected components, thinning, skeletons	4

Self-Learning

Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, Error free compression, Lossy compression. LZW coding, JPEG Compression standard

Practical Contents

- Read an 8 bit image and then apply different image enhancement techniques: (a) Brightness improvement (b) Brightness reduction (c) Thresholding (d) Negative of an image (e) Log transformation (f) Power Law transformation.
- Implement different interpolation techniques using MATLAB/ Scilab
- Read an image, plot its histogram then do histogram equalization. Comment about the result.
- Implement various Smoothing spatial filters.
- Write a program to implement various low pass filters and high pass filters in frequency domain.
- Write a program for erosion and dilation, opening & closing using inbuilt and without inbuilt function.
- Implement and study the effect of Different Mask (Sobel, Prewitt and Roberts)
- Implement various noise models and their Histogram
- Implement inverse filter and wiener filter over image and comment on them
- Implement Image compression using DCT Transform

Text Books

1.	Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education

Reference Books

1	Milan Sonka, Vaclav Hlavav, Roger Boyle, ―Image Processing, Analysis and Machine Vision‖, 2nd ed., Thomson Learning, 2001
2	Pratt W.K, ―Digital Image Processing‖, 3rd ed., John Wiley & Sons, 2007
3	Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education
4	Fundamentals of Digital Image Processing by Anil K Jain, PHI

Course Outcomes:

Cos	Description
CO1	Understand image formation and the role human visual system plays in perception of gray and colour image data.
CO2	Describe various applications of image processing in various sectors like medical, defence, etc.
CO3	Learn the signal processing algorithms and techniques in image enhancement and image restoration.
CO4	Apply various image processing techniques to solve real world problems.

Mapping of CO and PO:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**2**	**2**	**3**	**3**	**3**	**1**	**1**	**3**	**3**	**2**	**3**
CO2	**2**	**2**	**2**	**3**	**3**	**2**	**1**	**1**	**2**	**3**	**3**	**3**
CO3	**2**	**3**	**3**	**2**	**3**	**3**	**1**	**1**	**3**	**3**	**2**	**3**
CO4	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**