



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Subject Code : 3164804

Subject Name : Digital Image Processing

w. e. f. Academic Year:	A.Y. 2024-25
Semester:	6
Category of the Course:	Professional Elective Course

Prerequisite:	Knowledge of Fourier transforms Probability theory, good programming skills.
Rationale:	This course will provide students with more techniques in the digital image processing for image enhancement as well as restoration of noisy images. Emphasis is given more on implementation of various algorithms so that students will be able to develop their own algorithm. The techniques covered in the syllabus have wide applicability in any field which needs to handle the image data.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
1	Understand the basic image enhancement techniques in spatial & frequency domain.	U
2	Analyze the various kind of noise present in the image and how to restore the noisy image	A
3	Evaluate the basic multi-resolution techniques and segmentation methods on various problems.	E
4	To apply this concepts for image handling in various fields	Ap

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Tutorial / Practical		
				ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Subject Code : 3164804

Subject Name : Digital Image Processing

Course Content:

Unit No.	Content	No. of Hours	% of Weight age
1.	Digital image fundamentals: Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbours of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications.	08	20
2.	Image Enhancements: In spatial domain: Basic gray level transformations, Histogram processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters...	15	30
3	Image Restoration: Various noise models, image restoration using spatial domain Filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering. .	07	20
4	Colour Image processing: Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation.	05	05
5.	Wavelet and Multi-resolution processing: Image pyramids, Multi-resolution expansion, wavelet transform.	04	10
6.	Image compression: Introduction, Image compression model, Error-free compression, Lossy compression.	04	05
7.	Image segmentation: Detection of discontinuities, Edge linking and boundary detection, thresholding.	05	10

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)				
R Level	U Level	A Level	N Level	E Level
20	20	15	10	05

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Digital Image Processing, Second Edition by Rafael C. Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Subject Code : 3164804

Subject Name : Digital Image Processing

3. Fundamentals of Digital Image Processing by Anil K Jain, PHI
4. Digital Image Processing Using Matlab, Rafael C. Gonzalez and Richard E. Woods, Pearson Education

(b) Open source software and website:

Link:<https://nptel.ac.in/courses/117105135>

Link: https://onlinecourses.nptel.ac.in/noc24_ee38/preview

List of Open Source Software/learning website:

1. MATLAB with image processing toolbox.
2. Scilab (SIP)

Open ended problems:

1. Enhance the given degraded image (pick up any suitable degraded image which contains letters also) such that we may be able to read the letter properly. Try to get the best possible quality of image.
2. Identify the type of the noise present in the image using frequency as well as in spatial domain concepts and judge the basic behavioral characteristics of the various noises.
3. Capture the real time binary photo and apply the various segmentation algorithms to identify the various objects present in the image (i.e road, trees, river etc.)
4. Assign face recognition problem.

ACTIVE LEARNING ASSIGNMENTS:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.