Kadi Sarva Vishwavidyalaya

Gandhinagar-382015

B.E Semester: 8
Electronics & Communication Engineering
Subject Name: Digital Image Processing
Subject Code: EC-801

A. Course Objective:

The educational objectives of this course are

- To present a problem oriented introductory knowledge of digital image processing.

- To address the underlying concepts and methods behind human vision, digital image processing and its applications.

B. Teaching / Examination Scheme

SUBJECT		Teaching Scheme				Total Credit	Evaluation Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EC- 801	Digital image processing	4	0	2	6	5	3	70	30	20	30	150

C. Syllabus

1 **Introduction:** Overview of digital image processing, Image representation, Types of images based on color, digital image processing operations, applications

2 **Fundamental of Digital Imaging**: Human visual system & its properties, Sampling & quantization, Image storage & file formats, Some basic relationships between pixels, An introduction to the mathematical tools used in digital image processing

3 **Image Transformation in Spatial domain:** Basic Intensity Transformations functions, Histogram Processing, Fundamentals of Spatial Filtering

4 **Filtering in the Frequency Domain:** Preliminary Concepts, Extension to functions of two variables, 2D - Discrete Fourier Transform, Image Smoothing, Image Sharpening, Homomorphic filtering

5 **Color Image Processing:** Color Fundamentals, Color Models, Pseudo color image processing

6 **Image Compression:** Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, JPEG Compression standard

7 **Morphological Image Processing:** Erosion and dilation, Opening and closing, Basic Morphological Algorithms: Boundary Extraction, Hole filling, Thinning, Thickening

| | | | **Kadi Sarva Vishwavidyalaya** |
| | | | **Gandhinagar-382015** |

D. **Lesson Planning**

Sr. No.	No. of Hrs.	% Weight-age in Exam	Topic
1	06	**12**	**Introduction** Overview of digital image processing, Image representation, Types of images based on color, digital image processing operations, applications
2	09	**16**	**Fundamental of Digital Imaging**: Human visual system & its properties, Sampling & quantization, Image storage & file formats, Some basic relationships between pixels, An introduction to the mathematical tools used in digital image processing
3	10	**14**	**Image Transformation in Spatial domain:** Basic Intensity Transformations functions, Histogram Processing, Fundamentals of Spatial Filtering
4	10	**14**	**Filtering in the Frequency Domain:** Preliminary Concepts, Extension to functions of two variables, 2D- Discrete Fourier Transform, Image Smoothing, Image Sharpening, Homomorphic filtering
5	08	**12**	**Color Image Processing:** Color Fundamentals, Color Models, Pseudo color image processing.
6	09	**16**	**Image Compression:** Fundamentals of redundancies, Basic Compression Methods: Huffman coding, Arithmetic coding, JPEG Compression standard
7	08	**16**	**Morphological Image Processing:** Erosion and dilation, Opening and closing, Basic Morphological Algorithms: Boundary Extraction, Hole filling, Thinning, Thickening
TOTAL	60	**100**	

E. **Instructional Method & Pedagogy**

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed

- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weight age should be given to all topics while teaching and conduction of all examinations.

- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.

- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.

- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.

- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

- Experiments shall be performed in the laboratory related to course contents.

- Experiments shall be performed in the laboratory using MATLAB, Scilab, or lab view.

Suggested list of Experiments

Sr. No	Name Of Experiment
1	To read , write and display the image
2	Compression of image files form '.tif' to '.jpg.'
3	To find connectivity between given pixel
4	To generate negative, bright and dark image from given image
5	To see the effect of reducing the number of gray levels in an image
6	To see the effect of zooming the original image.
7	Program to show the bit plane slicing, it also illustrate the usage of command 'bit get'
8	To retrieve image from magnitude and phase information from its Fourier transform.
9	To find and display the FFT of a 2D image and see the effect of rotation of image on its FFT
10	Program to find out histogram of the image and to illustrate the usage of command 'imhist'. Program for image enhancement using Histogram equalization.
11	To pass the image through a low pass filter and see its effect
12	To pass the image through a high pass filter and see its effect
13	To illustrate the effect of high pass filter using various operators.
14	Program to show the high pass filtering in spatial domain, the mask used is 'Sobel' mask. It also illustrates the usage of command 'conv2'.

F. **Students Learning Outcomes**

On successful completion of the course

- The student can identify different areas of image processing. One can find the applications of all the areas in day to day life from industry, medical science, PCB verification etc.

G. **Recommended Study Materials**

Text/ Reference Books:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Third Edition, Pearson Education
2. Digital Image Processing Using MATLAB, Rafael C. Gonzalez, Richard E. Woods, and Steven L. Eddins, Second Edition, Tata McGraw Hill Publication
3. Digital Image Processing, S Sridhar, Oxford University Press.