Subject Name : Image Processing

Subject Code : CE 704-1 / IT 704-1

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	Total
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	Marks
04	00	02	06	5	3	70	30	20	30	150

Learning Objectives:

- To understand the sensing, acquisition and storage of digital images.
- To study the image fundamentals and mathematical transforms necessary for image processing.
- To understand the digital processing systems and corresponding terminology.
- To understand the base image transformation domains and methods.
- To have an understanding of colour models, type of image representations and related statistics.
- To study the image enhancement techniques.
- To study image compression procedures.
- To study image segmentation and representation techniques.
- To study image restoration.

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Introduction to computer graphics	4
2	Image processing fundamentals	6
3	Image Enhancement	10
4	Image Restoration	10
5	Colour Image Processing	12
6	Image Compression	10
7	Morphological Image Processing – Overview	8

Total hours (Theory): 60

Total hours (Lab): 30

Total hours: 90

Detailed Syllabus:

Sr. No	Topic	Lecture Hours	Weight age(%)
1	**Introduction to Computer Graphics:** • Introduction of Coordinate representation and Pixel • Raster Scan & Random Scan systems • Video controller and raster scan display processor.	4	8
2	**Introduction to image processing:** • Fundamentals • Applications • Image processing system components • Image sensing and acquisition • Sampling and quantization • Neighbors of pixel adjacency connectivity • regions and boundaries • Distance measures.	6	12
3	**Image Enhancement:** • Frequency and Spatial Domain • Contrast Stretching • Histogram Equalization • Low pass and High pass filtering.	10	16
4	**Image Restoration:** • Noise models • mean, order—statistics • adaptive filters • Band reject, Band pass and notch filters	10	16
5	**Colour Image Processing:** • Colour models • Pseudo colour Image processing • Colour transformation and segmentation.	12	20
6	**Image Compression:** • Fundamentals • Models • Error free and lossy compression • Standards.	10	16
7	**Morphological Image Processing: Overview** • Boundary extraction • Region filtering • Connected component extraction • Convex hull • Thinning; Thickening; skeletons; pruning; Image segmentation.	8	12
	Total	**60**	**100**

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be   discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome:

On successful completion of the course, the student will:
- Be able to understand basic concepts image processing, image storage and types of transformations that can be applied to images.
- Be able to compare the domains and methods of image processing.
- Be able to check the correctness of algorithms using inductive proofs and loop invariants.
- Learn Image Restoration & Enhancement techniques, colour image processing.
- Be able to make proper use of image processing tools.
- Familiar with morphological image processing.

Text Book:
1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education

Reference books:
1. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI
2. Fundamentals of Digital Image Processing by Anil K Jain, PHI
3. Digital Image Processing Using Matlab, Rafel C. Gonzalez and Richard E. Woods, Pearson Education

List of experiments:

Sr. No	Name of Experiment
1	Image Printing Program Based on Halftoning.
2	Reducing the Number of Intensity Levels in an Image.
3	Zooming and Shrinking Images by Pixel Replication.
4	Zooming and Shrinking Images by Bilinear Interpolation.
5	Arithmetic Operations.
6	Image Enhancement Using Intensity Transformations.
7	Histogram Equalization.
8	Spatial Filtering.
9	Enhancement Using the Laplacian.
10	Unsharp Masking.