

<b>Subject Code :</b> 1CS2010308	<b>Subject Title:</b> IMAGE PROCESSING
<b>Pre-requisite :</b>	Knowledge of Computer Graphics is desirable.

**Course Objective:**

The objectives of the course are to:

- Understand basic concepts and methodologies for digital image processing
- Develop a foundation that can be used as the basis for further study and research in this field
- Provide understanding of the different types of image representations, enhancing Image characteristics, image filtering, and reducing the effects of noise and blurring

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory		Practical		Total
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	3	6	60	40	30	20	150

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	<b>Introduction to Digital Image Processing and Fundamental</b> Introduction: What is Digital Image Processing, The origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamental steps in Digital Image processing, Components of Image Processing system Fundamentals, Image Sensing and Acquisition, Image Sampling and Quantization, Image data Formats.	4	10
2	<b>Transformations, Histogram Processing and Spatial Filtering</b> Image Enhancement in the spatial domain: Background, Some basic gray level Transformation, Introduction of Histogram processing, Enhancement using Arithmetic/Logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.	10	25
3	<b>Image Restoration and Compression</b> Image Restoration and compression: A model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only spatial filtering, , Image Compression: Fundamentals: Coding Redundancy, Spatial and Temporal Redundancy, Image Compression models, Error-free Compression: Huffman Coding, Arithmetic Coding, LZW coding, Bit plane coding, Run length coding, Introduction to JPEG.	8	20
4	<b>Color and Morphological Image Processing</b> Techniques of color image processing: Color image signal representation, color system Transformations, Morphology: Dilation, Erosion, Opening and Closing, Hit-and Miss transform, Morphological Algorithms: Boundary Extraction, Region filling, Extraction of connected components, Convex Hull.	8	20
5	<b>Image Segmentation and Object Recognition</b> Image Segmentation and object detection: Point, Line and Edge detection, Hough Transform for Detection, Thrashing – Local and Global, Region Based Segmentation, Wavelet transform and application for Image Segmentation, Distance Transform and Watershed Segmentation. Object Recognition: Decision Theoretic Methods-Maximum Distance classifier, Correlation matching, Optimal Statistical Classifier and String Matching	8	20

**Course Outcome:**

At the end of this course, the student would be able

- To choose the appropriate data type and data structure for a given problem.
- To choose the best algorithm to solve a problem by considering various problem characteristics, such as the data size, the type of operations, etc.
- To create the algorithms and program of various operations on Queues, Stacks, Linked Lists, Trees, Graphs, Sorting, Searching, Hash tables etc.
- To evaluate algorithms with respect to time and space complexity.

**List of References:**

1. Digital Image Processing, R.C. Gonzalez and R.E. Woods, Addison-Wesley (Pearson Education Asia), 3rd edition
2. Fundamentals of Digital Image Processing, Anil K. Jain, Prentice-Hall India, 2001
3. Digital Image Processing and Analysis, B. Chanda and D. Datta Majumder, Prentice-Hall India, 2001
4. Digital Image Processing, Madhuri A. Joshi, PHI, 2006

**The Syllabus content for Practical Sessions:**

**List of Experiments:**

**Note:** The experiment list provided beneath is for reference only. The course teacher may Change/formulate it as per his/her methodology and requirement.

Sr.No	Practical Exercise
1	<b>Introduction to MATLAB and Image Processing toolbox [10%]</b> Digital Image representation using MATLAB, Image I/O and Display, Classes and Image types, M-function programming
2	<b>Transformations, Histogram Processing and Spatial Filtering [25%]</b> Intensity transformations functions of MATLAB, Histogram Processing and Function Plotting, Image processing toolbox standard Spatial Filters, Computing and Visualizing the 2-D DFT in MATLAB, High pass (Sharpening) and Low pass (Smoothing) filters I frequency domain
3	<b>Image Restoration and Compression [25%]</b> Noise models, Restoration using spatial filtering, Coding redundancy, Spatial redundancy, Irrelevant information, JPEG compression
4	<b>Color and Morphological Image Processing [20%]</b> Color Image representation in MATLAB, Converting between Color Spaces, Basics of Color Image Processing, Morphological Image processing: Dilation and erosion, Labeling Connected components ,Gray scale morphology
5	<b>Image Segmentation and Object Recognition [20%]</b> Point , line and Edge Detection, Hough Transform, Thrashholding, Region based and Water Shed Transform

**List of Reference (Practical) :**

1. Digital Image Processing using MATLAB, R.C. Gonzalez and R.E. Woods, Steven L. Eddins McGraw Hill, 2nd Edition