Course Title: Image Processing
Course no: CSC-363 **Full Marks**: 70+10+20
Credit hours: 3 **Pass Marks**: 28+4+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: This course deals with image components.

Goal: To be familiar with processing of the images, recognition of the pattern and their applications.

Unit 1. Introduction to Digital Image Processing: 4 Hrs.

Digital image representation, Digital image processing: Problems and applications, Elements of visual perception, Sampling and quantization, relationships between pixels

Unit 2. Two-dimensional Systems: 5 Hrs.

Fourier transform and Fast Fourier Transform, Other image transforms and their properties: Cosine transform, Sine transform, Hadamard transform, Haar transform

Unit 3. Image Enhancement and Restoration: 8 Hrs.

Point operations, contrast stretching, clipping and thresholding, digital negative, intensity level slicing, bit extraction, Histogram modeling: Equalization modification, specification, Spatial operations: Averaging, directional smoothing, median, filtering spatial low pass, high pass and band pass filtering, magnification by replication and interpolation

Unit 4. Image Coding and Compression: 4 Hrs.

Pixel coding: run length, bit plan, Predictive and inter-frame coding

Unit 5. Introduction to Pattern Recognition and Images: 3 Hrs.

Unit 6. Recognition and Classification: 5 Hrs.

Recognition classification, Feature extraction, Models, Division of sample space

Unit 7. Grey Level Features Edges and Lines: 6 Hrs.

Similarity and correlation, Template matching, Edge detection using templates, Edge detection using gradient models, model fitting, Line detection, problems with feature detectors

Unit 8. Segmentation: **3 Hrs.**

Segmentation by thresholding, Regions for edges, line and curve detection

Unit 9. Frequency Approach and Transform Domain: **3 Hrs.**

Unit 10. Advanced Topics: **4 Hrs.**

Neural networks and their application to pattern recognition, Hopfield nets, Hamming nets, perceptron

Laboratory works: Developing programs of above features.

Text / Reference books:

1. K. Castlemann, "*Digital Image Processing*", Prentice Hall of India Ltd., 1996.
2. A. K. Jain, "*Fundamental of Digital Image Processing*", Prentice Hall of India Pvt. Ltd., 1995.
3. R. C. Gonzalez and P. Wintz, "*Digital Image Processing*", Addison-Wesley Publishing, 1987.
4. Sing_Tze Bow, M. Dekker, "*Pattern Recognition and Image Processing*", 1992
5. M. James, "*Pattern Recognition*", BSP professional books, 1987.
6. P. Monique and M. Dekker, "*Fundamentals of Pattern Recognition*", 1989.

