Course code : CSE-4875
Course title : Pattern Recognition and Image processing
Credit Hours: 3 **Contact Hours:** 3 per week
[Pre requisite: CSE-4703]

Course Objectives:
The course objectives include: overview of digital image processing field ;understand the fundamental DIP algorithms and implementation; gain experience in applying image processing algorithms to real problems, understanding basic concept of pattern recognition.

Learning Outcomes:
After completing this course the students will learn

- The basic concepts of two-dimensional image acquisition, sampling, and quantization.
- Spatial filtering techniques, including linear and non-linear methods.
- The fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection.
- Programming techniques in digital image processing related problems.
- Understand segmentation and feature extraction process of pattern recognition.
- To develop a complete pattern recognition system to classify the patterns from images.
- Demonstrated teamwork and communication skills through course projects

Section-A (Mid-term: 30 Marks)

1. Introduction: Introduction of Digital Image Processing and Pattern Recognition, Application areas, Fundamental steps of Digital Image Processing, Components of Digital Image Processing, Image & Video, Image & Human eyes, Color TV scheme.
2. Analog and Digital Image: Analog and Digital Image, Image Acquisition and acquisition devices, Spatial and amplitude quantization, Pixels, Resolution, Aspect Ratio, Gray levels, Relationship color and gray levels.
3. Image Enhancement: Different types of Image Enhancement operations, Spatial domain and frequency domain processing, Different types of filtering.

Section-B (Final Exam: 50 Marks)

Group-A (20 Marks)

4. Image Compression: Fundamental concepts of Image Compression and Data Compression, Data Redundancy, Image Compression models, Error free and Lossy compression, Image Compression Standards.
5. Morphological processing: Morphological Image Processing, Dilation, Erosion, Opening, Closing, Hit and Miss etc.

Group-B (30 Marks)

6. Segmentation: Image Segmentation, Different types of Segmentation, Edge linking and boundary detection, Thresholding, Region oriented segmentation,
7. Image Representation: Object representation and description algorithms, Run Code, Chain Code, Signature, Skeleton, Boundary detection, Feature Extraction few case studies.
8. Pattern Recognition: Fundamental concepts of Pattern Recognition, Pattern, Pattern Classes, Types of Pattern Recognition, Decision Theoretic methods, Structural method, Statistical method, Neural Network, Few case studies like speech recognition, fingerprint recognition, character recognition etc.

Recommended Books:

1. R. C. Gonzalez, R. E. Woods :Digital Image Processing .

2. Earl Gose :Pattern Recognition and Image Analysis.
3. Related Papers from Journals and Conferences
4. I.T. Young, J.J. Gerbrands, L.J. van Vliet :Image Processing Fundamentals
5. Russ, J.C. :The Image Processing Handbook.

Course code : CSE-4876
Course title : Pattern Recognition and Image processing sessional
Credit Hours: 1.5 **Contact Hours:** 3 per week
Laboratory works based on CSE-4805

Lab 1: Report on Bitmap image format, Write a program in C/C++ to open a bitmap font image.
Lab2: Image enhancement: Binary Image, gray level image, negative, brightness, darkness, thresholding (single, duel, contrast stretching).
Lab 3: Filtering: Smoothing, Sharpening.
Lab 4: Image Histogram: Calculate the histogram of an image, equalize the image.
Lab 5: Implement various image compression methods.
Lab 7 Implement different segmentation methods.
Lab 8 Pattern recognition using different approaches.
To perform also other experiments relevant to this course.