GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER: V

Subject Name: **Image Processing (IP)** (**Elective-III**)
Subject Code: **650011**

Objectives:

The objective of this course is to
- Provide an introduction to basic concepts and methodologies for digital image processing, and to 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 in an image.

Prerequisites:
Knowledge of Computer Graphics is desirable.

Contents:

1. Introduction [5 hrs]
Image Processing, The origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamentals Steps in Digital Image Processing, Components of an Image Processing System.

2. Digital Image Fundamentals [7hrs]
Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationship between Pixels, An Introduction to the Mathematical Tools Used in Digital Image Processing

3. Intensity Transformation and Spatial Filtering [7hrs]
Background, Some Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters

4. Filtering in the Frequency Domain [12 hrs]
Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform (DFT) of One Variable, Extension to Functions of Two Variables,, Some Properties of the 2-D Discrete Fourier Transform, The Basics of Filtering in the Frequency Domain, Image Smoothing Using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters.

5. Color Image Processing [5 hrs]
Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening.

6. **Image Compression** [7hrs]
   Fundamentals, Some Basic Compression Methods (Huffman Coding, Arithmetic Coding, LZW Coding, Run-Length Coding, Block Transform Coding).

7. **Image Segmentation** [5hrs]
   Fundamentals, Thresholding, Point, Line and Edge Detection.

Text Books:

1) Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", 3rd Edition, Pearson Education.
2) Rafael C. Gonzalez, Richard E. Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", 2nd Edition, Tata McGraw Hill Education

Reference Books:

1) Sonka, Hlavac,Boyle , " Digital Image Processing and Computer Vision",CENGAGE Learning
2) B. Chanda and D. Dutta Majumder, "Digital Image Processing and Analysis", PHI Publication.
3) Madhuri A. Joshi, "Digital Image Processing – An Algorithmic Approach, PHI Publication.

Chapter wise coverage from the Text Books:

Book	Chapters
1	1(1.1 – 1.5), 2(2.1 – 2.6), 3(3.1 – 3.6), 4(4.1 – 4.9), 6(6.1 – 6.6), 8(8.1,8.2(8.2.1,8.2.3 – 8.2.5, 8.2.8)), 10(10.1 – 10.3)

Accomplishment of the student after completing the course:

At the end of the work student will be able to
- Use histogram processing techniques; introduce fuzzy set theory and its application to Image Processing.
- Deal with frequency domain and data compressing.