EC-312 Digital Image Processing - Course Contents

a. **Credits:** 2+1

b. **Text Book:** Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing , Latest Edition,
Addison Wesley.

c. **Reference Books:**

1. Digital Image Processing by Kenneth R. Castleman, Prentice Hall International
Edition, 1996.
2. Digital Image Processing Using Matlab by Rafael C. Gonzalez and Richard E.
Woods, Pearson Education, 2004.

d. **Objectives:**

1. The main objective of this course is to provide a comprehensive presentation of the fundamentals of image processing and analysis both from a theoretical as well as practical point of view.

2. To familiarize the students with the techniques of image enhancement in spatial and frequency domain.

3. To introduce the students to the image restoration techniques.
4. To familiarize students with the basic concepts relating to the color image processing.
5. To provide broader understanding of image compression, image morphology and
wavelets.
6. To enable students to program solutions in MATLAB to practical problems.

e. **Outcomes:**

1. Understand how digital images are represented and stored efficiently depending on the

desired quality.

2. Be able to apply the principles of digital image enhancement and restoration to

improve an image.

3. Be able to understand the techniques of colour image processing.

4. Understand the techniques and constraints of image compression when dealing with

larger data sets.

5. Understand the basic morphological operations and their application to binary images.

6. Understand the foundations of wavelets and their utility for image compression.

f. **Topics:**

I. Introduction to Digital Image Processing :

Digital Image Representation, Acquisition, Storage, Processing, Communication and Display.

II. Digital Image Fundamentals:

Visual Perception, Issues in Sampling and Quantization of a digital image, Connectivity and relations between pixels.

III. Image Enhancement:

Spatial and Frequency Domain methods, Enhancement by point processing, Histogram Processing, spatial filtering techniques, Enhancement in Frequency domain, frequency filtering techniques.

IV. Image Transforms:

Discrete Fourier Transform, Properties of 2-D Fourier Transforms, Fast Fourier transform (FFT), Discrete Cosine Transform (DCT).

V. Image Restoration:

Degradation model, Spatial and frequency domain filtering, Inverse filtering, Weiner filtering.

VI. Colour Image Processing

Fundamentals of colour image processing, colour models.

VII. Image Compression:

Types of redundancy, fidelity criterion, study of error free compression and lossy compression techniques; their merits and demerits, Image Compression Standards.

VIII. Wavelets & Morphology:

Introduction to wavelets and their application in image compression, some basic morphological algorithms.

Lab Work

Extensive lab work is required by the students in MATLAB to carryout assignments.