

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B.E. SEMESTER : VIII

### MECHATRONICS ENGINEERING

Subject Name: **MACHINE VISION**

Sr. No.	Course Contents	Total Hrs
1.	<b>Image Acquisition and MATLAB fundamentals :</b> Image acquisition using MATLAB's toolbox. Camera and Adaptors. Image format and types. MATLAB script file and function file.	3
2.	<b>Introduction:</b> Comparison with human visual system and perception level, digital image presentation, fundamental steps in image processing, elements of digital image processing systems, image acquisition, storage, processing, communication and display.	3
3.	<b>Digital Image Fundamentals:</b> A simple image model, uniform and nonuniform sampling and quantization, some basic relationships between pixels, connectivity, adjacency, distance measures, image geometry, basic transformations, different types of image sensors, different types of file formats.	5
4.	<b>Image Enhancement in Spatial Domain:</b> Spatial and frequency domain methods, point processing, mask processing, histogram processing, image subtraction, image averaging, smoothing and sharpening filters. Gamma correction, power law, negative and log transformations. Smoothing & Sharpening spatial filters.	12
5.	<b>Image Enhancement in Frequency domain:</b> The discrete Fourier Transforms – properties of 2-D Fourier Transforms: separability, translation, periodicity, conjugate symmetry, rotation, distributivity, scaling. Average value, Laplacian, convolution and correlation, sampling, FFT algorithm. Smoothing & Sharpening Frequency domain filters.	7
6.	<b>Image Restoration:</b> Degradation model for continuous function, discrete formulation, restoration in spatial and frequency domain. Arithmetic mean filters, geometric mean filters, adaptive filters. Band pass and band reject filters.	5
7.	<b>Morphological Image Processing:</b> Basic concept, Dilation and Erosion, Opening & Closing, Hit-or-Miss Transformation, Morphological Algorithms	5
8.	<b>Image Segmentation:</b> Point Detection, Line Detection, Edge Detection, Edge linking & Boundary Detection, Canny Detector.	5
9.	<b>Color Image Processing:</b> Color Fundamentals, Color Models, Pseudo color Image Processing & Full color image processing, Color Transformations, Smoothing & Sharpening	5

## **LIST OF EXPERIMENTS:**

1. Learning and implementing basic MATLAB commands.
2. Forming script file and function file in MATLAB.
3. Understanding different image classes.
4. Use of arithmetic and logical operators on images.
5. Image segmentation.
6. Blurring the given image by spatial convolution method.
7. Blurring and sharpening of image with built in command and performing scaling of the image.
8. Performing negative, log, power-law and contrast stretching transformations on given image.
9. Matching of the histogram of image with the specified one.
10. 1-D and 2-D Discrete Fourier Transformation of given image.

## **REFERENCE BOOKS:**

- |   |   |
|---|---|
| 1. Refael C. Gonzalez and Richard E. Woods<br>Digital Image Processing<br>Addison-Wesley        | 4. Castleman K.R.<br>Digital Image Processing<br>Prentice-Hall India                                  |
| 2. Scott E Umbaugh<br>Computer Vision and Image Processing<br>Prentice-Hall International, Inc. | 5. Pratt W.K.<br>Digital Image Processing<br>Wiley-Interscience                                       |
| 3. A.K. Jain<br>Fundamentals of Digital Image<br>Processing<br>Prentice-Hall of India           | 6. Refael C. Gonzalez and Richard E. Woods<br>Digital Image Processing Using MATLAB<br>Addison-Wesley |
|   | 7. Milan Sonka<br>Machine Vision and Image Processing   |