

**ITE6014 Image Processing and Computer Vision****LTPJC**  
**3 0 044****Version : 1.00****Pre-requisite: NIL****Objective:**

1. To learn the principles of image processing and computer vision
2. To understand object recognition, tracking and 3D Image processing algorithms.
3. To cultivate a foundation that can be used as the basis for further study and research in this field.

**Expected Outcome:**

At the end of the course students should be able to

1. Apply their knowledge in image processing to solve the real world problems.
2. Design a machine vision system by applying the techniques learnt and with realistic constraints.
3. Develop 3D image processing applications

<b>Module</b>	<b>Topics</b>	<b>L Hrs</b>	<b>SLO</b>
<b>1</b>	<b>INTRODUCTION TO IMAGE PROCESSING AND COMPUTER VISION:</b> Introduction, Digital Image Fundamentals, image acquisition and display using digital devices - Human visual perception, properties – Image Formation - Image sampling and quantization-Basic relationship between pixels – Color models	6	1
<b>2</b>	<b>IMAGE ENHANCEMENT :</b> <b>Image enhancement in the spatial domain:</b> basic grey level transformation, Histogram Processing-Enhancement using arithmetic/Logic operations-Spatial filtering: smoothing and sharpening. <b>Image enhancement in the frequency domain:</b> Introduction to two-dimensional transforms- Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform - smoothing frequency domain filtering-sharpening frequency domain filtering.	7	5
<b>3</b>	<b>MORPHOLOGICAL IMAGE PROCESSING AND IMAGE SEGMENTATION:</b> <b>Morphological Image Processing:</b> Dilation and Erosion – Opening and Closing – Hit or Miss Transformation – Basic morphological algorithm <b>Image Segmentation:</b> Detection of discontinuities- Object Detection Methods, Edge Likening and Boundary Detection, Thresholding Methods, Region Oriented Methods.	6	5
<b>4</b>	<b>REPRESENTATION AND DESCRIPTION:</b> Chain codes, Polygonal approximation, Signature Boundary Segments, Skeletons, Boundary Descriptors, Regional Descriptors, Relational Descriptors, Principal components for Description, Relational Descriptors.	6	1
<b>5</b>	<b>OBJECT RECOGNITION:</b> Extracting Interest Points and Their Descriptors (with Harris, SIFT, and SURF) in Image Pairs, Principal Component Analysis (PCA) and Linear Discriminant Analysis for Image Recognition.	6	14

6	<b>VIDEO SEGMENTATION AND TRACKING:</b> Change Detection, Motion Segmentation, Motion Tracking, Image and Video matting, Performance Evaluation.	6	14
7	<b>3D IMAGE PROCESSING:</b> 3D Image filtering, 3D morphological operation, 3D interpolation.	5	5
8	<b>Expert talk on recent trends</b>	3	17
<b>Total Lecture Hours</b>		<b>45</b>	
<b># Mode:</b> Flipped Class Room, [Lecture to be videotaped], Use of physical and computer models to lecture, Visit to Industry, Min of 2 lectures by experts			
<b>Text Books</b> 1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson Education, Third Edition, 2013.			
<b>Reference Books</b> 1. David A. Forsyth, Jean Ponce, “Computer Vision: A Modern Approach”, Prentice Hall; Second edition, 2011. 2. Murat Tekalp A, "Digital Video Processing", Prentice Hall, Second Edition, 2015 3. Scott E Umbaugh, “Digital Image Processing and Analysis: Human and Computer Vision Application with CVIP tools”, Second Edition, CRC Press, 2011			
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