COMPUTER VISION

Course Code: 13CS2111 **L P C**
4 0 3

Pre requisites: Image Processing, Artificial Intelligence.

Course Educational Objectives:
Explicitly state the objectives of the course in line with the NBA manual/ABET outcome based education principles.

- Computer vision studies how computers can analyze and perceive the world using input from imaging devices.
- The course will focus on object recognition and detection, introducing the tools of
  computer vision in support of building automatic objects recognition and classification system.
- Graduates will demonstrate the ability in topics include line and region extraction, stereo
  Vision, motion analysis, color and reflection models, and object representation and recognition

Course Outcomes:
Upon completion of the course, students should possess the following skills:

- Apply image processing techniques in both the spatial and frequency (Fourier) domains
- Understand various image segmentation approaches.
- Apply image compression and restoration techniques.
- Understand morphological algorithms and Motion analysis.
- Get understanding of various pattern recognition and object recognition algorithms

UNIT-I
Image Pre-processing: Elements of digital image processing, Sampling and Quantization, Relationships between pixels, Spatial filtering: Smoothing, Median, & Sharpening, Color Models. Morphological operation: Dilation and Erosion, Opening and Closing, Convex hull, Region filling, boundary extraction.

UNIT-II

Image Segmentation : Edge based segmentation: edge relaxation, border detection as graph search, Hough Transform ,region based segmentation, , Canny edge detection, , mean shift segmentation, Active Contour model,3D Graph based image segmentation

UNIT-III

3D Vision and Video analysis: Basic Projective Geometry, Homography,3D information from Radiometric measurement: Shapes from Shading, Photometric Stereo. Video tracking, Background modelling, Kalman filter, Particle filter

UNIT-IV

Image data compression: Discrete image Transforms, K L Transform, DCT, Wavelet transform, Runlength coding, Huffman codes and EZW Coding. JPEG Compression, MPEG compression

UNIT-V

Object recognition: Statistical pattern recognition, SVM, K-Mean clustering, Neural networks, Optimization techniques in recognition Genetic algorithm, Fuzzy systems

Text Books:

1. Sonaka,Vaclav Hivac and Roger Boyle," Digital Image processing and Computer Vision", 2008 by Cenage Learning
2. R.C. Gonzalez & R.E. Woods ,"Digital Image processing", Addison Wesley/ Pearson education,2nd Education,2010.

References:

1. Forsyth and Ponce ,"Computer Vision: A Modern Approach", 2nd Edition,2011.
2. William K. Pratt, John Wilely, "Digital Image processing", 3rd Edition, 2004.
3. Richard Szeliski, "Computer Vision: Algorithms and Applications". Edition, 2009.

Web reference:

http://www.nptel.iitm.ac.in/video.php?subjectId=117105079