

**Name of the Course: Computer Vision**

**Under Graduate: Code-ICV630E**

**Post Graduate: Code-ICV240E**

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**Introduction :** Human Vision and Computer Vision ; Eye and Brain; Low, Intermediate and High level Vision processes; Historical Perspectives, Theoretical approaches to Visual Perception and Processing; Visual Illusions; Structuralism, Gestaltism, Ecological Optics and Constructivism; Marr's 2.5 D Sketch; Color Perception and Processing.

**Viewing through Camera :** Camera, Image and World Reference Frames; Views and Coordinates Transformations : Orthogonal, Euclidean, Affine, Projective, etc.; Camera Calibration.

**Single and Multiview – Geometry :** Perspective, and Epipolar Geometry, Binocular Stereopsis, Homography, Rectification, DLT, RANSAC, Depth Map and 3-D reconstruction framework, Depth Estimation.

**High Level Vision Processing :** Understanding images and scenes, Four Stages of Visual Perception, Feature level Processing ( Edges, Lines, Corners), Surfaces Extraction; Segmentation and Classification; Representations and Organizations of Objects and Scenes; 3D Scene Analysis; Size and Shape Constancy and Illusions; Using knowledge and learning for Object and Scene Recognition.

**Shape from X :** Light at Surfaces, Phong Model, Reflectance Map, Albedo estimation, Photometric Stereo, Use of Surface Smoothness Constraint, Shape from Texture, color, motion and edges.

**Motion Analysis :** Background Subtraction and Modeling, Optical Flow, KLT, Spatio-Temporal Analysis, Dynamic Stereo, Motion parameter estimation; Motion Models and Analysis; Rigid and Non – Rigid Body Motion; Self Motion.

**Applications :** Gesture and Activity Recognition, Biometrics, Tracking, Stitching, etc.; Simulation of Visual Attention and Visual Memory Processes.

**Books:**

- (a). Computer Vision: Algorithms and Applications, Richard Szeliski, Springer-Verlag London Limited 2011.
- (b). Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, 2003.
- (c). Vision Science : Photons to Phenomenology, MIT Press, Cambridge, 1999.
- (d). Handbook of Computer Vision, Vol.1, Vol.2, Vol.3 : Bernd Jahne, Horst Haubecker, and Peter Geibler (Eds.), Academic Press, London, 1999.