

## CS321 COMPUTER GRAPHICS (ELECTIVE I)

### Course Description & Objective:

To provide a comprehensive introduction to computer graphics leading to understand the contemporary terminology and algorithms of computer graphics. To make the students learn the basic principles of visualization. To give an introduction to 2D and 3D modeling and animation.

### Course Outcomes:

- Students will understand the working of various graphics systems along with the algorithms used for these devices for drawing.
- They will have an understanding of 2D graphics and algorithms including: line drawing, polygon filling, clipping, and transformations.
- They will understand the concepts of and techniques used in 3D computer graphics and basic about animation.

### UNIT I - Overview of Graphics System

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices  
Output primitives, Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

### UNIT II - 2D geometric transformations and viewing

Basic transformation: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.  
2-D Viewing, The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

**UNIT III - 3D geometric transformations**

3-D Object representation, Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces, sweep representations, octrees BSP Trees, 3-D Geometric transformations, Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

**UNIT IV - Visible surface detection methods**

Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods Illumination Models and Surface rendering Methods: Basic illumination models, polygon rendering methods

**UNIT V - Computer animation**

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

**Text Books:**

1. Donald Hearn and M. Pauline Baker, Computer Graphics C version, Pearson education, Second Edition, 2008
2. Zhigang Xiang, Roy Plastock, Computer Graphics, Schaum's outlines, Second Edition, Tata McGraw Hill Edition, 2000

**Reference Books:**

1. Foley, VanDam, Feiner and Hughes, Computer Graphics Principles & Practice in C, Pearson Education. Second Edition, 1996
2. David F Rogers, Procedural elements for Computer Graphics, Tata McGraw Hill, 2nd edition., 1988
3. Neuman and Sproul, Principles of Interactive Computer Graphics, Tata McGraw Hill, 2nd edition., 1978
4. Shalini, Govil-Pai, Principles of Computer Graphics, Springer. First Edition, 2006
5. Steven Harrington, Computer Graphics, TMH, Second Edition, 1987