

**B.Tech. IV (CSE) Semester – VII**  
**COMPUTER GRAPHICS (CORE ELECTIVE-3)**  
**CS421**

**Scheme**

L	T	P	Credit
3	0	0	03

**1. Course Outcomes (COs):**

**At the end of the course, students will be able to**

CO1	understand Computer Graphics Systems, scan conversion process, object representation, object filling and related algorithms.
CO2	use geometric transformations on graphics objects and apply them in composite form.
CO3	analyse various techniques of clipping, transformations and projection to extract scene and transform it to display device.
CO4	evaluate various techniques for effective scene generation with special effects and animation.
CO5	create an application using computer graphics tools and software's in the development of computer games, information visualization and business applications.

**2. Syllabus**

• **INTRODUCTION (06 Hours)**

Overview, Classification, Characteristics and Advantages of Computer Graphics, Coordinate Representation, Raster Scan & Random Scan methods, Video Basics, Display devices, Interactive Devices and Hardcopy Devices. Digital Images, Image Formation, Image Representation and Modelling, Overview of Image and Graphics Applications, Graphics Libraries & Graphic Software's.

• **GRAPHICS PRIMITIVES (08 Hours)**

Line, Circle, Ellipse Generating Algorithms, Character Generation, Polygon Drawing and Representation, Polygon Filling Algorithms – Scanline Algorithms, Edge List Algorithm, Edge Fill Algorithm, Fence Fill Algorithm, Edge Flag Algorithm, Seed Fill Algorithms, Simple Seed Fill, Scan Line Seed Fill Algorithms.

• **2D AND 3D TRANSFORMATIONS upto Shear (08 Hours)**

Representation of Objects in Matrix Form, 2-D Transformations Homogeneous Coordinates, Combined Transformations, Transformation between Coordinate Systems, Affine Transformation, 3-D Transformation, Multiple Transformation, Coordinate Transformation.

• **3D PROJECTION (04 Hours)**

Introduction to Projection, Categories of Projection, Parallel Projection, Perspective Projection, 3-D Viewing and Viewing Parameters.

- **CLIPPING** **(08 Hours)**

Viewing Transformation, Window to Viewport Coordinate Transformation, Point Clipping, Line Clipping, Cohen-Sutherland Line Clipping algorithm, Mid-Point Line Clipping Algorithm, Polygon Clipping, Sutherland-Hodgeman Algorithm, Weiler Atherton Algorithm; Curve Clipping, Text Clipping, Interior Exterior Clipping, 3- D Clipping, 3-D Mid-Point Subdivision Algorithm.

- **ADVANCE TOPICS** **(08 Hours)**

Overview of Hidden Lines and Visible Surface Methods, Fundamentals of Curve Generation, Illumination, Shading Lighting, Color and Animation, Special-Purpose Graphics Hardware, Recent Developments.

- **Tutorials will be based on the coverage of the above topics separately.** **(14 Hours)**

**(Total Contact Time: 42 Hours)**

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**3. Books Recommended:**

1. Peter Shirley, Steve Marschner and others, "Fundamentals of Computer Graphics", 4/E, A K Peters/CRC Press, 2015.
2. James D. Foley, Andries van Dam, Steven K. Feiner, F. Hughes John, "Computer Graphics: Principles and Practice in C", Addison Wesley, 2/E, 2012.
3. D. Hearn and M. Baker, "Computer Graphics with OpenGL", 3/E, Pearson India, 2013.
4. Edward Angel, "Interactive Computer Graphics - A Top-Down Approach Using OpenGL", 5/E, Pearson Education, 2012.
5. F. S. Hill Jr. and S. M. Kelley, "Computer Graphics using OpenGL", 3/E, Pearson India, 2015.