

Learning Outcomes:

After learning the course the students should be able to

- Explain fundamental concepts within computer graphics such as geometrical transformations, illumination models, removal of hidden surfaces and rendering
- Explain the ideas in some fundamental algorithms for computer graphics and to some extent be able to compare and evaluate them
- Explain and apply fundamental principles within interaction programming
- Explain and understand fundamental concepts within information visualization and scientific visualization.

SYLLABUS

Unit No.	Topics	Lectures (Hours)
1	Introduction History of computer graphics, applications, graphics pipeline, physical and synthetic images, synthetic camera, modeling, animation, rendering, relation to computer vision and image processing, review of basic mathematical objects (points, vectors, matrix methods)	6
2	Introduction to OpenGL OpenGL architecture, primitives and attributes, simple modeling and rendering of two- and three-dimensional geometric objects, indexed and RGB color models, frame buffer, double buffering, GLUT, interaction, events and callbacks, picking	6
3	Geometric transformations Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear), concatenation, matrix stacks and use of model view matrix in OpenGL for these operations	6
4	Viewing Classical three dimensional viewing, computer viewing, specifying views, parallel and perspective projective transformations; Visibility- z-Buffer, BSP trees, Open-GL culling, hidden-surface algorithms	7
5	Shading Light sources, illumination model, Gouraud and Phong shading for polygons. Rasterization- Line segment and polygon clipping, 3D clipping, scan conversion, polygonal fill, Bresenham's algorithm	7
6	Discrete Techniques Texture mapping, compositing, textures in OpenGL; Ray Tracing- Recursive ray tracer, ray-sphere intersection	7

7	Representation and Visualization	6
	Bezier curves and surfaces, B-splines, visualization, interpolation, marching squares algorithm	

Text Books:

1. Edward Angel, Interactive Computer Graphics. A Top-Down Approach Using OpenGL (fifth Edition), Pearson Education, 2008
2. Donald Hearn and Pauline Baker, Computer Graphics with OpenGL (third edition), Prentice Hall, 2003
3. F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (third edition), Prentice Hall, 2006
4. Peter Shirley and Steve Marschner, Computer Graphics (first edition), A. K. Peters, 2010