CSE304:COMPUTER GRAPHICS AND VISUALIZATION

L:3 T:1 P:0 Credits:4

Course Outcomes: Through this course students should be able to

- Classify and describe various Computer Graphics tools and techniques.

- Analyze and apply various algorithms of 2D and 3D Transformations on different type of objects.

- Determine and apply appropriate 2D and 3D clipping algorithms and various projection techniques on different types of objects.

- observe and Understand and differentiate various visibility and shading techniques and models.

- Interpret Discrete Techniques and Object Representation: Describe Bezier and B-spline curves with properties.

Unit I

Introduction to Computer Graphics and OpenGL : History and applications of computer graphics, Video display devices, Refresh Cathode-Ray Tubes, Raster and Random Scan Displays, Color CRT Monitors, Flat Panel Displays, 3-D viewing devices, Stereoscopic and Virtual-Reality Systems, Coordinate Representations, Introduction to OpenGL, Coordinate Reference Frames, Specifying a 2-D world-coordinate reference frame in OpenGL, OpenGL Point functions, OpenGL Line functions, OpenGL Polygon fill-area functions, OpenGL display lists, OpenGL state variables, Color and Grayscale, OpenGL color functions, Point attributes, OpenGL point attribute functions, Line attributes, OpenGL Line attribute functions, Character attributes, OpenGL character attribute functions

Unit II

Rasterization and Transformations : DDA and Bresenham line drawing algorithm, Mid-point circle generating algorithm, Mid-point ellipse generating algorithm, Fill methods for areas with irregular boundaries, Implementation methods for antialiasing, Basic 2-D geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, 2D composite transformations, other 2D transformations

Unit III

2D viewing pipeline : 2D viewing pipeline, Clipping window, Normalization and viewport transformations, OpenGL 2D viewing functions, Clipping algorithms, 2D point clipping, Cohen sutherland for 2D line clipping, Sutherland Hodgeman and Weiler Atherton polygon clipping algorithm

Unit IV

3D viewing pipeline : 3D translation, rotation and scaling, Composite 3D transformations, Other 3D transformations, 3D viewing pipeline, Projection Transformations, Orthogonal Projections, Oblique parallel projections, Perspective projections, 3D clipping algorithms

Unit V

Visibility and Shading : Light sources, Classification of visible -surface detection algorithms, Back-face detection, Depth buffer method, Scan line method, Area-Subdivision method, Surface Lighting Effects, Basic Illumination Models, Polygon rendering methods

Unit VI

Discrete Techniques and Object Representation : Texture mapping, Ray Tracing- Recursive ray tracer, Interpolation and Approximation splines, Spline specifications and surfaces, Bezier spline curves, B-spline curves

Text Books:

1. COMPUTER GRAPHICS by HEARN AND BAKER, PEARSON

References:

1. COMPUTER GRAPHICS by ZHIGANG XIANG, ROY PLASTOCK, MCGRAW HILL EDUCATION

2. INTERACTIVE COMPUTER GRAPHICS- A TOP-DOWN APPROACH USING OPENGL by EDWARD ANGEL, PEARSON