

## FBEF811 COMPUTER GRAPHICS(3-1-0)

### Module – 1 (14 hours)

**Computer Graphics:** A Survey of Computer graphics, Overview of Graphics System: Video Display Devices, Raster-Scan Systems, Input Devices, Hard-Copy Devices, Graphics Software, Introduction to OpenGL.

Graphics Output Primitives: Point and Lines, Algorithms for line, circle & ellipse generation, Filled-Area Primitives. Attributes of Graphics Primitives: Point, line, curve attributes, fill area attributes, fill methods for areas with irregular boundaries, Antialiasing.

Geometric Transformations (both 2-D & 3-D): Basic Geometric Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Inverse Transformations, Other Transformations (Reflection, shear), Transformation between coordinate systems, Affine Transformations.

Two Dimensional Viewing: Viewing pipeline, Clipping Window, Normalization & Viewport coordinate Transformations, Clipping Algorithms: Point clipping, Line clipping and Polygon clipping. Three Dimensional Viewing: 3-dimensional Viewing Concepts, Viewing pipeline, Projection Transformations (Orthogonal, Oblique parallel, Perspective), Clipping Algorithms.

### Module – 2 (14 hours)

Three Dimensional Object Representations: Curved Surfaces, Quadratic Surfaces, Spline Representations, Bezier Spline Curves and Surfaces, B-Spline Curves and Surfaces, Octrees, BSP Trees, Fractal Geometry Methods, Shape Grammars.

Visible Surface Detection Methods: Classification of Visible-Surface Detection Algorithms, Back-Face Detection, Depth-Buffer method, A-Buffer Method, Scan line and Depth Sorting, Area subdivision Method, Ray Casting Method.

Illumination Models: Basic Illumination Models, Displaying light Intensities, Halftone Patterns and Dithering techniques, Polygon-Rendering Methods (Gouroud Shading, Phong Shading), Ray-Tracing Methods (Basic Ray-Tracing Algorithm, Ray-Surface Intersection Calculations). Computer Animation, Hierarchical Modeling (introductory idea only).

### Module – 3 (12 hours)

**Multimedia Fundamentals:** Introduction, Multimedia & Hypermedia, WWW, Multimedia software tools, Multimedia Authoring and Tools, Graphics and Image Data Representation, Color Models in images & video, Fundamental Concepts in Video, Basics of digital Audio.

Multimedia Data Compression: Lossless Compression Algorithms (Basics of Information Theory, Run length coding, variable length coding, lossless image compression), Lossy Compression Algorithms (distortion measure, quantization, Discrete Cosine transform), Basic Image Compression standard-JPEG, Basic Video Compression standard-MPEG (MPEG-1&2).

### Text Books:

1. Donald Hearn & M. Pauline Baker, “*Computer Graphics with OpenGL*”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-Nian Li and Mark S. Drew, “*Fundamentals of Multimedia*”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

### Reference Books:

1. Jennifer Burg, “*The Science of Digital Media*”, First Edition, 2009, Pearson Education Inc., New Delhi.
2. Francis S. Hill & Stephen M. Kelly, “*Computer Graphics using OpenGL*”, Third Edition, 2007, PHI Learning Pvt. Ltd., New Delhi.
3. Zhigang Xiang, Roy A. Plastock, “*Computer Graphics*”, Second Edition, 2007, McGraw-Hill Education (India), New Delhi.
4. Leen Ammeral, Kang Zhang, “*Computer Graphics for Java Programmers*”, Second Edition, 2007, Wiley India Pvt. Ltd., New Delhi.
5. Edward A. Angel, “*Interactive Computer Graphics: A Top-Down Approach Using OpenGL*”, Fifth Edition, 2009, Pearson Education Inc., New Delhi.