3/4 B.Tech - SECOND SEMESTER

IT6T2	**COMPUTER GRAPHICS AND ALGORITHMS**	**Credits:3**
Lecture: 3 Periods/week		**Internal assessment: 30 marks**
Practice/Interaction: 1Period/week		**Semester end examination: 70 marks**

Objectives:

- To introduce the basics of graphics through OpenGL.
- To discuss the basic input devices and interaction of computer graphics.
- To provide the basics of transformations and projections.
- To discuss different types of clipping algorithms, rasterization techniques.

Outcomes:

Students will be able to

- Develop and build an interactive graphics program using the OpenGL application programming interface.
- Design menus and display lists by using various input devices.
- Develop and differentiate 2D and 3D transformations.
- Understand different types of projections.
- Understand different types of the clipping algorithms and rasterization techniques.

Prerequisites:

Classic Data Structures, Engineering Mathematics-I and Engineering Mathematics-II

Syllabus:

UNIT-I

INTRODUCTION: Applications of computer graphics, A graphics system, The programmer's interface, Graphics architectures, Programmable pipelines, Performance characteristics.

The OpenGL: The OpenGL API, Primitives and attributes, Color, Viewing, Control functions, Polygons and recursion.

UNIT-II

INPUT AND INTERACTION: Interaction, Input devices, Clients and servers, Display lists, Display lists and modeling, Programming event-driven input, Menus, Picking, Building interactive models, Animating interactive programs, Design of interactive programs, Logic operations.

UNIT-III

GEOMETRIC OBJECTS AND TRANSFORMATIONS-1: Scalars, points, and vectors, Three-dimensional primitives, Coordinate systems and frames, Affine transformations, Rotation, translation and scaling.

GEOMETRIC OBJECTS AND TRANSFORMATIONS-2: Transformations in homogeneous coordinates, Concatenation of transformations, OpenGL transformation matrices, Interfaces to three-dimensional applications.

UNIT-IV

VIEWING: Classical and computer viewing, Viewing with a computer, Positioning of the camera, Simple projections, Projections in OpenGL, Hidden-surface removal, Interactive mesh displays, Parallel-projection matrices, Perspective-projection matrices, Projections and shadows.

UNIT-V

IMPLEMENTATION : Basic implementation strategies, The major tasks, Clipping, Line-segment clipping, Polygon clipping, Clipping of other primitives, Clipping in three dimensions, Rasterization, Bresenham's algorithm, Polygon rasterization, Hidden-surface removal.

Text Books:

1. Edward Angel, "Interactive Computer Graphics A Top-Down Approach using OpenGL", Pearson Addison-Wesley, 5th Edition, 2008.

Reference Books:

1. F.S. Hill,Jr, and M. Kelley, Jr. "Computer Graphics Using OpenGL", Pearson/PHI, 3rd Edition, 2009.
2. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, "Computer Graphics", Addison-wesley 1997.

e-Learning Resources:

1. http://nptel.ac.in/courses/106102065/
2. http://nptel.ac.in/courses/106102063/
3. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-graphics-fall-2012/lecture-notes/
4. http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106090