Computer Graphics (3 – 1 – 2)

Evaluation:

	Theory	Practical	Total
Sessional	30	20	50
Final	50	-	50
Total	80	20	100

Course Objectives:

1. To provide the knowledge of basic techniques used in Computer Graphics Systems.
2. To provide the knowledge of 2D and 3D algorithms used in Computer Graphics Systems.

Course Contents:

1. Introduction **2 hrs**

1.1 Introduction
1.2 History of Computer Graphics
1.3 Application of Computer Graphics

2. Graphics Hardware **6 hrs**

2.1 Interactive Input Devices
2.2 Display Devices and Hard Copy Devices
2.3 Raster and Random Systems and Architectures
2.4 Video Controller
2.5 Use of Digital to Analog Converter and Frame Buffer Organization
2.6 Color Monitors

3. Two Dimensional Algorithms **7 hrs**

3.1 Line Drawing Algorithms
3.1.1 DDA
3.1.2 Bresenham's Algorithm
3.2 Circle Generation Algorithm
3.3 Ellipse Generation Algorithms
3.4 Area Filling-Scan Line Algorithm
3.5 Boundary Fill Techniques
3.6 Flood Fill Techniques

4. Two Dimensional Geometric Transformations and Viewing **8 hrs**

4.1 Basic Transformations
4.2 Other Transformations
4.3 Homogeneous Co-ordinate systems
4.4 Composite Transformations
4.5 Windowing Concepts
4.6 Viewing Pipeline
4.7 Window to View port Transformation

4.8 Line Clipping Algorithm: Cohen-Sutherland
4.9 Polygon Clipping: Sutherland-Hodgeman

5. Three Dimensional Graphics Systems **7 hrs**

5.1 3D Co-ordinate System and 3D Transformations
5.2 3D Representations
5.3 Polygon Surfaces
5.4 Cubic Spline and Beizer Curve
5.5 Non-Planer Surface: Bezier Surface
5.6 Fractal Geometry Method
5.7 3D Viewing Transformation
5.8 Projection Methods: Parallel and Perspective
5.9 Clipping in 3D

6. Visible Surface Detection **5 hrs**

6.1 Hidden Surfaces and their Removal Techniques
6.2 Back-Face Detection
6.3 Depth Buffer Method
6.4 A- buffer method
6.5 Scan Line Method
6.6 Area Subdivision Method
6.7 Depth Sorting Method

7. Illumination and Shading **6 hrs**

7.1 Illumination Theory
7.2 Ambient Light
7.3 Reflections: Diffuse, Specular
7.4 Surface Shading methods
  7.4.1 Constant Shading
  7.4.2 Gouraud Shading
  7.4.3 Phong Shading
  7.4.4 Fast Phong Shading
7.5 Color Models: RGB, CMYK

8. Graphical Languages **4 hrs**

8.1 Need for Machine Independent Graphical Languages
8.2 Graphical Languages: PHIGS, GKS
8.3 Graphics Software Standard
8.4 Overview of Graphics File Formats
8.5 Data Structure in Computer Graphics
8.6 Introduction to OpenGL

Laboratory:
Implementation of various 2D and 3D graphics algorithms covered in the course using C / C++ and OpenGL.

Text Book:

Donald Hearn and M. Pauline Baker: *Computer Graphics*, Prentice-Hall.

References:

1. James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, *Computer Graphics: Principles and Practice in C*, Addison-Wesley.
2. Mason Woo, Jackie Neider, Tom Davis, Dave Shreiner, *Open GL Programming Guide* Third Edition, The Official Guide to Learning OpenGL, Version 1.2, OpenGL Architecture Review Board, LPE Pearson Edition Asia.