

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:**Unit 1: Introduction****(2 hrs)**

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

Unit 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

Unit 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

Unit 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

Unit 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

Unit 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

Unit 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

Unit 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.

Reference Books:

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.