GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Integrated MSc, 6th Semester
Branch: Computer Science
Subject Name: Computer Graphics
Subject Code: 1360302

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE(E)	PA (M)	PA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Content:

Sr. No.	Content	Teaching Hours	(%)Module Weightage
1.	**Introduction of Computer Graphics**: Introduction, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system, Overview of Computer Graphics, Computer Graphics Application and Software, Input Devices for Operator Interaction, Active and Passive Graphics Devices, Display Technologies, Storage Tube Graphics Displays, Calligraphic Refresh Graphics Displays, Raster Refresh (Raster-Scan) Graphics Displays, Cathode Ray Tube Basics.	5	10%
2.	**Scan conversion - lines, circles and Ellipses; Filling polygons:** Scan Conversion of: point, line using Digital differential analyzer & Bresenham's algorithm, circle using midpoint approach, Curve Generation : Bezier and B-Spline curves.Introduction to fractals: generation procedure, classification, dimension and Koch Curve	5	10%
3.	**Two Dimensional Transformation and Viewing:** Basic Geometrical 2D transformations: Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation. Introduction, Viewing Pipeline, View Coordinate reference frame, Window to viewport transformation, Point clipping, Line Clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping.	9	25%
4.	**Three Dimensional Transformations:** Introduction, Three-Dimensional Scaling, Three-Dimensional Shearing, Three-Dimensional Rotation, Three-Dimensional Translation, Rotation about an Arbitrary Axis in Space, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Affine and Perspective Geometry, Perspective Transformations, Techniques for Generating Perspective Views, Vanishing Points, the Perspective Geometry and camera models, Orthographic Projections, Axonometric Projections, Oblique Projections.	6	20%
5.	**Visible Surface determination:** Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line	5	10%

	method, Painter's algorithms (depth sorting), Area sub-division method, Visible-Surface Ray Tracing.		
6.	**Illumination and Colour Models**: Basic Illumination Model, Diffuse reflection, Specular reflection, Phong Shading Gourand shading, and color models like RGB, YIQ, CMY, HSV.	5	10%
7	**Plane Curves and Surfaces**: Curve Representation, Nonparametric Curves, Parametric Curves, Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, Parametric Cubic Curves and Quadric Surfaces. Bezier Surfaces **Introduction to Animation:** Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping (only Mesh Warping).	5	15%

Reference Books:

1. Computer Graphics (TextBook) Donald Hearn & M. Pauline Baker; PHI,2011; Second Edition.
2. "Computer Graphics with Virtual Reality" (TextBook) R. K Maurya; Wiley India.
3. Computer Graphics Principles and Practices by Folay Vandam, Feiner, Hughes; Pearson Pub.
4. Procedural Elements of Computer Graphics by Rogers,; Tata McGraw Hill.

Course Outcome:

CO – 1	Understand contemporary terminology, progress, issues, and trends in Computer Graphics.
CO – 2	Understand interdisciplinary nature of computer graphics in the wide variety of examples and applications.
CO – 3	Designed and implement graphics primitives.
CO – 4	Enhance their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information.

List of Practical's:

1	A brief study of various types of input and output devices.
2	To generate a human face using basic shapes and colour in the graphics.
3	WAP to draw line using DDA algorithm
4	WAP to draw line using Bresenham's algorithm
5	WAP to draw circle using Bresenham's algorithm
6	WAP to draw eclipse using Midpoint algorithm
7	WAP to implement flood fill and Boundary fill algorithm.
8	WAP to implement polygon filling.
9	Program to implement 2D Transformation.
10	Program to implement 3D rotation about an arbitrary axis.
11	Program to implement Cohen Sutherland line clipping.
12	Program to draw Bezier curve.