techniques in computer graphics, including graphic systems, transformations, viewing pipelines, clipping algorithms, curve and surface modeling, projection methods, shading models, and hidden surface removal.

S. NO	Course Outcomes (CO)
CO1	Apply various algorithms for line drawing, circle and ellipse generation, filling techniques, and anti-aliasing in computer graphics.
CO2	Apply 2D and 3D transformations, including matrix representations, composite transformations, and coordinate system conversions in computer graphics.
CO3	Implement viewing pipelines and apply various clipping algorithms for lines, polygons, and text in a two-dimensional viewing context.
CO4	Analyze and construct curves and surfaces using parametric equations, Bezier curves, and B-Spline techniques with continuity testing.
CO5	Understand and apply different projection methods, including parallel, oblique, and perspective projections for 3D objects onto 2D planes.
CO6	Utilize shading models, reflection calculations, and hidden surface removal techniques to enhance the visual realism of 3D scenes.

S. NO	Contents	Contact Hours

UNIT 1	**Overview of Computer Graphics:** Usage of Graphics and their applications, Over view of Graphics systems: Refreshing display devices, Random and raster scan display devices, Colour Models: RGB, HSV etc., Tablets, Joysticks, Track balls, Mouse and light pens. **Output primitives:** DDA Line drawing algorithm, Bresenham's Line Drawing Algorithm, Mid-point circle algorithm, Mid-point Ellipse algorithms, filling algorithms, boundary fill and flood fill algorithms, scanline filling, character generation, line attributes, fill styles, anti-aliasing	6
UNIT 2	**Transformations:** Basic 2D Transformations, Matrix representations & Homogeneous Coordinates, Matrix Representations for basic 2D and 3D transformations, Composite Transformations, reflection and shear transformations, affine transformation, transformations between coordinate systems.	8
UNIT 3	**Two dimensional viewing:** The viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, Barky line clipping algorithm, Algorithm for polygon clipping, Sutherland-Hodgeman polygon clipping, Wailer-Atherton polygon clipping, curve clipping, Text clipping.	6
UNIT 4	**Curves and Surfaces:** Representation of surfaces, polygon meshes, plane equations, parametric cubic curves, Hermite Curves, Bezier Curves, 4 point and 5 point Bezier curves using Bernstein Polynomials, Conditions for smoothly joining curve segments, Bezier bi-cubic surface patch, B-Spline Curves, Cubic B-Spline curves using uniform knot vectors, Testing for first and second order continuities.	8
UNIT 5	**Projection:** Parallel Projection, Oblique Projection on XY plane, Isometric Projection, Perspective Projection, One Vanishing Point (V.P.) projection, Generation of 2 V.P. Projection, planar geometric projections.	7
UNIT 6	Shading and Hidden Surface Removal: Shading, Illumination Model for diffused Reflection, Effect of ambient lighting, distances, Specular Reflection Model, Computing Reflection Vector, Curved Surfaces, Polygonal Approximations, Guard Shading, Phong Model, Hidden Surface Removal, Back Face Detection, Depth Buffer (Z-Buffer, A-Buffer) Method, Scan Line Method, Depth Sorting Method, Area Subdivision Method.	7
	TOTAL	42

	REFERENCES	
S.No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	D. Hearn , P. Baker& W. Carithers, "Computer Graphics with OpenGL", Pearson,	2015
2	Z. Xiang & R. Plastock "Computer Graphics", Schaum's Series, McGraw Hill	2007

3	David F. Rogers, "Procedural Elements for Computer Graphics", Tata McGraw Hill	2002
4	D. Rogers and J. Adams, "Mathematical Elements for Computer Graphics", MacGraw- Hill International Edition	2002
5	Foley et al., "Computer Graphics Principles & practice", Addison Wesley	1999

B.Tech. Information Technology		
Course code: Course Title	Course Structure	Pre-Requisite