

| CS319: Computer Graphics | L | T | P |
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Nil

| Course Objective: The objective of the course is to help students learn broad introduction to the theory and | |
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| S. No. | Course Outcomes (CO) |
| CO1 | Understand the components and applications of computer graphics systems, including display devices and color models. |
| CO2 | Implement and analyze output primitive algorithms for rendering lines, shapes, and fills. |
| CO3 | Apply 2D and 3D transformation techniques using matrix representations and homogeneous coordinates. |
| CO4 | Utilize 2D viewing and clipping techniques for managing and displaying graphical content. |
| CO5 | Design and manipulate curves and surfaces using Bezier and B-Spline techniques. |
| CO6 | Apply projection and shading methods for realistic image rendering and hidden surface removal. |

| S. No | Contents | Contact Hours |
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| 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, plotters, printers, digitizers. | 6 |
| UNIT 2 | 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, scan-line filling, character generation, line attributes, fill styles, anti-aliasing. | 8 |
| UNIT 3 | 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. | 6 |
| UNIT 4 | Two dimensional viewing: The viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Two Dimensional Viewing Functions, Barycentric line clipping algorithm, Algorithm for polygon clipping, Sutherland-Hodgeman polygon clipping, Waliel-Atherton polygon clipping, curve clipping, Text clipping. | 8 |
| UNIT 5 | 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. | 6 |
| UNIT 6 | 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. 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. | 8 |
| Total | | 42 |