

UCS505: COMPUTER GRAPHICS

L T P Cr  
3 0 2 4.0

**Course Objectives:** This course provides an introduction to the principles of computer graphics. It covers detailed study of computer graphics fundamentals, 2-D & 3-D geometric transformations, curve design, visible surface detection and illumination models.

**Fundamentals of Computer Graphics:** Applications of computer Graphics in various fields, Evolution of computer Graphics, Graphical Input-Output Devices, Random scan displays, Raster scan displays.

**Graphics Primitives:** Algorithms for drawing various output primitives - Line, circle, ellipse, arcs & sectors, Boundary Fill & Flood Fill algorithm, Color Tables.

**2-D & 3-D Geometrical Transformations:** Translation, Rotation, Scaling, Shear, Reflection, Homogenous coordinate system, Composite transformations.

**Viewing &Clipping in 2-D:**Window to View port transformation, Cohen Sutherland, Liang Barsky, Nicholl-Lee-Nicholl Line clipping algorithms, Sutherland Hodgeman, Weiler Atherton Polygon clipping algorithm.

**Three Dimensional Viewing & Clipping:** 3-D Viewing, Projections, Parallel and Perspective projections, Clipping in 3-D.

**Curves& Surfaces:** Curved Lines & surfaces, Interpolation & Approximation splines, Parametric & Geometric Continuity conditions, Bezier Curves & surfaces, B-spline curves & surfaces.

**Visible Surface Detection Methods:** Classification of visible surface detection algorithms, Depth buffer method, Scan-line method, Depth-Sorting method, Subdivision Algorithm.

**Illumination Models & Surface Rendering:** Light sources, Illumination models, Surface Rendering methods, Basic Ray tracing algorithm.

**Laboratory work:**

Laboratory work should be done in OpenGL (version 3+). Covers all the basic drawing, filling, 2D & 3D transformations, clipping, and curve generation.

**Course Learning Outcomes (CLOs)/ Course Objectives (COs):**

After the completion of the course, the student will be able to:

- 1. Comprehend the concepts related to basics of computer graphics and its applications in various fields.
- 2. Apply algorithms to scan convert various output primitives and alters the coordinate descriptions of objects using 2-D & 3-D geometric transformations.
- 3. Understand and apply various concepts of viewing & clipping in 2-D & 3-D.
- 4. Comprehend the concepts related to curve design and identify visible surfaces in three dimensional scene using visible surface detection methods.
- 5. Apply OpenGL to create various primitives of computer graphics.

**Text Books:**

- 1. *Donald D Hearn, M. Pauline Baker, “Computer Graphics, C version”, 2<sup>nd</sup> Edition, Pearson Education (1997).*
- 2. *James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, “Computer Graphics: Principles & Practice in C”, Second Edition, Addison Wesley Longman (1995).*

**Reference Books:**

- 1. *Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education, 2004.*
- 2. *Zhigang Xiang, Roy A Plastock, “Computer Graphics”, Schaums Outline, TMH (2007).*
- 3. *Dave Shreiner, Mason Woo, Jackie Neider, Tom Davis, “OpenGL Programming Guide: The Official Guide to Learning OpenGL” (2013).*

**Evaluation scheme**

Sr. no. Evaluation Elements		Weights
		(%)
1.	MST	25
2.	EST	45
3.	Sessionals (May include Assignments/Projects/Tutorials/Quiz/Lab evaluations)	30