

Faculty Name: Prof. Yogesh N				Academic Year: 2025 - 2026			
Department: Computer Science & Design							
Course Code	Course Title	Core / Elective	Prerequisite	Contact Hours			Total Hrs/
				L	T	P	Sessions
BCG402	Computer Graphics and Visualization	Core	Basics of C Programming concept	3	0	2	40T+20P
Course Objectives	1. Understand concepts of Computer Graphics along with its applications 2. Exploring mathematics for 2D and 3D graphics along with OpenGL API's 3. Use of Computer graphics in animation and GUI design 4. Demonstrate Geometric transformations, viewing on both 2D and 3D objects 5. Infer the representation of curves, surfaces, Color and Illumination models						
Topics Covered as per Syllabus							
Module-1							
Computer Graphics: Application of Computer Graphics.							
OpenGL: Introduction to OpenGL, coordinate reference frames, specifying two-dimensional world coordinate reference frames in OpenGL, OpenGL point functions, OpenGL line functions, point attributes, line attributes, curve attributes, OpenGL fill area functions, OpenGL Vertex arrays, Line drawing algorithm- Bresenham's.							
Module-2							
2D and 3D graphics with OpenGL: 2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates, OpenGL raster transformations, Transformation between 2D coordinate systems, OpenGL geometric transformation functions.							
3D Geometric Transformations: 3D Translation, rotation, scaling, OpenGL geometric transformations functions.							
Module-3							
Interactive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface.							
Computer Animation: Design of Animation Sequences, Traditional Animation Techniques, General Computer- Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation Procedures.							

Module-4

Clipping: clipping window, normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping.

Color Models: Properties of light, color models, RGB and CMY color models.

Illumination Models: Light sources, basic illumination models-Ambient light, diffuse reflection, specular and phong model.

Module-5

3D Viewing: 3D viewing concepts, 3D viewing pipeline, Transformation from world to viewing coordinates, Projection transformation, orthogonal projections, perspective projections, OpenGL 3D viewing functions.

Visible Surface Detection Methods: Classification of visible surface Detection algorithms, depth buffer method.

Laboratory Component:

1. Develop OpenGL program to draw a line using Bresenham's algorithm for all types of slopes.
2. Develop OpenGL program to create and rotate a triangle about the origin and a fixed point.
3. Develop a OpenGL program to implement to recursively subdivide a tetrahedron to form 3D sierpinski gasket. The number of recursive steps is to be specified by the user.
4. Develop a OpenGL program to Spin 3D sierpinski gasket using OpenGL transformation matrices.
5. Develop a OpenGL program to Clip 2D lines using Cohen-Sutherland algorithm.
6. Develop a menu driven program to animate the polygon using 3D geometric transformations.
7. Develop a OpenGL program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing.
8. Develop a OpenGL program to draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the surfaces of the solid object used in the scene.
9. Develop a OpenGL program to draw a simple scene containing few 3D objects and provide day and night effect. Define suitably the position and properties of the light source used in the scene.

List of Textbooks	
1. Donald D Hearn, M Pauline Baker and Warren Carithers: Computer Graphics with OpenGL 4th Edition, Pearson, 2011. 2. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2009.	
Course Outcomes	1. Demonstrate simple algorithms using OpenGL Graphics primitives and attributes. 2. Apply mathematical concepts for 2-D and 3-D geometric transformations. 3. Make use of OpenGL functions for Interactive Input, GUI and animations. 4. Explain clipping algorithms, color models and illumination models. 5. Demonstrate visualization of surfaces and 3D objects.
Internal Assessment Marks: 50 (CIE for theory component-25 Marks: 2 Tests, each of 15 marks and other assessments for 10 marks and CIE for Practical component-25 Marks: conduction of the experiment along with laboratory record for 15 Marks and test for 10 Marks).	

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	BCG402	TITLE: Computer Graphics and Visualization							Faculty Name:	Prof. Yogesh N			
List of	Program Outcomes												Total
Course													
Outcome s	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
CO-1	3	2	2	2	2	-	-	-	2	2	2	-	17
CO-2	3	2	2	2	2	-	-	-	2	2	2	-	17
CO-3	3	2	2	2	2	-	-	-	2	2	2	-	17
CO-4	3	2	2	2	2	-	-	-	-	1	-	-	12
CO-5	3	2	2	2	2	-	-	-	2	2	2	-	17
Total	15	10	10	10	10	-	-	-	8	9	8	-	80

Note: 3 = Strong Contribution, 2 = Average Contribution, 1 = Weak Contribution, - = No Contribution

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Subject Code:	BCG402	TITLE: Computer Graphics and Visualization	Faculty Name:	Prof. Yogesh N	
List of Course Outcomes	Program Specific Outcomes			Total	
	PSO-1	PSO-2			
CO-1	3	3		6	
CO-2	3	3		6	
CO-3	3	3		6	
CO-4	-	3		3	
CO-5	3	3		6	
Total	12	15		27	

Course Coordinator

HoD