Course Code	18CIPC504				
Category	Engineering Science Courses : Professional Core				
Course title	**COMPUTER GRAPHICS – THEORY**				
Scheme and Credits	No. of Hours/Week				Semester - V CSE/ISE
	L	T	P	SS	Credits	
	2	2	0	0	3	
CIE Marks: 50	SEE Marks: 50		Total Max. Marks: 100		Duration of SEE: 03 Hours
Prerequisites (if any): NIL					

COURSE OBJECTIVES:

The course will enable the students to

Understand about 2D and 3D graphics primitives and attributes.

Know about Geometric transformations on 2D and 3D objects.

To study about Clipping functions.

Study about various viewing functions.

To acquire knowledge about Curved surfaces

UNIT I: INTRODUCTION 09 Hours

Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The Programmer's interface; Graphics architectures; Programmable pipelines; Graphics programming: Programming two dimensional applications. Video Display Devices: Raster Scan display, Flat panel displays. Raster-scan systems: video controller, raster scan Display processor, graphics workstations and viewing systems, Input devices, graphics networks, graphics on the internet, graphics software. 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 point attribute functions, OpenGL line attribute functions, Line drawing algorithms-DDA, Bresenham's, circle generation algorithms - Bresenham's.

UNIT II: 2D GEOMETRIC TRANSFORMATIONS AND 2D VIEWING 09 Hours

2D Geometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. inverse transformations, 2D Composite transformations, other 2D transformations, raster methods for geometric transformations, OpenGL raster transformations, OpenGL geometric transformations function, 2D viewing: 2D viewing pipeline, OpenGL 2D viewing functions.

UNIT III: CLIPPING, 3D GEOMETRIC TRANSFORMATIONS, COLOR AND ILLUMINATION MODELS 10 Hours

Clipping: normalization and viewport transformations, clipping algorithms, 2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping, polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm. Geometric Objects and Transformations, Affine Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices; Interfaces to three dimensional applications, 3D Geometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, OpenGL geometric transformations functions. 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, Corresponding openGL functions.

UNIT IV: VIEWING , VISIBLE SURFACE DETECTION 10 Hours

Viewing and Projections; orthographic and perspective projection, camera positioning, Hidden Surface Removal; its importance in rendering, z buffer algorithm, clipping, culling, 3D Viewing; 3D viewing concepts, 3D viewing pipeline, 3D viewing coordinate parameters, Transformation from world to viewing coordinates, Projection

transformation, orthogonal projections, perspective projections, The viewport transformation and 3D screen coordinates. OpenGL 3D viewing functions, Visible Surface Detection Methods; Classification of visible surface Detection algorithms, back face detection, depth buffer method, OpenGL visibility detection functions.

UNIT V: INPUT AND INTERACTION, CURVES AND COMPUTER ANIMATION   **10 Hours**
Input and Interaction; Input devices, Clients and Servers, Display Lists, Display Lists and Modelling, Programming Event Driven Input, Menus; Picking, Building Interactive Models, Animating Interactive Programs, Design of Interactive Programs, Logic Operations, Curved surfaces, quadric surfaces, OpenGL Quadric-Surface and Cubic-Surface Functions, Bezier Spline Curves, Bezier surfaces, OpenGL curve functions, Corresponding openGL functions.

TEXT BOOKS:

Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version, $3^{rd}/4^{th}$ Edition, Pearson Education, 2011.

E. S. Angel, Interactive Computer Graphics, A top-down approach with OpenGL, (5e), Pearson Education, 2009.

REFERENCES:

James D Foley, Andries Van Dam, Steven K Feiner, John F Huges: "Computer graphics with OpenGL", Pearson education

Kelvin Sung, Peter Shirley, Steven Baer: Interactive Computer Graphics, Concepts and Applications, Cengage Learning.

Xiang, Plastock : Computer Graphics , sham's outline series, 2nd edition, TMG.

e-BOOKS/ONLINE RESOURCES:

https://nptel.ac.in/courses/106106090/
https://nptel.ac.in/courses/106102065/8

MOOCs:

https://www.mooc-list.com/tags/computer-graphics
https://nptel.ac.in/courses/112102101/47

COURSE OUTCOMES:

The students at the end of the course, will be able to
CO1:   Design and implement algorithms for 2D/3D graphics primitives and attributes.
CO2:   Analyze Geometric transformations on 2D and 3D objects.
CO3:   Apply the concepts of clipping and visible surface detection in 2D and 3D viewing.
CO4:   Analyze the algorithms for viewing geometrical objects.
CO5:   Know about Curves and Quadric surfaces.

SCHEME OF EXAMINATION:

CIE – 50 Marks	Test I (Any Three Units) - 20 Marks	Quiz I – 5 Marks	25 Marks	Total: 50 Marks
	Test II (Remaining Two Units) - 20 Marks	Quiz II – 5 Marks	25 Marks	
SEE – 100 Marks	**Q1 (Compulsory):** MCQs or Short answer type questions for 15 Marks covering entire syllabus.		15 Marks	Total: 100 Marks
	Q2 & Q3 from Units which have 09 Hours are compulsory.		17*2= 34 Marks	
	Q4 or Q5, Q6 or Q7 and Q8 or Q9 from Units which have 10 Hours shall have Internal Choice.		17*3= 51 Marks	

Note: SEE shall be conducted for 100 Marks and the Marks obtained is scaled down to 50 Marks.

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