**COMPUTER GRAPHICS AND VISUALIZATION**
**[As per Choice Based Credit System (CBCS) scheme]**
**(Effective from the academic year 2017 - 2018)**
**SEMESTER – VI**

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| Subject Code | 17CS62 | IA Marks | 40 |
| Number of Lecture Hours/Week | 4 | Exam Marks | 60 |
| Total Number of Lecture Hours | 50 | Exam Hours | 03 |

**CREDITS – 04**

| **Module – 1** | **Teaching Hours** |
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| **Overview: Computer Graphics and OpenGL:** Computer Graphics:Basics of computer graphics, Application of Computer Graphics, Video Display Devices: Random Scan and Raster Scan displays, color CRT monitors, 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).<br>**Text-1:Chapter -1: 1-1 to 1-9,2-1 to 2-9 (Excluding 2-5),3-1 to 3-5,3-9,3-20** | **10 Hours** |
| **Module – 2** | |
| **Fill area Primitives, 2D Geometric Transformations and 2D viewing:** Fill area Primitives: Polygon fill-areas, OpenGL polygon fill area functions, fill area attributes, general scan line polygon fill algorithm, OpenGL fill-area attribute functions. 2DGeometric Transformations: Basic 2D Geometric Transformations, matrix representations and homogeneous coordinates. Inverse transformations, 2DComposite 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.<br>**Text-1:Chapter 3-14 to 3-16,4-9,4-10,4-14,5-1 to 5-7,5-17,6-1,6-4** | **10 Hours** |
| **Module – 3** | |
| **Clipping,3D Geometric Transformations, Color and Illumination Models:** Clipping: clipping window, normalization and viewport transformations, clipping algorithms,2D point clipping, 2D line clipping algorithms: cohen-sutherland line clipping only -polygon fill area clipping: Sutherland-Hodgeman polygon clipping algorithm only.3DGeometric Transformations: 3D translation, rotation, scaling, composite 3D transformations, other 3D transformations, affine 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.<br>**Text-1:Chapter :6-2 to 6-08 (Excluding 6-4),5-9 to 5-17(Excluding 5-15),12-1,12-2,12-4,12-6,10-1,10-3** | **10 Hours** |
| **Module – 4** | |

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| **3D Viewing and Visible Surface Detection:** 3DViewing: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 and OpenGL visibility detection functions.<br>**Text-1:Chapter: 7-1 to 7-10(Excluding 7-7), 9-1 to 9-3, 9-14** | **10 Hours** |
| **Module – 5** | |
| **Input& interaction, Curves and Computer Animation:** 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.<br>**Text-1:Chapter :8-3 to 8-6 (Excluding 8-5),8-9,8-10,8-11,3-8,8-18,13-11,3-2,13-3,13-4,13-10**<br>**Text-2:Chapter 3: 3-1 to 3.11: Input& interaction** | **10 Hours** |

**Course outcomes:** The students should be able to:

- Design and implement algorithms for 2D graphics primitives and attributes.
- Illustrate Geometric transformations on both 2D and 3D objects.
- Understand the concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
- Discussabout suitable hardware and software for developing graphics packages using OpenGL.

**Question paper pattern:**

The question paper will have TEN questions.
There will be TWO questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer FIVE full questions, selecting ONE full question from each module.

**Text Books:**


1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd/ 4thEdition, Pearson Education,2011
2. Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008


**Reference Books:**


1. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: pearson education
2. Xiang, Plastock : Computer Graphics , sham's outline series, 2nd edition, TMG.
3. Kelvin Sung, Peter Shirley, steven Baer : Interactive Computer Graphics, concepts and applications, Cengage Learning
4. M MRaiker, Computer Graphics using OpenGL, Filip learning/Elsevier