

Course Title: Computer Graphics

Course no: CSC-254

Full Marks: 60+20+20

Credit hours: 3

Pass Marks: 24+8+8

Nature of Course: Theory (3 Hrs.)+ Case Study

Course Synopsis: This Graphics hardware, software, and applications, data structures for graphics, graphics languages, models for 2D and 3D objects, clipping, hidden surface elimination, depth buffer, raster graphics, shading rendering, splines tools.

Goal: The objective of this course is to understand the theoretical foundation of 2D and 3D graphics.

Course Contents:

Unit 1.

5 Hrs.

Introduction, Advantage of Computer Graphics, Areas of Applications, Hardware and Software for Computer Graphics.(Hard Copy, Display Technologies), Random Scan Display System, Video Controller, Random Scan Display Processor. Raster Graphics, Scan Conversion Algorithms (Line, Circle, Ellipse), Area Filling (Rectangle, Ellipse), Clipping (Lines, Circle, Ellipse), Clipping Polygons.

Unit 2.

10 Hrs.

Geometrical Transformations, Homogeneous coordinates 2D and 3D Transformations, Matrix Representations, Window to View Port Transformation. 3D Viewing, Projections, Mathematics of Projections.

Unit 3.

15 Hrs.

3D object Representation, Representing Curves and Surfaces, (Polygon Meshes, Parametric Cubic Curves, Quadratic Surface), Solid Modeling (Sweep Representation, Boundary Representation, Spatial Partitioning Representation)

Unit 4.

12 Hrs.

Visible Surface Determination, Various Techniques, Algorithms for Visible Surface Detection, (Z-Buffer, List priority, Scan Line Algorithms), Shading and Illumination models.

Unit 5.

3 Hrs.

Introduction to Virtual Reality and Animation.

Laboratory works: All algorithms covered in the text to be implemented in PHIGS/OpenGL in C/C++.

Text/References books:

1. Foley, J.D., A.V. Dam, S.K. Feiner, J.F. Hughes, *Computer Graphics Principle and Practices*, Addison Wesley Longman, Singapore Pvt. Ltd., 1999.
2. Hearn Donald, M.P. Baker, *Computer Graphics*, 2E, Prentice Hall of India Private Limited, New Delhi, 2000.

Model Question: Computer Graphics

Semester: IV

Time: 3 hrs

Full Marks: 100

- Candidates are required to give their answers in their own words as far as practicable.
 - Attempt all questions. All questions carry equal marks
1. How line can be drawn in the computer graphics? Explain in detail about Bresenhems's line drawing algorithm.
 2. What is a window to viewport transformation? Derive its transformation coefficient matrix.
 3. Explain the Following terms with practical applications.
 - a) 3D Shear
 - b) 2D Rotation
 4. What do you mean by clipping? Explain in detail about line clipping algorithm.
 5. Why filling algorithm is required? Explain about scan-line polygon fill algorithm.
 6. How computer animation can be generated? Explain with reference to the polygon table.
 7. How curves can be generated? Explain about Bezier curve.
 8. How hidden-surface can be removed? Explain in detail about plane equation method.

Or

What happens if the hidden surface is not removed in the computer graphics?

Explain in detail about depth buffer method.

9. What do you mean by intensity assignment? Consider 512 pixels X 512 scan lines image with 24-bit true color. If 5 minutes video is required to capture, calculate the total memory required?
10. Explain the importance of shading in the computer graphics. Explain in detail about Gouraud shading.

Or

Why shading model is required in the computer graphics? Explain in detail about

Phong shading model.