Guidelines for DSE for B.A(Prog), BSc.(Prog) Physical Sc/Math Sc

Foundations of Computer Graphics
DSE
(Effective from Academic year 2024-25)

Unit	Topics	Chapter	Ref.	Suggested Number of Weeks
1	**Introduction**: Introduction to Graphics systems, Basic elements of Computer graphics, Applications of computer graphics, Architecture of Raster and Vector scan display devices, Color Lookup Table, Display devices (Cathode Ray Tube (CRT) , Colored CRTs, Direct View Storage tube(DVST), Plasma Panel, LCD, LED, Emissive and Non-emissive displays), Input devices.	**Ch 1** 1.1-1.8 **Ch 2** 2.1-2.6	1	2
2	**Drawing and clipping primitives**: Raster scan line (Digital Differential Analyzer (DDA) and Bresenhams) and circle drawing algorithms, line clipping using Cohen and Sutherland Line clipping algorithm and polygon clipping using Sutherland and Hodgeman Polygon clipping algorithm.	**Ch 3** 3.2-3.2.2, 3.3 (only 1st order differences), 3.12.3,3.14,3.17-3.17.3	2	3
3	**Transformation and Viewing:** Transformation and Viewing: Basic 2D transformations (Translation, Rotation, scaling, reflection and shearing), Homogenous coordinates, composite transformation, 3D Geometric Transformations, Viewing Transformations (Projections- Parallel and Perspective), Vanishing points.	**Ch 2** 2.1-2.21 **Ch 3** 3.1- 3.9, 3.11,3.12 (pp 135-136),3.13-3.15,3.17	3	4

4	**Geometric Modelling:** Polygon Mesh Representation, Cubic Polynomial curves (Hermite).	**Ch 11** 11.1-11.1.1, 11.2-11.2.1	2	2
5	**Visible Surface determination and Surface Rendering**: Need for hidden surface removal, Z-buffer algorithm and area subdivision algorithm for visible surface determination. Phong Illumination model, Phong and Gouraud shading models, Halftoning and Dithering.	**Ch 15** 15.4, 15.7.1	2	3
		Ch 14 14.1-14.2(till page no. 524),14.3,14.4(till page no. 540),14.5(till page no. 545)	1	
6	**Basics of Computer Animation**: Storyboard layout, keyframe systems, simulating motion, morphing.	**Ch 16** 16.1-16.6	1	1

Essential/recommended readings

1. Hearn, D & Baker, M.P. Computer Graphics, 2nd edition, Prentice Hall of India, 2006.
2. Foley, J. D., Dam, A.V, Feiner, S. K., & Hughes, J. F. Computer Graphics: Principles and Practice in C, 2nd edition, Pearson education, 1999.
3. Rogers, D. F. Mathematical Elements for Computer Graphics, 2nd edition, McGraw Hill Education, 2002.

Additional References

1. Bhattacharya, S. Computer Graphics, Oxford University Press, 2018.
2. Marschner, S., & Shirley, P. Fundamentals of Computer Graphics, 4th edition CRC Press, 2017.

Suggested Practical List :

Practical exercises such as

1. Write a program to implement Bresenham's line drawing algorithm.
2. Write a program to implement a midpoint circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgemann algorithm.
5. Write a program to fill a polygon using the Scan line fill algorithm.
6. Write a program to apply various 2D transformations on a 2D object (use homogeneous Coordinates).
7. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
8. Write a program to draw Hermite /Bezier curve.