5th Semester	RCS5D006	**Computer Graphics**	L-T-P 3-0-0	3 Credits

Objectives:

☐ To understand the basics of various inputs and output computer graphics hardware devices.

☐ Exploration of fundamental concepts in 2D and 3D computer graphics.

☐ To know 2D raster graphics techniques, 3D modelling, geometric transformations, 3D viewing and rendering.

Module I: **(6 Hours)**
Basic of Computer Graphics: Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.*

Module II: **(10 Hours)**
Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers. *

Module III: **(8 Hours)**
2D transformation and viewing: Transformations, matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping, polygon clipping.*

Module IV: **(12 Hours)**
3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.*
3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.*

Module V: **(4 Hours)**
Advance topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular eflection), Color models: properties of light, XYZ, RGB, YIQ and CMY colormodels.*
*Programming assignments are mandatory

Outcomes

☐ Ability to understand the various computer graphics hardware and display technologies.

☐ Ability to implement various 2D and 3D objects transformation techniques.

☐ Ability to apply 2D and 3D viewing technologies into the real world applications

Books:
[1]   Computer Graphics; Principles and practice; 3rd Edition in C; J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes; Addison Wesley, 2018
[2]   Computer Graphics - C version; D. Hearn and M. P. Baker; Pearson Education, 2nd Edition, 2004

[3]   Computer Graphics - OpenGL version; D. Hearn and M. P. Baker; Pearson Education, 4th Edition, 2013

[4]   Mathematical elements for Computer Graphics; 2nd edn.; D. F. Rogers and J. A. Adams; McGraw-Hill International. Edn., 1990.

Digital Learning Resources:

Course Name:	Computer Graphics
Course Link:	https://nptel.ac.in/courses/106/103/106103224
Course Instructor:	Prof. S. Bhattacharya, IIT Guwahati
Course Name:	Computer Graphics
Course Link:	https://nptel.ac.in/courses/106/102/106102063
Course Instructor:	Prof. P.K. Kalra, IIT Delhi
Course Name:	Introduction to Computer Graphics
Course Link:	https://nptel.ac.in/courses/106/102/106102065
Course Instructor:	Prof. P.K. Kalra, IIT Delhi
Course Name:	Computer Graphics
Course Link:	https://nptel.ac.in/courses/106/106/106106090
Course Instructor:	Prof. S. Das, IIT Madras