Uka Tarsadia University

B. Tech.
CSE / CSE (CC) / CE (SE)
Semester VII

Program Elective - V
COMPUTER GRAPHICS
CE6015

EFFECTIVE FROM July-2024

Syllabus version: 1.00

Subject Code	Subject Title
	Subject Title
CE6015	**Computer Graphics**

Teaching Scheme				Examination Scheme				
Hours		**Credits**		**Theory Marks**		**Practical Marks**		**Total Marks**
Theory	Practical	Theory	Practical	Internal	External	Internal	External	
3	2	3	1	40	60	20	30	150

Objectives of the course:
- To enable learner to understand the raster scan, radom scan systems and to implement different line, circle and eclipse drawing algoritms.
- To gain the fundamentals of two dimensional, three dimensional viewing and transformations of objects.
- To develop understanding of modeling, rendering and animations.

Course outcomes:
Upon completion of the course, the student shall be able to,

CO1: Understand various compuer graphics hardware and display technologies.

CO2: Implement various line, circle and eclipse drawig algorithms.

CO3: Understand and explain 2D and 3D viewing

CO4: Understand and explain 2D and 3D objects transformation techniques.

CO5: Learn concepts of different curves and surfaces.

CO6:Understand modeling and rendering concepts along with the elementary fundamentals of animations.

Sr. No.	Topics	Hours
	Unit – I	
1	**Introduction to Graphics System:** Input devices, Output devices – CRT, Random Scan system, Raster Scan system, Color CRT Monitors, DYST, Introduction to graphics programming (OpenGL).	6
	Unit – II	
2	**Raster Graphics:** Line, Circle and ellipse drawing algorithms, Polygon drawing and	8

	filling methods, Attributes of output primitive, Character cieneration – Bit map and outline font method.	
	Unit – III	
3	**Two-Dimensional Viewing:** Viewing pipeline, Windowing and clipping – Cohen and Sutherland line clipping, Linag-Barsky clippins method, Nicholl-Lee-Nicholl, Polygon Clipping – Sutherland-IJodgeman polygon clipping and Weiler Atherton polygon clipping.	8
	Unit – IV	
4	**2D and 3D Geometrical Transformations:** Scaling, Translation, Rotation, Shear, Reflection, Three-dimensional viewing, Transformations – Parallel and perspective projection, 3D clipping.	6
	Unit – V	
5	**Curves and Surfaces:** Cubic splices, Bezier curves, B-splines, Tensor product surfaces, Surface of revolution, Sweep surfaces, Fractal curves and surfaces.	8
	Unit – VI	
6	**Modeling, Rendering and Avanced Topics:** Modeling – Polygonal meshes, Spline & subdivision surfaces, Volumetric representations, Rendering – Lighting models, Global illumination, Visibility, Image-based rendering, Animation – Kinematics, Passive dynamics, Active dynamics, Hidden lines & hidden surface removal algorithms, Additive and subtractive picture representation, Shading, Shadows, Texture and ray tracing, Fractals, Half-toning, Anti-aliasing methods.	9

Sr. No.	Computer Graphics (Practicals)	Hours
1.	Implement DDA line algorithm.	2
2.	Implement Bresenham's line algorithm.	2
3.	Implement midpoint Circle Drawing algorithm.	2
4.	Implement Ellipse Drawing algorithm.	2
5.	Write a program to generate a generalized Histogram to show monthly sales of a company and fill every bar with different colors/patterns. The filling has to be done using boundary/flood fi11 algorithm.	2
6.	Implement a program to draw a rectangle using mouse.	4
7.	Implement Polygon filling algorithm. (Scan-line filling Algorithm)	4
8.	Write a program that draws a polygon of users choice. Implement 2-D transformation concepts. The transformation should be selected by user in form of menu displaying the following options: a. Translate	4

	b. Rotate c. Scale d. Exit.	
9.	(a) Implement Line Clipping algorithm. (b) Implement Polygon Clipping algorithm.	4
10.	Mini project - Implementation of any computer gpahics application.	4

Text book:
1. Donald Hearn and M. Pauline Baker, " Computer Graphics", Pearson Education.

Reference books:
1. Sinha & Udai, "Computer Graphics", TMH.
2. Foley and Van Dam, "Computer Graphics", Person Education.

Course objectives and Course outcomes mapping:
- To enable learner to understand the raster scan, radom scan systems and to implement different line, circle and eclipse drawing algoritms: CO1, CO2.
- To gain the fundamentals of two dimensional, three dimensional viewing and transformations of objects: CO3, CO4.
- To develop understanding of modeling, rendering, animations and advanced funamentals of graphics: CO5, CO6.

Course units and Course outcomes mapping:

Unit No.	Unit Name	Course Outcomes					
		CO1	CO2	CO3	CO4	CO5	CO6
1	Introduction to Graphics System	✓					
2	Raster Graphics		✓				
3	Two-Dimensional Viewing			✓			
4	2D and 3D Geometrical Transformations				✓		
5	Curves and Surfaces					✓	
6	Modeling, Rendering and Advanced Topics						✓

Programme outcomes:

PO 1: Engineering knowledge: An ability to apply knowledge of mathematics, science, and engineering.

PO 2: Problem analysis: An ability to identify, formulates, and solves engineering problems.

PO 3: Design/development of solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints.

PO 4: Conduct investigations of complex problems: An ability to use the techniques, skills, and modern engineering tools necessary for solving engineering problems.

PO 5: Modern tool usage: The broad education and understanding of new engineering techniques necessary to solve engineering problems.

PO 6: The engineer and society: Achieve professional success with an understanding and appreciation of ethical behavior, social responsibility, and diversity, both as individuals and in team environments.

PO 7: Environment and sustainability: Articulate a comprehensive world view that integrates diverse approaches to sustainability.

PO 8: Ethics: Identify and demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work.

PO 9: Individual and team work: An ability to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give/receive clear instructions.

PO 11: Project management and finance: An ability to demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12: Life-long learning: recognition of the need for, and an ability to engage in life-long learning.

Programme outcomes and Course outcomes mapping:

Programme Outcomes	Course Outcomes					
	CO1	CO2	CO3	CO4	CO5	CO6
PO1	✓			✓		
PO2		✓			✓	
PO3			✓		✓	
PO4						
PO5						✓
PO6						
PO7						

PO8						
PO9						
PO10						
PO11						
PO12						