SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

Year: B. Tech III (Semester VI)

Subject Name: Computer Graphics **Subject Code:** BTIT14601
Type of course: Professional Elective Course
Prerequisite (if any): Programming for Problem Solving

Rationale: To understand the basics of various inputs and output computer graphics hardware devices as well as the course will offer an in-depth exploration of fundamental concepts in 2D and 3D computer graphics. After introducing 2D raster graphics techniques, the course focuses on 3D modeling, geometric transformations, 3D viewing and rendering. This course presents an introduction to computer graphics designed to give the student an overview of fundamental principles.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	30	20	150

CA1: Continuous Assessment (assignments / projects / open book tests / closed book tests) CA2: Sincerity in attending classes / class tests / timely submissions of assignments / self-learning attitude / solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work / Quality of work submitted / Active participation in lab sessions / viva on practical skills learned in course.

Contents:

Sr. No.	Contents	Total Hrs
1	**Basic of Computer Graphics:** Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards	06
2	**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.	10
3	**2D transformation and viewing:** Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping	08
4	**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	07

5	**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	**08**
6	**Advance topics:** Visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), Color models: properties of light, XYZ, RGB, YIQ and CMY color models	**06**

Suggested Specification table with Marks (Theory): (For B. Tech only)

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	20	10	10	0	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN
1	Computer Graphics with OpenGL	Donald D Hearn	Pearson Education ISBN- 9789332518711
2	Computer Graphics, C Version - Anna University	Donald D Hearn	Pearson Education ISBN- 9789332518711

Note: Students should refer to the latest editions of books

Course Outcomes:

Sr. No.	CO statements	Marks % weightage
CO-1	Understand working of different graphics system and their use in real world application.	20%
CO-2	Apply graphics primitive algorithm to create 2D and 3D objects.	30%
CO-3	Understand and implement basic transformations of 2D and 3D objects.	30%
CO-4	Comprehend the various types of three dimensional object representation and viewing methods.	20%

List of Open learning website:

- https://open.gl/
- https://ininet.org/

List of Open Source Software:

- OpenGL

List of Experiments:

1. To study the various graphics commands in C language.
2. Develop the DDA Line drawing algorithm using C language
3. Develop the Bresenham's Line drawing algorithm using C language
4. Develop the Bresenham's Circle drawing algorithm using C language
5. Develop the C program for to display different types of lines
6. Perform the following 2D Transformation operation Translation , Rotation and Scaling
7. Perform the Line Clipping Algorithm
8. Perform the Polygon clipping algorithm
9. Perform the following tasks using MATLAB commands.
   - Read the grayscale and color image.
   - Display images on the computer monitor
   - Write images in your destination folder.
10. Generate the complement image using MATLAB.