

Course Title	Computer Graphics	
Course Code	CE313	
Course Credit	Theory	: 03
	Practical	: 01
	Tutorial	: 00
	Credits	: 04
Course Learning Outcomes		
<p>On the completion of the course, students will be able to:</p> <ul style="list-style-type: none"> ● Understand the basic knowledge of basic computer graphics system. ● write program functions to implement graphics primitives ● Use the underlying algorithms, mathematical concepts, supporting computer graphics to create the various applications. ● Design programs to display graphic images to given specifications ● Design and implement the programs of different transformations. ● Design and implement model and viewing transformations, the graphics pipeline and an interactive render loop ● Enhance their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information. ● Understand and select among models for lighting/shading. 		
Detailed Syllabus		
Sr. No.	Name of chapter & details	Hours Allotted
Section – I		
1	Introduction:	06

	Computer Graphics, Elements of Graphics, Application of computer graphics, raster and random scan system, Video display devices - Refresh CRT, color CRT monitors, DVST, Flat panel display, Input devices.	
2	Output Primitives: Point and Lines, Line Drawing Algorithms – DDA, Brasenham’s and mid-point, Properties of a Circles, Circle generating algorithms - Brasenham’s and mid-point, Ellipse generating algorithm, Polygon representation, An Inside test, outside test, Polygon Interfacing Algorithms, Polygon Filling - boundary and flood fill.	10
3	2D Transformations Introduction, Matrices, Basic Transformation – Translation, Rotation and Scaling, Homogeneous Co-ordinates, Composite transformation, Transformation about an arbitrary point, Other Transformations – Reflection, Shear, Inverse Transformations, Coordinate transformation	08
Section – II		
4	2D Viewing and Clipping The 2D Viewing Transformation pipeline, 2D Clipping - The Cohen-Sutherland Algorithm, Liang barsky line clipping Algorithm, NLN	06
5	3D Transformation and Viewing Introduction, 3D Geometry, 3D Primitives, 3D Transformations, Rotation About An Arbitrary Axis, Parallel Projection, Perspective Projection, 3D Viewing Transformations.	08
6	Visible Surface Determination Visual Realism, Back-Face Removal, Z Buffers, Scan-Line Algorithms Light, Color And Shading Illumination Model, Shading Algorithms, Color Models – RGB, CMY	10
Instructional Method and Pedagogy		

- Lectures will be conducted in audio-visual class room to discuss important concepts with the help of animations / videos / PPTs / case studies to understand the concepts effectively.
- Lecture will consist of real time case studies which have to be solved by students.
- Problems based on concepts discuss in each unit/topic will be given followed by discussion with professor which improves problem solving skills.
- Team project / Problem will be given such that students can apply their skills.
- Active learning methodologies will be introduced like problem based, quiz, scenario-based etc, according to the topic need

Reference Books

- D.Hearn and P.Baker, Computer Graphics C Version, 2nd Edition, Pearson Education
- Steven Harrington, Computer Graphics, Second Edition, McGrawhill Publications.
- R.H.Bartels, J.C.Beatty and B.A.Barsk, An Introduction To Splines For Use in Computer Graphics And Geometric Modelling, First Edition, Morgan Kaufmann series
- Peter Shirley, Fundamentals of Computer Graphics, Third Edition, CRC Press
- James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics Principles And Practice, Third Edition, Pearson
- Foley, Computer Graphics Principles And Practice in C, Second Edition, AddisonWelsley

Additional Resources

- NPTEL Lecture series of Computer Graphics by Prof. Prem K Kalra, Computer Science and Engineering, IIT Delhi
- NPTEL Lecture series of Computer Graphics by Prof. Sukhendu Das, Computer Science and Engineering, IIT Delhi

LAB PLANNING

Name of Faculty:	Vaishali Kalaria, Sheetal Pandya, Vinay Harsora, Gaurav Bhatt	
Subject :	Computer Graphics [CE512]	
Semester:	5th CE-A/CE-B/IT	
Sr. No.	Lab week	Tutorial details
1	1 st week	Tutorial 1
2	2 nd week	Tutorial 2
3	3 rd week	Tutorial 2
4	4 th week	Tutorial 3
5	5 th week	Tutorial 4
6	6 th week	Tutorial 5
7	7 th week	Tutorial 6
8	8 th week	Tutorial 7
9	9 th week	Tutorial 8
10	10 th week	Tutorial 8
11	11 th week	Tutorial 9
12	12 th week	Tutorial 9

Tutorial List

Tutorial-1

(Sketch out following output primitives with use of some basic graphics functions)

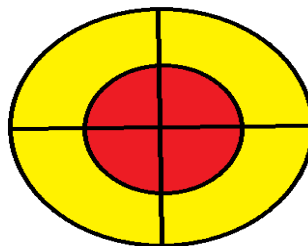
1. Co-ordinate axis at center of the screen.
2. Circle at center of the screen with dashed filling pattern.
3. Rectangle at center of the screen with dotted filling pattern.
4. Ellipse solid filled with blue color at center of the screen.
5. Twinkling star without use of line function.

Tutorial-2

1. **Create** a Triangle shape with composition of Line drawing Methods where each line differentiate with color and method like – 1st line (Blue + DDA Method) 2nd line (Yellow + Bresenham's Method) 3rd line (Red + Mid-point Method)

Tutorial-3

1. **Construct** following object. [Draw inner circle with use of mid-point method and Outer circle with use of Bresenham's method]. **Apply** boundary fill algorithm to fill inner circle and flood fill algorithm to fill outer circle.



Tutorial -4

1. **Construct** cone shape with use of Mid-Point Ellipse drawing method and line function.

Tutorial -5

1. **Draw** a rectangle. **Apply** the three basic 2D transformations translation, Rotation and Scaling on it.

Tutorial-6

1. **Perform** reflection object as per user's choice. Choices are with respect to x – axis, with respect to y – axis, with respect to co-ordinate origin and with respect to an axis at 45 degree to x – axis.
2. **Demonstrate** shear transformation x-shear and y shear on square object.

Tutorial-7

1. **Draw** a 3D Cube. **Apply** 3D basic transformations on it.

Tutorial-8

1. **Construct** a bicycle and translate it from left side to right side.

Tutorial-9

1. **Design** Analog Clock with pendulum at 45' clock wise and anti-clock wise direction with respect to system date and time.

