

**Course Name : Computer Engineering Group**

**Course Code : CO/CM/CD**

**Semester : Fourth**

**Subject Title : Computer Graphics**

**Subject Code : 12112**

**Teaching and Examination Scheme:**

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS.	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	25@	--	125

**NOTE:**

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

**Rationale:**

The computer is an information-processing machine. Almost every computer system is set up to allow the user to interact with the system through a graphical user interface, where information on the display screen is conveyed in both textual and graphical forms. Everyone should be aware of this rapidly expanding technology. The prerequisites of Computer Graphics are working knowledge of computer system.

Computer graphics is a complex and diversified technology. The output product of Computer graphics is a pictorial image. Hence the computer has become a new tool for the artist and animator. Computer graphics is an extremely effective medium for communication between man and machine through pictures, charts and diagrams. Thus the one can understand the information contents of a displayed diagram or perspective view much faster than the table of numbers.

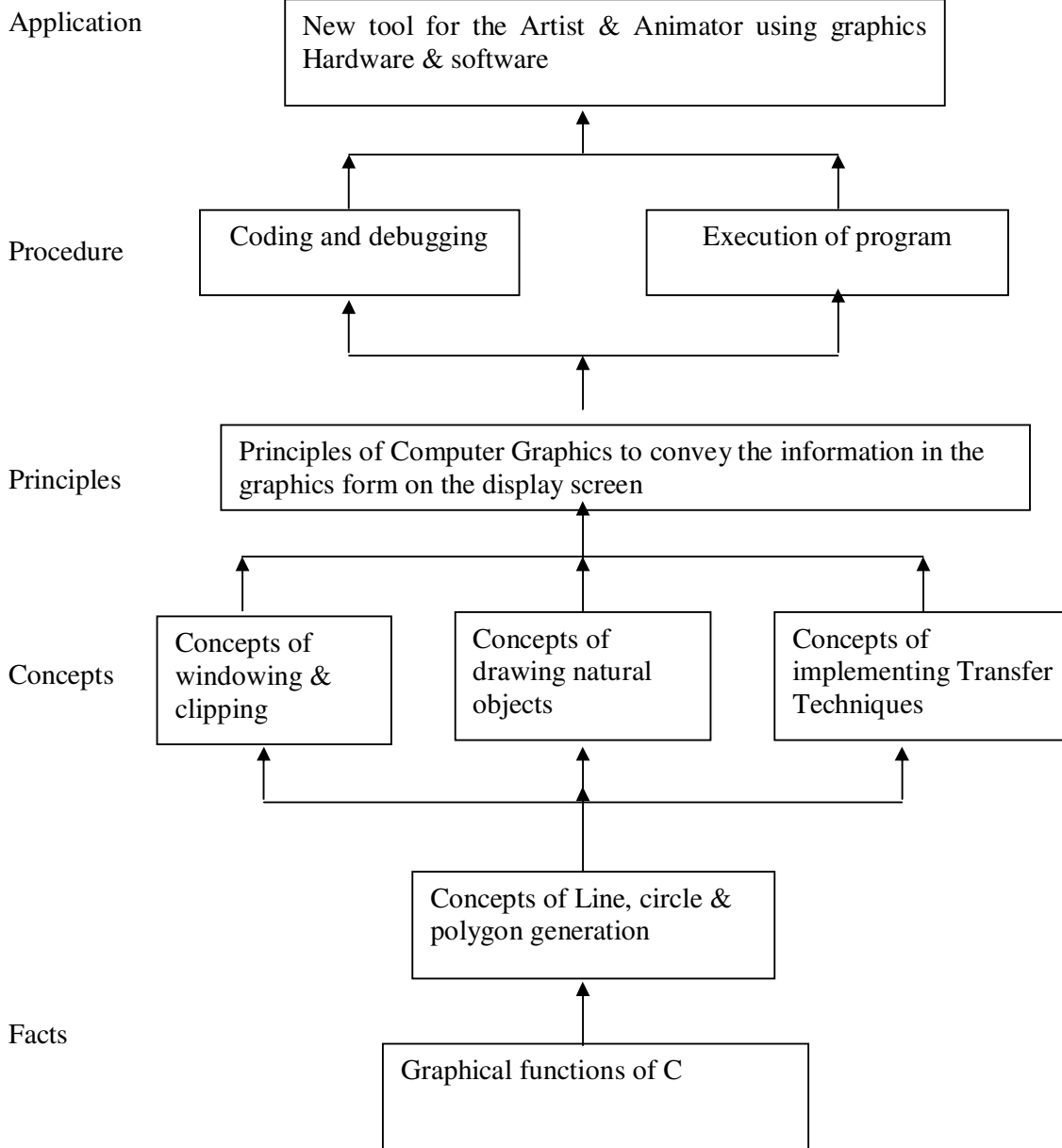
Computer graphics techniques can be used in many fields such as Engineering drawing, business graphs, architectural design and also for video games, which provides a new form of entertainment.

**Objectives:**

The students will be able

- To describe file structure of display & graphics file formats.
- To apply the algorithms to draw lines, circles and polygons.
- To use transformation techniques to scale, rotate and translate the object.
- To select the methods of enlarging visible portion of drawing
- To develop the logic for drawing the natural objects using different algorithms for curved lines
- To describe the fundamentals of raster graphics and interactive graphics.

**Learning Structure:**



**Contents: Theory**

Chapter	Name of the Topic	Hours	Marks
01	<p>Basics of Computer Graphics            Raster scan display: Frame buffers:            - Rotating memory frame buffer            - Shift register frame buffer            - Random access frame buffer            - Multiple plane frame buffer            Display devices: Construction and            Random scan display ,            working of following devices: CRT, Beam penetration CRT,            Shadow mask CRT, DVST, Plasma panel, Liquid crystal display.            Primitive operations: - moveto, lineto            The Display-file interpreter, Display file structure, Graphics file            formats: general explanation, advantages, disadvantages :            - BMP            - GIF            - JPEG            - TIFF            - PCX            Text mode graphics function, Graphic mode graphics functions,            Shapes, colors, Co-ordinate systems, Applications of computer            graphics</p>	09	20
02	<p>Line, circle, and polygon.            Basic concepts in line drawing, Line drawing algorithms: DDA            algorithms, Bresenham's algorithm            Circle generating algorithms: Symmetry of circle, DDA circle            drawing algorithm, Bresenham's circle drawing algorithm,            midpoint circle algorithm            Polygons – Types of polygons, Polygon representation, Entering            polygons, inside –outside test, polygon filling: Flood fill, scan-            line algorithm. Sample problems to illustrate above algorithms</p>	11	22
03	<p>Transformations            2D transformation: scaling, Reflection, shearing, Rotation,            Translation, Rotation about an arbitrary point..            3D Transformation: scaling, rotation, translation, rotation about            arbitrary axis. Sample problems with sample coordinates to            illustrate above algorithms</p>	07	16
04	<p>Windowing &amp; clipping            Viewing transformation, Normalization transformation            Line clipping: Cohen-Sutherland, Line clipping algorithm,            midpoint subdivision algorithm            Polygon clipping: Sutherland – Hodgeman Polygon clipping            algorithm. Sample problems with sample coordinates to illustrate            above algorithms</p>	08	16

05	Curves and fractals Curve generation: arc generation using DDA algorithm, Interpolation, B-Spline, Bezier curves: Properties, Cubic Bezier curves  Fractals: Hilbert's Curve, Koch curve, Fractal lines, Fractal Surfaces.	09	18
06	Raster graphics and interactive graphics Need for graphics standards, Graphics standards: CORE GKS PHIGS IGES CGM VDI Advantages of Graphics standards, Hazards of Graphics standards. Graphical user interface : Introduction - Example - Features of GUI - Principles for good GUI design	04	08
<b>Total</b>		<b>48</b>	<b>100</b>

**Practical:**

Skills to be developed:

**Intellectual skills:**

- Specifically develop the logic and algorithms for developing basic graphic software.
- Use of programming language constructs in program implementation.
- To be able to apply different logics to solve given problem.
- To be able to write program using different implementations for the same problem
- Study different types of errors as syntax semantic, fatal, linker & logical
- Debugging of programs
- Understanding different steps to develop program such as
  - Problem definition
  - Analysis
  - Design of logic
  - Coding
  - Testing
  - Maintenance (Modifications, error corrections, making changes etc.)

**Motor skills:**

Proper handling of Computer System

**List of Practical:**

- 1) Implement DDA algorithm for line drawing
- 2) Implement Bresennham's algorithm for line drawing.
- 3) Implement DDA algorithm for circle drawing
- 4) Implement Bresennham's algorithm of circle drawing.
- 5) Implement Flood fill algorithm for Polygon filling.
- 6) Implement scan-line algorithm for polygon filling.
- 7) Write Program for 2-D transformations -> scaling, Rotation,

- 8) Write Program for 2 D transformations shearing and Translation program
- 9) Write and implement program for rotation about an arbitrary point.
- 10) Implement Cohen- Sutherland algorithm for line clipping.
- 11) Implement mid point subdivision algorithm for line clipping.
- 12) Implement Sutherland-Hodgeman algorithm for polygon clipping.
- 13) Write a program to draw a curve using Bezier's algorithm.
- 14) Write a program to draw fractal lines.

#### List of Practical oriented Projects:

- 1) Oral geometry insertion for character animation (Develop a system to create an animatable mouth in head geometry)
- 2) Online storyboarding system ( Create a system that will keep still images, text descriptions, sample animations, sample audio for each scene of an animation)

#### Learning Recourses:

##### 1. Books:

Sr. No.	Book Title	Author	Publication
01	Computer Graphics	ISRD group	Tata McGraw Hill
02	Computer Graphics	A.P. Godse	Nirali Prakashan Technical Publications
03	Computer Graphics	Steven Harington	Mc Graw Hill
04	Computer Graphics	M.Pauline Baker & Donald Hearn	Prentice-Hall
05	Graphics Under 'C'	--	BPB
06	Principles of Interactive Computer Graphics	Newman and Sproull	Tata McGraw Hill
07	Computer Graphics	Plastock	Tata McGraw Hill

##### 2. Websites:

- 1) [www.insidecg.com](http://www.insidecg.com)
- 2) [www.graphics.standard.edu](http://www.graphics.standard.edu)
- 3) [www.cmp.uea.ac.uk/research](http://www.cmp.uea.ac.uk/research)
- 4) [www.computerarts.co.uk](http://www.computerarts.co.uk)

##### 3. Magazines:

- 1) Computer Graphics World
- 2) In-plant Graphics
- 3) Computer Arts

Demo lectures with power point presentations using LCD projector should be arranged to develop programming concepts of students.