Course Title: Computer Graphics
Course No. : ICT Ed 466 Nature of Course: Theoretical + Practical
Level: B.Ed. Credit Hours: 3 (2T+1P)
Semester: Teaching Hours: 80 (32T+48P)

1. Course Description

This course deals with computer graphics consisting of introduction of graphical system, different hardware used in the graphical system, Output primitives, implementation of two dimensional algorithms, and understanding in three dimensional graphics and their implementation.

2. General Objectives

The general objectives of this course are as follows:

- To familiarize the students with computer graphics and its applications.
- To familiarize the students with graphical input, display and output hardware.
- To make the students competent in implementing graphical primitives: point, line and circle.
- To enable the students to implement two – dimensional transformations.
- To make the students familiar with three – dimensional transformation.
- To make the students capable for demonstrating rendering and illusion techniques.

3. Specific Objectives and Contents

Specific Objectives	Contents
• To define the computer graphics. • To explore the history of computer graphics. • To identify the application areas of Computer graphics. • To explain the process of picture presentation in computer system. • To find the importance of light in graphic element. • To explain the different color models. • To identify the different graphics standards and file formats.	**Unit I: Introduction** **(10)** 1.1 History of computer graphics 1.2 Applications of computer graphics 1.3 Picture representation 1.4 Properties of light 1.5 Color models 1.6 Graphics Standards and Graphical file formats
• To identify the different graphical input devices. • To explain the working principle CRT monitor.	**Unit II: Hardware Concepts** **(10)** 2.1 Input hardware: Keyboards, Mouse, Trackball, Joysticks, Data Glove, Digitizer, Scanner, Touch Panels, Light Pens, Voice system.

• To differentiate between raster scan display architecture and random scan display architecture in detail. • To identify the different flat-panel display devices. • To identify different Hardcopy devices.	2.2 Video Display Devices: Refresh Cathode - Ray Tubes, Raster scan display architecture, Random scan display architecture, Flat-Panel displays. 2.3 Hard-Copy Devices
• To define the output primitives. • To implement the DDA algorithm. • To implement the Bresenha's line algorithm. • To differentiate between DDA and Bresenham's line algorithm. • To implement the Midpoint circle algorithm. • To implement Bresenham's circle drawing algorithm. • To explain the attributes of Line, curve and characters.	**Unit III: Output Primitives** **(15)** 3.1 Points and Lines 3.2 Line Drawing Algorithms: DDA algorithm, Bresenham's Line algorithm. 3.3 Circle Generating Algorithm: Properties of circle, Midpoint circle drawing algorithm, Bresenham's circle drawing algorithm, 3.4 Attributes: Line attributes, Curve attributes and Character attributes.
• To solve the basic 2-D transformations problems. • To explain the 2-D Composite Transformations. • To transform the 2-D object to screen viewing. • To explain the different line clipping operations. • To use line clipping algorithms.	**Unit IV: 2-D Geometric Transformations** **(22)** 4.1 Basic Transformations: Translation, Rotation, Scaling 4.2 Composite Transformations: Translation, Scaling, Rotation. 4.3 Recent transform concepts and advantages 4.4 Two-dimensional object to screen viewing transforms 4.5 Workstation Transformation 4.6 Clipping Operations: Point Clipping, Line Clipping: Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping.
• To define the 3-D viewing pipeline. • To explain the types of projections. • To explain the basic 3-D transformations. • To explore the different HSR techniques. • To explain the basic Illumination models. • To Illustrate Polygon rendering methods.	**Unit V: Three-Dimensional Graphics** **(22)** 5.1 Three- dimensional viewing pipeline 5.2 Projection: Parallel Projections, Perspective Projections. 5.3 Extension of two-dimensional transforms to three dimensions: Translation, Rotation, Scaling. 5.4 Methods of generating non-planar surfaces 5.5 Hidden line and hidden surface removal techniques 5.6 Need for shading in data visualization 5.7 Basic Illumination Models: ambient, diffuse and specular reflections

• To explore the future of 3-D display architecture.	5.8 Polygon – Rendering Methods: Constant, Gouraud, Phong and Fast-Phong. 5.9 Specialized and future three dimensional display architectures

Laboratory:

1. write a program to plot a pixel.
2. Write a program to draw a rectangle using line function.
3. Write a program to draw a line using DDA line drawing algorithm.
4. Write a program to draw a line using Bresenham's line drawing algorithm.
5. Write a program to draw a circle using Midpoint circle drawing algorithm.
6. Write a program to draw a circle using Bresenham's circle drawing algorithm.
7. Write a program to implement Cohen Sutherland line clipping algorithm.
8. Write a program to perform 2-D transformation on a line.

4. Instructional Techniques

Reading materials will be provided to students in each unit. Lecture preferably with the use of multi-media projector, demonstration, practical classes, discussion, and brain storming are used in all units.

5. Evaluation

Evaluation of students' performance is divided into parts: Internal assessment and internal and external practical examination and theoretical examinations. The distribution of points is given below:

Internal Assessment	External Practical Exam/Viva	Semester Examination (Theoretical exam)	Total Points
40 Points	20 Points	40 Points	100 Points

***Note**: Students must pass separately in internal assessment, external practical exam and semester examination.*

5.1 Internal Assessment (40 Points)

Internal assessment will be conducted by subject teacher based on following criteria:

1) Class Attendance	5 points
2) Learning activities and class performance	5 points
3) First assignment (written assignment)	10 points
4) Second assignment (Case Study/project work with presentation)	10 points
5) Terminal Examination	10 Points
Total	40 points

5.2 Semester Examination (40 Points)

Examination Division, Dean office will conduct final examination at the end of semester.

Objective question (Multiple choice questions 10 x 1 point)	10 Points
Short answer questions (6 questions x 5 marks)	30 Points
Total	40 points

5.3 Practical Exam/Viva (20 Points)

Examination Division, Dean Office will conduct final practical examination at the end of semester. Practical record book, practical written test, demonstration of practical activities and viva are assessment indicators.

6. Recommended Books and References

Recommended Books

1. Hearn and Baker, "*Computer Graphics, C Version*", Second Edition, Prentice- Hall of India Private Limited, 2003.
2. Computer Graphics (Principles and Practice) by Foley, van Dam, Feiner and Hughes, Addisen Wesley (Indian Edition).