



Faculty of Sciences
Department of Computing

First Semester 2025/2026 Academic Session

Computer Graphics And Visualization (2 Units)
CMP 431
Dr. Omanma C. Uche
16 Weeks
2

Course Description

Computer graphics is an art of drawing pictures on computer screens with the help of programming. It involves computations, creation, and manipulation of data. In other words, we can say that computer graphics is a rendering tool for the generation and manipulation of images. Computer Graphics simplify the process of displaying pictures of any size on a computer screen. Various algorithms and techniques are used to generate graphics in computers. This course will help the students understand how all these graphics are processed by the computer to give a rich visual experience to the user.

Course Objectives

By the end of this course, students will be able to:

1. Understand the hardware and software components of computer graphics systems.
2. Apply 2D and 3D transformations and projections.
3. Implement clipping, shading, and rendering algorithms.
4. Use appropriate data structures for graphics applications.
5. Develop basic handwriting and character recognition systems.
6. Analyze and synthesize curves and contours.
7. Construct hierarchical models for scene representation.

Course Contents

Hardware aspect, plotters microfilm, plotters display, graphic tablets, light pens, other graphical input aids Facsimile and its problems Refresh display refresh huggers, changing images, light pen interaction. Two and three-dimensional transformation, perspective Clipping algorithms. Hidden line removal bolded surface removal. Warmock's method, shading, data reduction for graphical input. Introduction to hand writing and character recognition. Curve synthesis and fitting. Contouring. Ring structures versus doubly linked lists. Hierarchical structures. Data structure: Organization for interactive graphics.

Lab work:

Teaching Methodology

- Lectures
- Practical sessions
- Interactive Discussions
- Assignments
- Group Presentations

Method of Assessment

Continuous Assessment: 40

Final Exam: 60

Textbooks and References

1. Computer Graphics: Principles and Practice by **John F. Hughes et al.**
2. Fundamentals of Computer Graphics by **Steve Marschner and Peter Shirley**
3. Interactive Computer Graphics: A Top-Down Approach with WebGL by **Edward Angel and Dave Shreiner**
4. Data Structures and Algorithms in C++ by **Michael T. Goodrich et al.**
5. Pattern Recognition and Machine Learning by **Christopher Bishop (for handwriting recognition)**

Attendance and Participation

75% attendance is required from all students to qualify for the examination.

Course Schedule

Week	Topic
1.	Introduction to Computer Graphics and Visualization
2.	Graphics Hardware: Plotters, Microfilm, Displays
3.	Graphical Input Devices: Tablets, Light Pens, Aids
4.	Facsimile Systems and Challenges
5.	Display Refresh Techniques: Huggers, Dynamic Images
6.	Light Pen Interaction and Real-Time Graphics
7.	2D and 3D Transformations
8.	Perspective and Projection Techniques
9.	Clipping Algorithms
10.	Hidden Line and Surface Removal
11.	Wormock's Method and Shading Techniques
12.	Data Reduction for Graphical Input
13.	Handwriting and Character Recognition
14.	Curve Synthesis, Fitting, and Contouring
15.	Data Structures: Ring vs Doubly Linked Lists
16.	Hierarchical Structures and Scene Graphs