Department of Computer Science

College of Science

University of Cihan Sulaimaniya

Subject: Computer GraphicsI

Course Book – Stage 3

Lecturer's name: asst. lecturer Asan Baker Kanbar

Academic Year: 2023/2024

Course Book

1. Course name		**Computer Graphicsi**
2. Lecturer in charge		**Asan Baker**
3. Department/ College		**Computer Science**
4. Contact		**e-mail: asan.baker@sulicihan.edu.krd**
5. Time (in hours) per week		**Theory: 2** **Practical: 2**
6. Office hours		
7. Course code		**CSC3103**
8. Teacher's academic profile		2005-2008 M. Sc. Ege University Computer Engineering Department - Izmir- Turkey 2004-2005 Gazi University Turkish Learning Center Ankara-Turkey 2000-2004 BSc Software Technical Engineering Department - Kirkuk-Iraq **EXPERIENCE:** 2002-2003 **Kirkuk Petrol Company** (*Practical Training*) Kirkuk 2009 **Ava Group** *(software engineer)* Sulaymania 2011 Cihan University
9. Keywords		Computer graphics, OpenGL, 3D transformations

	10. Course overview: Today, computer graphics is a central part of our lives, in movies, games, computer-aided design, virtual simulators, visualization and even imaging products and cameras. This course includes an overview of Computer Graphics applications; Graphics Output Primitives and its attributes; 2D and 3D Geometric Transformations; 2D Viewing and Clipping; Graphical User Interface and its attributes; Introduction to OpenGL programming and its applications; Example applications will be developed in lectures using C++ and OpenGL to demonstrate the techniques being presented. Topics include 2D and 3D transformations, Bezier and B-Spline curves for geometric modelling, ´ interactive 3D graphics programing, computer animation, kinematics, and rendering including ray tracing, shading, and lighting. There will be an emphasis on the mathematical and geometric aspects of computer graphics
	11. Course objective: The objective of this course is to familiarize students with fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers. The main goal of this course is to teach students the foundation of computer graphics and how images are generated on the computer. The principles and practise of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualisation, virtual reality, computer games and film animation. The course will include some practical experience of graphical software environments such as OpenGL.
	12. Student's obligation - Quizzes, - Exams, - Assignments,
	13. Forms of teaching - Data show - White board - Computers

14. Assessment scheme

The 100 marks will be divided into :-

Midterm theoretical exam	25 marks
Practical exam	15 marks
Quizzes, activities	10 marks
Final theoretical exam	35 marks
Final practical exam	15 marks

15. Student learning outcome:

Upon successful completion, students will have the knowledge and skills to:

1. Demonstrate advanced knowledge on the fundamentals of 2D and 3D computer graphics.
2. Understand the techniques used in computer graphics for geometric transformations.
3. Learn the basics of graphics programming with OpenGL
4. Explain and apply the algorithms commonly used in 3D computer graphics.
5. Understand the viewing pipeline and what goes behind the scene for images to look the way they do and how to manipulate parameters to control the model view.
6. Write computer graphics applications and implement the various techniques discussed throughout the course using OpenGL.
7. Write and develop programs that create images of a 3D scene with lighting

16. Course Reading List and References:

1. **Reference books:**

   - Computer Graphics with Open GL Hearn Baker Carithers Fourth Edition
   - Introduction to Computer Graphics, David J. Eck, Hobart and William Smith Colleges, Version 1.2, January 2018. http://math.hws.edu/graphicsbook/

2. **Textbook**

   Fandementals od computer graphics by Dr John Collomosse,2019 uk

17. The Topics:	**Lab**	**weeks**
• Introduction to computer graphics, • Video Display Devices • Raster-Scan Systems • Graphics Workstations and Viewing Systems	• Installing Glut • Introduction to OpenGL • Learning how to use Open GL	Week1
• Input devices and output devices • Hard-Copy Devices • Specifying a Two-Dimensional World-Coordinate Reference Frame in OpenGL	• Introduction to OpenGL • OpenGL Point Functions • OpenGL Line Functions • OpenGL Curve Functions	Week2
• Line drawing algorithms • DDA line drawing algorithm	• OpenGL Curve Functions • Drawing a line using DDA	Week3
• Bresenham's Line-Drawing Algorithm • Parallel Line Algorithms	Drawing a line using Bresenham's algorithms Parallel line algorithms	Week4
Circle-Generating Algorithms Mid-point Algorithm	Using Mid-point algorithm to draw a circle	Week5
Circle drawing using Bresenham's Algorithm	Using Bresenham's algorithm to draw a circle	Week6
• Filling Polygon ✓ Scan line ✓ Boundary fill	Fill-Area Primitives Fill-Area Attributes Implementing Scan line and boundary algorithm	Week7

Attributes of primitives: • Line type • Line width • Line color Color models(RGB,CMY,HSV)	OpenGL Color Functions Line Styles OpenGL Line-Attribute Functions Curve Attributes	Week8
2D Geometric Transformations • Translation • Rotation • Scaling • Reflection • Shearing	OpenGL Functions for Two-Dimensional Geometric Transformations	Week9
• Sequence of geometric transformation • Matrices • matrix properties • matrix representation • sequence of transformation using matrices	OpenGL Geometric-Transformation Applying more than one transformation	Week10
• Successive transformations • Inverse transformations • Rotation and scaling about fixed point	Continue more examples OpenGL Geometric-Transformation Programming rotation, scaling	Week11
Reflection • Reflection y=a • Reflection x= b • Reflection y=x • Reflection y= -x • Reflection about x axis • Reflection about y axis • Reflection about line y = mx+b	Drawing the reflection of an object with openGL	Week12
Shearing • X- direction shearing • Y- direction shearing •	Performing shearing transformation on objects	Week13
3D Geometric transformation • 3D Translation • 3D Scaling • 3D Reflection • 3D Rotation	Applying 3D Geometric transformation Changing view point	Week14

Revision previous lectures & answer students questions	Writing a program with OpenGL and applying most of above techniques.	Week15
20. Extra notes: ……	None	
21. Peer review	Assistant Professor Dr.Lway Faisal Abdulrazak	

Asst.Lecturer: Asan Baker