Department of Computer science

College of Science

Salahaddin University-Erbil

Subject: Computer Graphics

Course Book – For 4ᵗʰ Year

Lecturer's name: Tarza Hasan Abdullah

Academic Year: 2020/2021

Course Book

1. Course name	**Computer Graphics**
2. Lecturer in charge	**Tarza Hasan Abdullah**
3. Department/ College	**College of Science – Computer Science Department**
4. Contact	e-mail: **tarza.abdullah@su.edu.krd**
5. Time (in hours) per week	**Theory: 2** **Practical: 2**
6. Office hours	
7. Course code	
8. Teacher's academic profile	BSc: Computer Science MSc: Software engineering Specific Specialization: Computer Vision
9. Keywords	

10. Course overview:

Computer Graphics is the study of the software and hardware principles of computer graphics. This course aims to provide knowledge about computer graphics algorithms. Topics include an introduction to the basic concepts, 2D transformations including scaling, rotation, shearing, and reflection. Additionally, line drawing algorithms of direct, Digital Differential analyzer and Bresenham algorithms will be included. Also, algorithms of clipping and windowing are taken through this subject such as Cohen and Sutherland line clipping algorithm. In the end, an introduction to OpenGL programming will be given.

11. Course objective:

- Understand the concept, basic elements, and applications of computer graphics.
- Implementation of algorithms such as line drawing, and circle drawing algorithms.
- Get familiar with geometric transformations including scaling, reflection, rotation, and shearing.
- Learn to use basic graphics functions of BGI and OpenGL libraries.

12. Student's obligation:

- Attendance.
- Assignment
- Participation

13. Forms of teaching

The course consists of two parts; a theoretical part and a practical part, part I (theory) will depend on lectures in the hall to explain the basic concepts associated with the course by using PowerPoint.

Part II (practical) is associated with algorithms and functions taken in theoretical lectures and will be applied in the lab using CodeBlocks editor and WinBGIm and OpenGL libraries.

14. Assessment scheme

15 % theoretical part: The students are required to do at least two closed-book exams.

30% practical part: The students are required to perform specified tasks in the lab at least two practical exams.

5% assignments and participation.

The final exam will take **50%** of the marks and it is only theoretical.

15. Student learning outcome:

Upon completion of this course, students should be able to Computer graphics elements. Moreover, students are expected to be able to implement different algorithms and use basic graphics functions.

16. Course Reading List and References:
Text Book

1- Johnn F. Hughes. Computer Graphics: Principles and Practice. Third Edition 2013.

2- Marschner, S., 2010. Fundamentals of Computer Graphics, Fourth Edition.
3- Donald D. Hearn, M. Pauline Baker - Computer Graphics with OpenGL (3rd Edition).
4- Donald_ Baker, M. Pauline Hearn - Computer Graphics, C Version-Prentice (1997).

5- https://www.geeksforgeeks.org/computer-graphics-2/
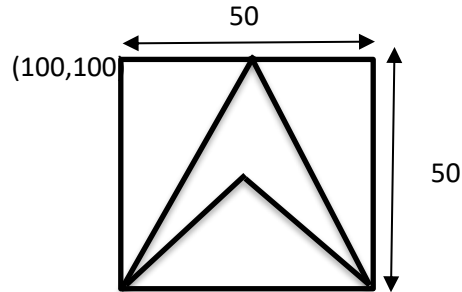
17. The Topics:	Lecturer's name

Week(s)	Basic Tutorial Subject to be covered	Lab
1	**Graphics definitions, applications, systems, and categories.**	Instructions to set up WinBGIm library
2	**Display devices, graphics software, raster graphics, file formats.**	Cartesian and raster graphics system and plotting a pixel on the screen.
3-4	**Graphics output primitives, rasterization of output primitives, aliasing, and anti-aliasing.**	Introducing basic graphics functions and rasterizing a line on the screen with put pixel function. Example of drawing an aliased line. Drawing a vertical, horizontal, and diagonal line on the screen.
5-10	**Properties of good line drawing algorithm, direct algorithm, Digital differential Analyzer (DDA), and Bresenham's line drawing algorithm. Introducing methods to draw a line and moving the current position to draw output primitives. And changing styles and color of the line.**	Implementation of scan converting a line using direct, Digital Differential Analyzer (DDA) and Bresenham algorithms. Examples to draw a line, changing the current position to draw output primitives. And, examples about changing styles and color of the line.
11-12	**Drawing rectangle, filling the closed shape, changing the filled pattern of the closed shape. Writing a text on the graphics screen and changing the style and pattern of the text.**	Examples of drawing a rectangle, filling the rectangle with different color and styles such as solid and LT-Slash fill style. Writing a code to change direction and size of the text. And writing a text in the specified position of the screen.
13-15	**Drawing output primitives of circle, ellipse, arc, and sector. Methods of drawing a polygon, pieslice, bar, and 3d bar.**	Different examples on circle, ellipse, arc, and sector. Drawing a polygon, pieslice, bar chart, and 3d bar chart.
16	**Mid-term Exam**	
17-19	**Circle drawing algorithms: standard, polar, and mid-point circle generating algorithms. Ellipse drawing algorithms.**	Implementation of circle, and ellipse drawing algorithms.
20-25	**2Dimensional Geometric transformations:** rotation, scaling ,reflection and shearing.	Implementation of rotating, scaling ,reflection and shearing of an closed area.
26-27	**Clipping and windowing algorithms:** Cohen and Sutherland algorithm.	Implementation of clipping and windowing algorithms.
28-29	**An introduction to OpenGL programming:** Plotting output primitives.	Implementation of scan converting basic output primitives with OpenGL.
30	**Exam**	

18. Practical Topics (If there is any)

19. Examinations:

Q1) Consider the line from (6,7) to (13,10), use Digital Differential Analyzer (DDA) algorithm to find the intermediate positions.

Q2) Write a <u>code fragment</u> to draw the following figure using <u>linerel</u> function.

20. Extra notes:

21. Peer review