

## Course E-Syllabus

1	<b>Course title</b>	Computer Graphics
2	<b>Course number</b>	1901359
3	<b>Credit hours</b>	3
	<b>Contact hours (theory, practical)</b>	3
4	<b>Prerequisites/corequisites</b>	Data Structures (1901242)
5	<b>Program title</b>	B.Sc. in Computer Science
6	<b>Program code</b>	01
7	<b>Awarding institution</b>	The University of Jordan
8	<b>School</b>	King Abdullah II School of Information Technology
9	<b>Department</b>	Computer Science
10	<b>Level of course</b>	Third year
11	<b>Year of study and semester (s)</b>	2022/2023 – Fall semester
12	<b>Final Qualification</b>	Bachelor
13	<b>Other department (s) involved in teaching the course</b>	-
14	<b>Language of Instruction</b>	English
15	<b>Teaching methodology</b>	<input checked="" type="checkbox"/> Blended <input type="checkbox"/> Online
16	<b>Electronic platform(s)</b>	<input checked="" type="checkbox"/> Moodle <input checked="" type="checkbox"/> Microsoft Teams <input type="checkbox"/> Skype <input type="checkbox"/> Zoom <input type="checkbox"/> Others:
17	<b>Date of production/revision</b>	10/2022

### 18 Course Coordinator:

Prof. Hazem Hiary  
 Computer Science Department, Office no. 113, 1<sup>st</sup> floor  
 Phone: +9625355000. Extension: 22578  
 Email: hazemh@ju.edu.jo  
 Office hours: 12:30-1:30 (Sun, Tue)

### 19 Other instructors:

N/A

## ۲ • Course Description:

*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. Application project of well-known 3D computer graphics software is required.*

## ۲ ۱ Course aims and outcomes:

### A- Aims:

The main goal of this course is to teach students the foundation of computer graphics and how images are generated on the computer. The course aims to provide you with sufficient background in the theoretical concepts behind primitives drawing and geometric transformations, and to write computer graphics applications.

Objectives include enabling students to:

1. Learn about computer graphics and its broad applications in various aspects of our day-to-day life.
2. Understand the algorithms used in computer graphics to build 2D/3D complex models from basic output primitives.
3. Understand the techniques used in computer graphics for geometric transformations.
4. 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.
5. Write computer graphics applications and implement the various techniques discussed throughout the course using OpenGL.
6. Build an application project which covers aspects of 3D computer graphics using a well-known software.

### B- Intended Learning Outcomes (ILOs):

Upon successful completion of this course, students will be able to:

A- Knowledge and Understanding: Students should ...

- A1) Learn the concepts of computer graphics, including graphics primitives, geometric transformations, Viewing, etc.
- A2) Know the important principles of computer graphics

B- Intellectual skills: with the ability to ...

- B1) Compare and analyze algorithms used in computer graphics.
- B2) Apply mathematical tools to algorithm design.

C- Subject specific skills – with ability to ...

- C1) Work on OpenGL environment to implement and handle complete graphics programs.
- C2) Translate abstract ideas into practice.
- C3) Understand the main attributes of Graphical User Interface.
- C4) Understand aspects of 3D computer graphics such as modeling, etc. using well-known software

D- Transferable skills – with ability to ...

- D1) Possess good programming style and computer graphics concepts.
- D2) Develop advanced structures and algorithms into complete projects.
- D3) Choose the appropriate algorithm structure for a certain project.

## ۲۲. Topic Outline and Schedule:

Week	Lecture	Topic	ILOs/SOs	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	Topic 1 <b>Introduction:</b> computer graphics history, domain, and applications	A1, A2 1	Synchronous lecturing/meeting	in class questions	Chapter 1
	1.2			Asynchronous lecturing/meeting		
	1.3			Asynchronous lecturing/meeting		
2	2.1	Topic 2 <b>Graphics Systems:</b> video display devices, raster vs. vector graphics, raster-scan types, input devices, graphics software	A1, A2 1	Synchronous lecturing/meeting	in class questions Project overview	Chapter 2
	2.2			Asynchronous lecturing/meeting		
	2.3			Asynchronous lecturing/meeting		
3+4	3.1	Topics 3+4 <b>Graphics Primitives and attributes:</b> Color models, point, line drawing algorithms, circle drawing algorithms. Primitives attributes and filling	A2, B1, C1, D1, D3 1, 2, 6	Synchronous lecturing/meeting	in class questions <b>Quiz 1: Topics 1-4</b>	Chapters 3 + 4
	3.2			Asynchronous lecturing/meeting		
	3.3			Asynchronous lecturing/meeting		
	4.1			Synchronous lecturing/meeting		
	4.2			Asynchronous lecturing/meeting		
	4.3			Asynchronous lecturing/meeting		
5+6	5.1	Topic 5.1 <b>2D Geometric Transformation:</b> 2D translation, rotation, scaling, and some other transformations, homogeneous coordinates, composite transformations	A1, B2, C2 1, 2, 6	Synchronous lecturing/meeting	in class questions	Chapter 5
	5.2			Asynchronous lecturing/meeting		
	5.3			Asynchronous lecturing/meeting		
	6.1			Synchronous lecturing/meeting		
	6.2			Asynchronous lecturing/meeting		
	6.3			Asynchronous lecturing/meeting		
7	7.1	Topic 5.2 <b>3D Geometric Transformation:</b> 3D vector calculus, 3D translation, rotation, scaling, and some other transformations, homogeneous coordinates, composite transformations	A1, C2, D2 1, 2, 6	Synchronous lecturing/meeting	in class questions Project progress	Chapter 5
	7.2			Asynchronous lecturing/meeting		
	7.3			Asynchronous lecturing/meeting		

Midterm Exam						
8	8.1	Topic 6 <b>2D Viewing:</b> 2D viewing pipeline, different coordinate representations, clipping algorithms	A1, A2, B2  1, 6	Synchronous lecturing/meeting	in class questions	Chapter 6
	8.2			Asynchronous lecturing/meeting		
	8.3			Asynchronous lecturing/meeting		
9	9.1	Topic 7 <b>Graphical user interface:</b> Introduction to GUI, its components and requirement and attributes of GUI	A2, C3  1	Synchronous lecturing/meeting	in class questions	Chapter 11
	9.2			Asynchronous lecturing/meeting		
	9.3			Asynchronous lecturing/meeting		
10	10.1	Topic 8.1 <b>OpenGL Basics:</b> basic GL library, GLUT, GLUT, sample OpenGL program	A2, C1  1, 2, 6	Synchronous lecturing/meeting	in class questions	OpenGL – Part 1
	10.2			Asynchronous lecturing/meeting		
	10.3			Asynchronous lecturing/meeting		
11	11.1	Topic 8.2 <b>OpenGL:</b> Graphics primitives and attributes	A1, B2, C1, C2, D1  1, 2, 6	Synchronous lecturing/meeting	in class questions	OpenGL – Part 2 Chapters 3+4
	11.2			Asynchronous lecturing/meeting		
	11.3			Asynchronous lecturing/meeting		
12	12.1	Topic 8.3 <b>OpenGL:</b> Geometric transformations	A1, C1, C2, D2, D3  1, 2, 6	Synchronous lecturing/meeting	in class questions  Project progress	OpenGL – Part 3 Chapter 5
	12.2			Asynchronous lecturing/meeting		
	12.3			Asynchronous lecturing/meeting		
13	13.1	Topic 8.4 <b>OpenGL:</b> Viewing and Clipping. GUI and user interaction	C1, C2, D2, D3  2, 6	Synchronous lecturing/meeting	in class questions	OpenGL – Part 4 Chapter 6
	13.2			Asynchronous lecturing/meeting		
	13.3			Asynchronous lecturing/meeting		
14	14.1	Topic 8.5 <b>OpenGL:</b> GUI and user interaction	C2, C3, D1, D2  1, 2, 6	Synchronous lecturing/meeting	in class questions  <b>Quiz 2: Topics 6-8</b>	OpenGL – Part 5 Chapter 11
	14.2			Asynchronous lecturing/meeting		
	14.3			Asynchronous lecturing/meeting		
15	15.1	Topic 9 <b>Additional material:</b> Directional Scaling. 3D Shearing. Color Models	A1, B2  1, 6	Synchronous lecturing/meeting	in class questions	Additional selected material from the topics in Chapters 4 and 5
	15.2			Asynchronous lecturing/meeting		
	15.3			Asynchronous lecturing/meeting		
16		<b>Project</b>	C4  2	Project Discussion: Students should be able to build an application project which covers aspects of 3D computer graphics such as modeling, rendering, etc. using a well-known software		

- Teaching methods include: Synchronous lecturing/meeting; Asynchronous lecturing/meeting
- Evaluation methods include: Homework, Quiz, Exam, Project...etc

## ۲۳ Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

<b>Evaluation Activity</b>	<b>Mark</b>	<b>Topic(s)</b>	<b>Period (Week)</b>	<b>Platform</b>
Quiz 1	10	Topics 1-4	4 <sup>th</sup>	Moodle
Midterm Exam	30	Topics 1-5	7 <sup>th</sup>	Moodle
Quiz 2	10	Topics 6-8	14 <sup>th</sup>	Moodle
Project	10		16 <sup>th</sup>	
Final Exam	40	Topics 1-9		Moodle

## ۲۴ Course Requirements (e.g: students should have a computer, internet connection, webcam, account on a specific software/platform...etc):

- Computer
- Internet connection
- Account on MS Teams, Moodle
- MS Visual Studio (C++)

## ۲۵ Course Policies:

Please follow The University of Jordan regulations regarding the following policies, more information is at [www.ju.edu.jo](http://www.ju.edu.jo)

A- Attendance policies:

B- Absences from exams and submitting assignments on time:

C- Health and safety procedures:

D- Honesty policy regarding cheating, plagiarism, misbehavior:

E- Grading policy:

F- Available university services that support achievement in the course:

**References:**

A- Required book(s), assigned reading and audio-visuals:  
Computer Graphics with OpenGL, Hearn and Baker, Pearson, 4th Edition

B- Recommended books, materials and media:

- Interactive Computer Graphics - A Top-Down Approach using OpenGL, Angel and Shreiner, Addison-Wisely, 5th or 6th Edition
- OpenGL(R) Programming Guide: The Official Guide to Learning OpenGL(R), Version 1.4 (4th Edition), Architecture Review Board, Dave Shreiner, Mason Woo and Jackie Neider

**Additional information:**

N/A

Name of Course Coordinator: Prof. Hazem Hiary Signature:  Date: 10/10/2022

Head of Curriculum Committee/Department: ----- Signature: -----

Head of Department: ----- Signature: -----

Head of Curriculum Committee/Faculty: ----- Signature: -----

Dean: ----- Signature: -----