جمهورية مصر العربية
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research

SH. A.
أكاديمية الشروق

المعهد العالي للحاسبات وتكنولوجيا المعلومات
مدينة الشروق ـ القاهرة
شعبة علوم الحاسب

Course specification

Course Code: CS 340

Course Title: Computer Graphics

Academic Year: 2025 /2026

Course specification
(CS 340 – Computer Graphics)

Course Outline	
Faculty:	*HICIT- (**Higher Institute for Computers & Information Technology**-El Shorouk Academy)*
Programme(s) on which the course is given:	Undergraduate program in Computer Science
Major or minor element of programme:	Compulsory
Department offering the program	Department of Computer Science
Department offering the course:	Department of Computer Science
Level	Third Level
Date of specification approval	08/08/2023

Basic Information				
Code:	CS 340	***Title:***	Computer Graphics	
Prerequisites:		CS 220 Computer Organization		
Weekly Hours:				
Lecture: 2		**Exercise: 1**	**Practical : 1**	**Total:** 3 credit hours

Professional Information

Course Aims:

Teaching Basic Elements of Computer Graphical Picture, Mapping Real to Device and Vice Versa, Rasterizing Polylines, Polygon, General Functions Drawing, Regions Filling Techniques, 2D Transformations, 3D Transformations, Lightening and Shading, Projection Models, Containment, Clipping. As well as selected advanced topics. Lab work focuses on Open GL as well as a selected game engine to perform simple games.

a1	Understand the essential mathematics relevant to computer science.
a3	Show a critical understanding of Requirements, practical constraints and computer-based systems.
a5	Recognize the basis of data qualitatively and/or quantitatively.
a7	Show a critical understanding of the principles of artificial intelligence, image Processing, Machine Learning, Neural Networks, and Virtual Reality.
a9	Understanding of fundamental topics in computer science, including software architectures, software engineering principles and methodologies, and software tools.
a12	Select advanced topics to provide a deeper understanding of some aspects of the Game Design & Development, Geographic Information Systems, and computer graphics & animation.
b1	Define traditional and non-traditional problems, set goals towards solving them, and observe results.
b3	Perform classifications of (data, results, methods, techniques, algorithms, etc.).
b4	Identify attributes, components, relationships, patterns, main ideas, and errors.
b9	Solve computer science problems with pressing commercial or industrial constraints.
b10	Generate an innovative design to solve a problem containing a range of commercial and industrial constraints.
c1	Use appropriate programming languages and design methodologies.
c5	Specify, design, and implement and manage computer-based systems.
c7	Apply the principles of effective information management, information organization, and information-retrieval skills to information of various kinds, including text, images, sound, and video.
d1	Communicate effectively by oral, written and visual means.
d2	Work effectively as an individual and as a member of a team.
d8	Search for information and adopt life-long self-learning.
d9	Manage one's own learning and development.

Program ILOs Covered by Course			
Knowledge and understanding	**Intellectual Skills**	**Professional and practical skills**	**General and Transferable skills**
A1,A3,A5,A7,A9, A12	B1,B3,B9,B10	C1,C5,C7	D1,D2,D8,D9

Intended learning outcomes of course (ILOs)

a. Knowledge and Under-Standing:

On successful completion of the course, the student should demonstrate knowledge and understanding of:

a1- Comprehend the computer-generated pictures [A3]
a2- Computer generated 2D/3D pictures rasterization [A7, A5,A9,A12]
a3- Projection of 3-D views on 2-D plane using parallel and perspective projection. [A1,A12]
a4- Lighting to a seen based on local reflection model. [A3,A7,A12]
a5- Clipping and containment of objects in 2Dand 3D [A1, A3,A12].
A6-Selected Topics: GPU and Texture mapping [A1, A3,A12].

b. Intellectual Skills:

On successful completion of the course, the student should be able to.

b1– Appling Transformations and map problems to different domains [B1,B3]
b2 – Problem analysis and problem decompositions [B9, B10]

c. Professional and practical skills

On successful completion of the course, the student should be able to:

c1- Building graphics-based applications in 2D. [C1, C5, C7]
c2- Professionally use of OPENGL for graphics-based applications. [C5, C7]

d. General and transferable skills

d1- Communicate with others; work in a team and involvement in group discussion and seminars. [D1, D2]
d2- Search, and present findings orally and in written form. [D8, D9]

Contents

Topic	Contact Hours	
	lecture	Lab/EX
Introduction, computer generated picture, graphic devices	2	2
Basic elements of computer-Generated Picture	2	2
Mapping real window with coordinates to a device window	2	2
Linear polyline rasterization	3	2
Non-linear functions rasterization	3	2
2D transformations and half toning	3	3
Filling a region	3	3
Projection and 3D transformations	2	2
Lightening	2	2
2D containment and clipping	2	2
3D containment and clipping	2	2
Selected Topics	2	2
Course project	2	4

Teaching and learning methods	
Teaching and learning methods	**Used**
Lectures	√
Tutorial Exercises	√
Practical Lab	√
Discussions.	√
Self – Learning (Reading material, Websites search,)	√
Self-studies	√
Group work	√
Presentation	√
Problem solving/problem solving learning based	√
Case study	-
Synchronous E-Learning	-
Video lectures	√
Asynchronous E-Learning	√

Student assessment methods & Schedule		
Methods	**Used**	**Week#**
Midterm Exam	√	**8**
Final Exam	√	**16**
Course Project	√	**3-14**
Course Work & Quizzes	√	**2-14**
Practical Exam	√	**15**

Assessment Weight	
Assessment	**Weight %**
Mid Term Exam	15%
Practical Exam and Project	15%
Final Exam	60%
Course Work & Quizzes	10%
Total	100

Course Work &Quizzes
Short Exams, Assignments, Research, Reports, Presentations
Class/Project discussion

List of references	
Essential books (textbooks)	Fundamentals of Computer Graphics 5th Edition by (Steve Marschner with others) A K Peters/CRC Press (September 30, 2021)

	Computer Graphics using OPENGL, F. S. Hilll, JR and Stephen M. Kelley, PEARSON Prentice Hall 2011(2011)
Course notes	E-Learning Portal
Recommended books	Computer Graphics by Alexey Boreskov, Evgeniy Shikin, October 2013 **Introduction to Computer Graphics Version 1.3, August 2021 (*Version 1.3.1, December 2021*) Author: David J. Eck**
Periodicals, website	PowerPoint presentations of all course materials All labs material **[https://moodle.sha.edu.eg/course/view.php?id=2259]**
Videos link	Video of lectures and sections **[https://moodle.sha.edu.eg/course/view.php?id=2259]**

Required Facilities		
Tools & SW (Technology facilities):	- Anaconda Spyder with python, OpenGL - Game Engine GoDot - Microsoft TEAMS to create virtual classrooms for lectures, discussions for project. - Academy Portal (MOODLE) to make electronic quizzes and electronic midterm exam. - Academy Portal (MOODLE) to upload project deliverable and assignment. - Academy portal (MOODLE) to upload electronic material.	
Teaching facilities:	Whiteboard	√
	Computer Lab	√
	Data show	√
	E-Learning	√
	Videos	√
	Website	√

Course Content/ILO Matrix												
Course Contents	**Knowledge & understanding**						**Intellectual skills**		**Professional and practical skills**		**General**	
	a1	**a2**	**a3**	**a4**	**a5**	**a6**	**b1**	**b2**	**c1**	**c2**	**d1**	**d2**
Introduction, computer generated picture, graphic devices	X										X	
Basic elements of computer-Generated Picture	X						X		X	X		
Mapping real window with coordinates to a device window	X	X						x	x	x		
Linear polyline rasterization		X						x	x	x	X	
Non-linear functions rasterization		X								X		

2D transformations and half toning		X					X	X	X			
Filling a region		X							X	X		
Projection and 3D transformations		X	X				X	X				
Lightening		X		X					X	X	X	
2D containment and clipping		X			X		X					
3D containment and clipping synchronization		X			X	X	X			x		
Selected Topics	X					x		x				
Course project									x	x	x	x

Learning Method /ILOs Matrix												
Learning Methods	**Knowledge & understanding**						**Intellectual skills**		**Professional and practical skills**		**General**	
	a1	**a2**	**a3**	**a4**	**a5**	**a6**	**b1**	**b2**	**C1**	**C2**	**d1**	**d2**
Lectures	X	X	X	X	X		X	x			X	
Tutorial Exercises	X	X	X	X	X		X	X	X	X		
Reading material						x						x
Websites search						x						x
Research and reporting						x						x
Problem solving						x			x		x	x
Group work						x						
Practical Lab	X	X	X	X	X		X	X	X	X		
Discussions.											X	

Assessment Methods /ILOs Matrix												
Assessment Methods	**Knowledge & understanding**						**Intellectual skills**		**Professional & practical skills**		**General**	
	a1	**a2**	**a3**	**a4**	**A5**	**A6**	**b1**	**b2**	**C1**	**C2**	**d1**	**d2**
Mid Term Exam	x	x	x	x	x	x						
Final Exam	x	x	x	x	x	x						
Course Project							x	x	x	x	x	x
Course Work &Quizzes							x	x	x	x	x	x
Practical Exam	X	X	X	X	X	x	X	X	X	X		

Course ILOs Vs Program ILOs

Course ILOs \ Prog ILOs		Knowledge & understanding						Intellectual skills				Professional and practical skills			General			
		A1	A3	A5	A7	A9	A12	B1	B3	B9	B10	C1	C5	C7	D1	D2	D8	D9
Knowledge and Understanding	a1		√				√											
	a2			√	√	√	√											
	a3	√					√											
	a4		√		√		√											
	a5	√	√				√											
	a6	√	√				√											
Intellectual skills	b1						√	√	√									
	b2									√	√							
Professional and practical skills	c1											√	√	√				
	c2												√	√				
General skills	d1														√	√		
	d2																√	√

Course Coordinator: Dr. Abdellatief Hussien Abouali ( )
Course Reviewer: Dr. _____
Head of Department: Dr. Ahmed Al Abbassy ( )

Date: 8/5/2023