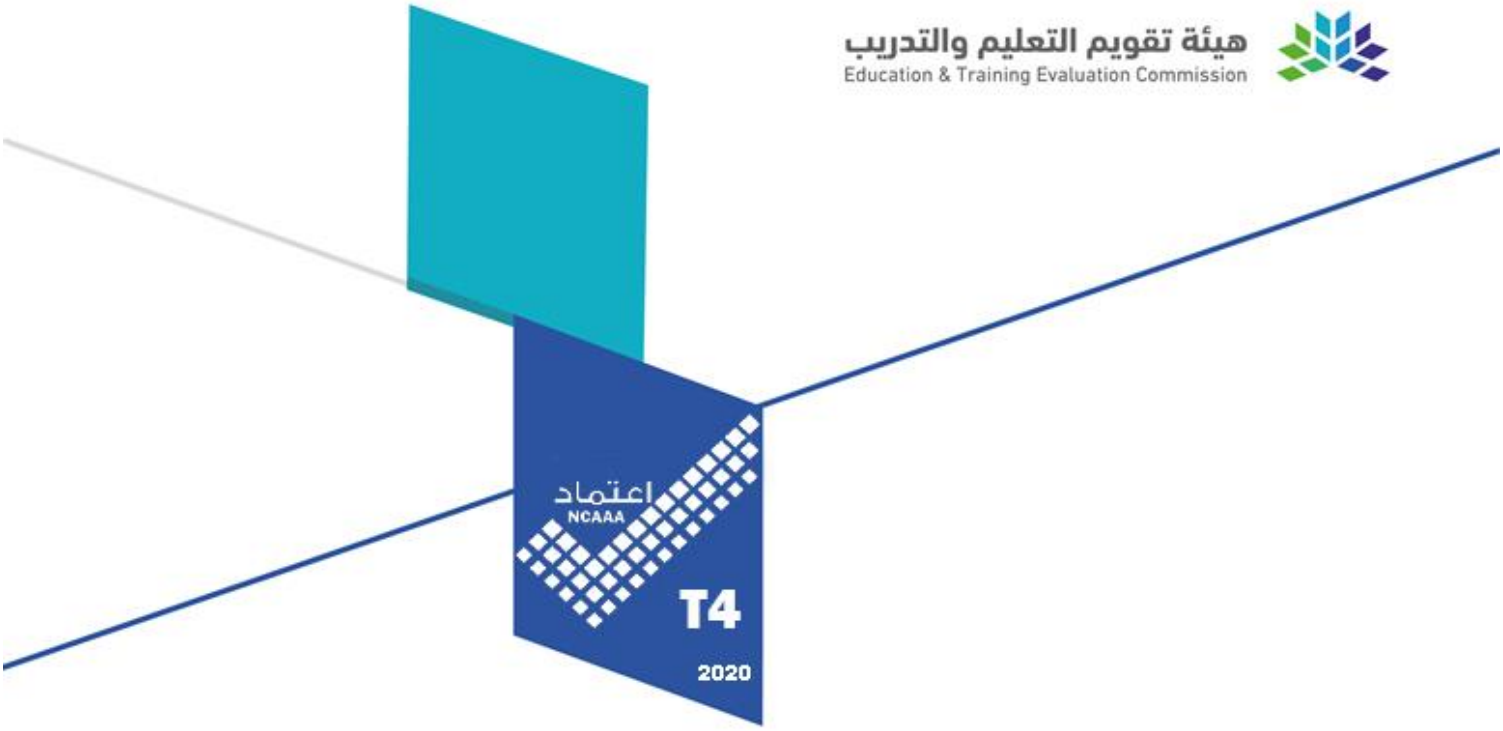
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Computer Graphics
Course Code:	**414 CCS-3**
Program:	**BSc in in Computer Science**
Department:	**Department of Computer Science**
College:	**College of Computer Science and Information Systems**
Institution:	**Najran University**

Table of Contents

A. Course Identification

1. Credit hours:	3 (2, 2, 1)
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Level 11 /Year 4
4. Pre-requisites for this course (if any)**:**	211 CCS-6
5. Co-requisites for this course (if any)**:**	284 MATH-4

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	50	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	20
2	**Laboratory/Studio**	20
3	**Tutorial**	10
4	**Others** (specify)	
	Total	**50**

B. Course Objectives and Learning Outcomes

1. Course Description

This course is dedicated to introduce the fundamental concepts in creating computer graphical images. Computer graphics is a multidisciplinary field which uses different ideas from art, mathematics, and computer science to create images. In this course the students study OpenGL that has combinations with C and C++ to create graphical images by writing frequent programs and solve problem sets. Topics to be covered in this course as: Introduction to graphics concepts, basic graphics programming and OpenGL (or 3D Max), basic raster graphics algorithms and primitives, scan conversion, graphics hardware, 2D geometrical transformations, 3D geometry and viewing, hierarchical modeling, input devices and techniques, lighting and color, projections, hidden surface removal, and shading and rendering

2. Course Main Objective

After successful completion of this course students should be able to understand the basics of computer graphics hardware, use basic mathematical knowledge and algorithms underlying the basic computer graphics primitives, use the OpenGL commands to create, manipulate

graphical 2D and 3D images, geometric transformations and lights, create graphic application and know to debug and document the graphics programs

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Demonstrate knowledge of fundamental and contemporary computer graphics hardware	K_1
1.2	Demonstrate basic knowledge of mathematical background (vector and matrix computation) and algorithms underlying the basic computer graphics primitives	K_1, K_3
2	**Skills :**	
2.1	Apply the main OpenGL attributes that control the display characteristics of graphics primitives	S_1, S_2
2.2	Implement basic geometrical transformations on simple 2D and 3D computer objects using OpenGL in C++	S_2
2.3	Create interactive and usable graphic applications in C++ using OpenGL programming interfaces	S_2, S_5
2.4	Apply basic physics of light and its interaction in simple objects using OpenGL in C++	S_1, S_2, S_4
3	**Values:**	
3.1	Illustrate good level of debugging, documentation and structuring skills in computer graphics programs	C_2
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Computer Graphics	5
2	Graphics display devices and input/output primitives	5
3	Drawing basic graphics primitives, filling polygons	7
4	Attributes of computer graphics primitives (state variables, color, points, lines, filling regions, antialiasing)	7
5	2D Geometric affine transformations	5
6	2D Viewing Pipeline, Clipping and coordinates	5
7	Three dimensional viewing and graphics rendering pipeline and 3D viewing and graphics rendering pipeline	5
8	Representation and transformation of geometric objects (Polyhedra and Curved Surfaces)	5
9	Introduction to interactive input methods and mouse and keyboard functions	3
10	Visible Surface Detection	3
Total		**50**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Demonstrate knowledge of fundamental and contemporary computer graphics hardware	TS:1-Interactive Lectures using power point slides with more examples TS: 4- Encouraging the students to use the online links to know the concepts in detail. TS: 5 – Recall the topics discussed in the last lecture by asking questions to the students. TS: 6 – Associating the topics in each chapter with the CLO.	Direct: Locally Developed Exams such as Quiz, Mid Exam & Final Exam Indirect: Students' Course CLO Survey
1.2	Demonstrate basic knowledge of mathematical background (vector and matrix computation) and algorithms underlying the basic computer graphics primitives	TS:1-Interactive Lectures using PowerPoint slides with more examples TS:2- Engaging the students in problem based learning through Tutorials TS:3- Lab Demonstrations TS: 5 – Recall the topics discussed in the last lecture by asking questions to the students. TS: 6 – Associating the topics in each chapter with the CLO.	Direct: Locally Developed Exams such as Quiz, Mid Exam & Final Exams embedded Questions with Scoring Rubrics Indirect: Students' Course CLO Survey
1.3			
2.0	**Skills**		
2.1	Apply the main OpenGL attributes that control the display characteristics of graphics primitives	TS:1-Interactive Lectures using power	Direct:

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	Implement basic geometrical transformations on simple 2D and 3D computer objects using OpenGL in C++	point slides with more examples TS:2- Engaging the students in problem based learning through Tutorials TS:3- Lab Demonstrations TS: 4- Encouraging the students to use the online links to know the concepts in detail. TS: 5 – Recall the topics discussed in the last lecture by asking questions to the students. TS: 6 – Associating the topics in each chapter with the CLO.	Locally Developed Exams such as Quiz, Lab Assessments & Mid Exam, Final Theory & Lab Exams Indirect: Students' Course CLO Survey
2.3	Create interactive and usable graphic applications in C++ using OpenGL programming interfaces		
2.4	Apply basic physics of light and its interaction in simple objects using OpenGL in C++		
3.0	**Values**		
3.1	Illustrate good level of debugging, documentation and structuring skills in computer graphics programs	TS:3- Lab Demonstrations	Direct: Lab Activities, Final Lab Exam Embedded Questions with Scoring Rubrics Indirect: Students' Course CLO Survey
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes	3rd and 7th weeks	10
2	Assignments or mini project (presentation)	5th week	10
3	Midterm Exam	5th or 6th week	20
4	Lab Project	10th	10
5	Final Lab Exam	11th	10
6	Final Theory Exam	12th or 13th week	40

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : Specifying office hours (10 hours per week) and messenger application (e.g. WhatsApp and Telegram)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. Francis S Hill Jr. and Stephen M Kelley, **Computer Graphics Using OpenGL**, Pearson, Third Edition , 2015 2. Hearn & Baker, **Computer Graphics with OpenGL** , PHI International Edition
Essential References Materials	**OpenGL Programming Guide: The Official Guide to Learning OpenGL**, Addison-Wesley, 9th Edition, 2016
	Edward Angel, **OpenGL: A Primer**, Addison Wesley, Latest Edition
Electronic Materials	http://freecomputerebooks.blogspot.com/2007/05/computer-graphics-3d-graphics-vrml.html
Other Learning Materials	• Installation CD of Microsoft Visual Studio 2010 with glut libraries • Help Tutorial – Addison Wesley OpenGL Reference Manual

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms to accommodate 50 students per classroom with desks and chairs, labs to accommodate 25 students per lab with advanced computers
Technology Resources (AV, data show, Smart Board, software, etc.)	Desktop/ Laptop computer Multimedia Projector
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	ACs for labs and classrooms

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching	Students, faculty and peer review	Indirect (questionnaires and interviews)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Assessment	Faculty and student	Direct and indirect (exams, quizzes, lab works and questionnaires)
Achievement of course learning outcome	Faculty	Direct and indirect (exams, quizzes, lab works and questionnaires)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Computer Science Departmental Council
Reference No.	14440203-0185-00002
Date	1st Sep, 2022