

CS4182: COMPUTER GRAPHICS

Effective Term

Semester A 2023/24

Part I Course Overview

Course Title

Computer Graphics

Subject Code

CS - Computer Science

Course Number

4182

Academic Unit

Computer Science (CS)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

CS2303 Data Structures for Media or
CS3334 Data Structures or
EE3206 Java Programming and Applications

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course aims at introducing the concepts and algorithms of 2D/3D computer graphics and the applications of computer graphics technologies. The main objectives are to cover the basic image generation techniques and to expose students to current graphics technologies and show them how these technologies can be used to solve real-world problems.

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if DEC-A1 app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify the main characteristics of basic computer graphics techniques.	x		
2	Design and develop simple graphics algorithms.			
3	Evaluate and critique different types of graphics systems.		x	
4	Apply computer graphics techniques to real-world applications.		x	

A1: Attitude

Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability

Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments

Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)	
1	Lectures	Introduce the concepts and algorithms of 2D/3D computer graphics and the applications of computer graphics technologies.	1, 2, 3, 4	3 hours/week
2	Tutorials	In most tutorials, students are provided with exercise questions and asked to do them during the class. The answers to the exercise questions are then provided and discussed in order for the students to learn to evaluate and develop graphics techniques.	2, 3	8 hours/semester

3	Course Project	In the project assignment, students are asked to develop a mini-graphics project, either by themselves or in groups. The project will involve OpenGL programming.	2, 4	After class
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Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Quiz	1, 2, 3	20
2	Course Project	2, 4	20

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination AND 30% of the maximum mark of the course project must be obtained.

Assessment Rubrics (AR)**Assessment Task**

Quiz

Criterion

Capacity in understanding the key concerns of computer graphics techniques

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Note even reaching marginal levels

Assessment Task

Course Project

Criterion

Ability to apply computer graphics techniques to develop an application

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Note even reaching marginal levels

Assessment Task

Examination

Criterion

Ability to evaluate computer graphics software and to apply computer graphics techniques on applications

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Note even reaching marginal levels

Part III Other Information

Keyword Syllabus

2D graphics. 2D transformations. 2D projection. 3D graphics. 3D transformations. 3D projection. Clipping. Object modeling. Rendering pipeline. Ray-tracing. Radiosity. Aliasing. Spatial aliasing. Temporal aliasing. Anti-aliasing. Image processing. Window systems. Virtual reality. Multimedia.

Syllabus

- Basic computer graphics techniques
Graphical input/output devices, 2D primitive drawing, 2D transformation, 3D transformation and projection, clipping, object modeling.
- Image Generation Techniques

Some of the important image generation techniques including scan-conversion, ray-tracing and radiosity. Related issues such as shading, anti-aliasing and texture mapping will also be discussed.

- Applications of Computer Graphics
Introduction to window system, virtual reality, image processing and multimedia.

Reading List

Compulsory Readings

Title	
1	Nil

Additional Readings

Title	
1	J. Hughes, A. van Dam, M. McGuire, D. Sklar, J. Foley, S. Feiner, and K. Akeley (2014) Computer Graphics: Principles and Practice. Addison Wesley, 3rd edition.
2	J. Foley, A. van Dam, S. Feiner, J. Huges, and R. Phillips (1994). Introduction to Computer Graphics. Addison Wesley.
3	D. Hearn and M. Baker (2014). Computer Graphics. Prentice-Hall, 4th edition.