City University of Hong Kong
Course Syllabus

offered by Department of Computer Science
with effect from Semester A 2023/24

Part I Course Overview

Course Title:	Computer Graphics
Course Code:	CS5182
Course Duration:	One Semester
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	CS2303 Data Structures for Media or CS3334 Data Structures or EE3206 Java Programming and Applications
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course covers the core concepts and algorithms of 2D/3D computer graphics and the applications of computer graphics technologies. The main objective is to familiarize students with current computer graphics techniques and their applications in different domains.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Identify the motivation and the main characteristics of different computer graphics techniques.		✓		
2.	Design and develop computer graphics algorithms.			✓	
3.	Evaluate and critique different types of graphics systems.			✓	
4	Apply computer graphics/geometry processing techniques to real-world applications.			✓	✓
		100%			

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lecture	The lectures will focus on the introduction of various 2D/3D computer graphics techniques.	✓	✓	✓	✓	2 hours/ week
Tutorial	In the tutorials, students are provided with exercise questions and asked to complete them during the class. The answers to the exercise questions are then provided and discussed.		✓	✓		1 hour/ week
Project	In the project, students are required to apply deep learning-based techniques for 3D geometry data processing or computer graphics techniques to develop an application. The project may involve OpenGL or deep learning-based programming.		✓		✓	

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.				Weighting	Remarks
	1	2	3	4		
Continuous Assessment: 40%						
Mid-term Quiz	✓	✓	✓		15%	
Course Project^		✓		✓	25%	
Examination^: 60% (duration: 2 hours)						
					100%	

^ 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.

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Mid-term Quiz	Capacity in understanding the key concerns of computer graphics techniques	High	Significant	Basic	Not even reaching marginal levels
2. Course Project	Ability to apply computer graphics/geometry processing techniques to develop an application	High	Significant	Basic	Not even reaching marginal levels
3. Final Examination	Ability to evaluate computer graphics software and to apply computer graphics techniques on applications	High	Significant	Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Mid-term Quiz	Capacity in understanding the key concerns of computer graphics techniques	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Course Project	Ability to apply computer graphics/geometry processing techniques to develop an application	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Final Examination	Ability to evaluate computer graphics software and to apply computer graphics techniques on applications	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Object modeling
- 2D/3DTransformation
- Projection and Clipping, Hidden Surface Removal and Shading
- Rendering Pipeline
- Deep Learning for 3D Point Clouds
- Ray-Tracing and Radiosity
- Spatial and Temporal Aliasing, and Anti-aliasing methods
- Real-time rendering
- GPU Architecture, Computer Animation
- Image-based rendering

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

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.
4.	Research papers on deep learning-based 3D geometry data processing