Daffodil International University

Department of Computer Science and Engineering (CSE)

Course Outline

Course Code:	CSE 421		
Course Title:	Computer Graphics		
Program:	B.Sc. in CSE		
Faculty:	Faculty of Science and Information Technology (FSIT)		
Semester:	Summer	**Year:**	2022
Credit:	3.00	**Contact Hour:**	3.00
Course Level:	L4T2	**Prerequisite:**	MAT211, CSE213, CSE222, STA 223
Course Category:	Core Engineering		
Instructor Name:	Tanim Ahmed		
Designation:	Lecturer		
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Class Hours:	**Section**	**Class Day**	**Class Hours**	**Classroom**

Google Classroom Code:	

1. Course Rationale

Computer Graphics is a 3-credit senior-level course that introduces the concepts and implementation of computer graphics. As one of the important subject areas of the study of computer science and information systems, this course will focus on the theoretical aspects and implementation of computer graphics using OpenGL.

1.1. Course Objective

Computer Graphics and Design - Foundation provides potential for the engagement of integrated learning opportunities and the capacity to develop design thinking skills to effectively transfer knowledge and understanding across disciplines. The applied design thinking and problem solving focus of this course helps equip learners to develop skills essential for the digital age.

1.2. Course Outcomes (CO's)

CO1	Able to explain the core concepts of computer graphics, including output primitives, anti-aliasing, fundamentals of colour models, lighting and shading models, animation, dithering, hidden surface elimination and rendering, anti-aliasing, 3D display-perspective and parallel projection.
CO2	Able to apply the concepts of different algorithms of output primitives and transformation in 2D and 3D
CO3	Able to analyse objects viewing and Clipping Algorithm.

1.3.Program Outcomes (PO's)

Program Outcomes are reported in Appendix-I.

1.4. CO-PO Mapping

PO's / CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		3										
CO3			3									
CO4												
CO5												

1.5. Mapping of CO-PO with Corresponding Learning Taxonomy

CO No.	CO Statement	Corresponding PO No.	Domain/level of learning taxonomy	Delivery methods and activities	Assessment tools
CO1	Able to explain the core concepts of computer graphics, including output primitives, anti-aliasing, fundamentals of colour models, lighting and shading models, animation, dithering, hidden surface elimination and rendering, anti-aliasing, 3D display-perspective and parallel projection.	PO1	L2	TLA1, TLA2, TLA3	Midterm/Final (Direct Method)
CO2	Able to apply the concepts of different algorithms of output primitives and transformation in 2D and 3D.	PO2	L3	TLA1, TLA2, TLA4	Midterm/Final (Direct Method)
CO3	Able to analyse objects viewing and Clipping Algorithm.	PO3	L4	TLA1, TLA2, TLA4	Midterm/Final (Direct Method)

1.6. CO Assessment Scheme

Assessment Task	CO's					Mark (Total=100)
	CO1	CO2	CO3	CO4	CO5	
Attendance	--	--	--	--	--	7
Class Test (CT1, CT2, CT3)	--	--	--	--	--	15
Assignment	--	--	--	--	--	5
Presentation	--	--	--	--	--	8
Midterm Examination	10	15				25
Semester Final Examination	10	10	20			40
Total Mark						100

2. Strategies and approaches to learning

2.1. Teaching and Learning Activities (TLA)

TLA1	Lectures twice a week using multimedia of different topics.
TLA2	Interactive discussion using Online/multimedia or whiteboard of different topics.
TLA3	Group discussion and presentation regarding diverse problems and corresponding lectures.
TLA4	Evaluation of class performances to reach each student in a class for every topic.

3. Course Schedule and Structure

3.1.Textbook

Computer Graphics, by Donald Hearn, M. Pauline Baker

3.2.Reference Books

1. Schaum's Outline of Computer Graphics by Ray Plastock, Gordon Kalley, Zhiang Xiang, Zhingang Xiang

2. C Programming Using Turbo C++ by Robert Lafore

3. Fundamentals of Computer Graphics, by Peter Shirley et al., ISBN 978-1568812694

4. Interactive Computer Graphics: A Top-Down Approach with Shader-Based OpenGL by Shreiner and Angel, Pearson Education ISBN 9780273752264

5. Computer Graphics: Principles and Practice by Foley, Van Dam, Feiner, & Hughes, Addison-Wesley ISBN 0201848406

3.3.Course Plan/Lesson Plan

Week	Lesson.	Topic	Teaching and Learning Activities (TLAi)	Textbook & Video Reference	Related CO's
1	Les. 1	Introduction: A Survey of Computer Graphics, Application of Computer Graphics	TLA1	Chapter-1 [page 4-page 34]	CO1
	Les. 2	Video Display Devices: Refresh Cathode Ray Tubes, Raster and Random Scan Displays, Color CRT Monitors, DVST, Flat-Panel Displays.	TLA1	Chapter-2 [page 36-page 52]	CO1
2	Les. 3	Points and Lines, Line Drawing Algorithm, DDA Algorithm	TLA1, TLA3	Chapter-3 [page 84-page 88]	CO1, CO2
	Les. 4	DDA Algorithm-example with plot in a graph.	TLA1, TLA3, TLA4	Do	CO1, CO2
		(Class Test – 1, Assignment – 1)			
3	Les. 5	Bresenham's Line Algorithm with Parameter description.	TLA1, TLA3	Chapter-3 [page 88-page 92]	CO1, CO2
	Les. 6	Bresenham's Line Algorithm with example	TLA3, TLA4	Do	CO1, CO2
4	Les. 7	Circle Generating Algorithm, Properties of Circle, Midpoint Circle Algorithm	TLA1, TLA3	Chapter-3 [page 97-page 101]	CO1, CO2
	Les. 8	Midpoint Circle Algorithm with example	TLA3, TLA4	Do	CO1, CO2
5		(Class Test – 2)			
	Les. 9	Two-Dimensional Geometric Transformation	TLA1, TLA2	Chapter-5 [page 184-page 190]	CO2
	Les. 10	2D Geometric Transformation Example	TLA1, TLA2, TLA4	Chapter-5 [page 184-page 190]	CO2
6	Les. 11	Antialiasing-Different techniques	TLA1, TLA2	Chapter-4 [page 171-page 178]	CO1
	Les. 12	Review Class for Mid-term exam			
(MID–TERM EXAM)					

Week	Lesson.	Topic	Teaching and Learning Activities (TLAi)	Textbook & Video Reference	Related CO's
7	Les. 13	Two-Dimensional Viewing, Window-to-Viewport Coordinate Transformation	TLA1, TLA2	Chapter-6 [page 217-page 221]	CO1
	Les. 14	Two-Dimensional Clipping, Cohen-Sutherland Line Clipping Algorithm	TLA1, TLA2, TLA4	Chapter-6 [page 224-page 230]	CO3
8	Les. 15	Polygon Clipping: Sutherland- Hodgeman Polygon Clipping Algorithm	TLA1, TLA3	Chapter-6 [page 237-page 242]	CO3
	Les. 16	Sutherland- Hodgeman Polygon Clipping Algorithm-Example	TLA1, TLA3, TLA4	Do	CO3
9	Les. 17	Polygon Clipping: Weiler-Atherton Polygon Clipping Algorithm	TLA2, TLA3	Chapter-6 [page 242-page 243]	CO3
	Les. 18	Weiler-Atherton Polygon Clipping Algorithm-Example	TLA4	Do	CO3
10	Les. 19	Three-Dimensional Display Methods, Parallel Projection, Perspective projection	TLA1, TLA3	Chapter-9 [page 297-page 299]	CO1
	Les. 20	Depth Cueing, Visible Line and Surface Identification, Surface Rendering	TLA1, TLA3	Chapter-9 [page 299-page 301]	CO1
11		(Class Test-3, Assignment – 2)			
	Les. 21	Three-Dimensional Geometric Transformation	TLA1, TLA3	Chapter-10 [page 327-page 346]	CO2
	Les. 22	Example of 3D Geometric Transformation	TLA2, TLA3, TLA4	Chapter-11 [page 408-page 423]	CO2
12	Les. 23	Halftone Pattern and Dithering Techniques, Color Models and Color Applications	TLA1, TLA3, TLA4	Chapter-14 [page 516-page 522]	CO1
	Les. 24	Review Class			
(FINAL EXAM)					

4. Assessment Methods

Grading System

Numerical Grade	Letter Grade	Grade Point
80-100	A+	4.00
75-79	A	3.75
70-74	A-	3.50
65-69	B+	3.25
60-64	B	3.00
55-59	B-	2.75
50-54	C+	2.50
45-49	C	2.25
40-44	D	2.00
Less than 40	F	0.00

CIE – Breakup (Theory) [60 marks]

Bloom's Criteria	Attendance (07)	Class Test (15)	Assignment (05)	Presentation (08)	Mid Exam (25)
Remember		05			
Understand		05	02	02	05
Apply		05		03	10
Analyze			03		10
Evaluate					
Create				03	

SEE – Semester End Examination [40 marks] {Theory}

Bloom Criteria	Score for the Test
Remember	05
Understand	05
Apply	15
Analyze	05
Evaluate	05
Create	05

Appendix-1: Program outcomes

Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills and attitudes that students acquire while progressing through the program. The program must demonstrate that by the time of graduation, students have attained a certain set of knowledge, skills and behavioral traits to some acceptable minimum level. The BAETE specifically requires that students acquire the following graduate attributes.

POs	Category	Program Outcomes
PO1	**Engineering Knowledge**	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis**	Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.
PO3	**Design/Development of Solutions**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.
PO4	**Investigations**	Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
PO5	**Modern tool usage**	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society**	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
PO7	**Environment and sustainability**	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice.
PO9	**Individual work and teamwork**	Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.
PO10	**Communication**	Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.
PO11	**Project management and finance**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.
PO12	**Life Long Learning**	Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.