University of Asia Pacific (UAP)
Department of Computer Science and Engineering (CSE)

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Computer Graphics
Course Code:	CSE 425
Semester:	Fall -2023
Level:	8th Semester
Credit Hour:	3.0
Name & Designation of Teacher:	Shammi Akhtar, Assistant Professor
Office/Room:	7th Floor, teacher's compound
Class Hours:	SECTION A: Sunday: 09:30 AM – 10:50AM Tuesday: 2:00 PM – 3:20PM SECTION B:
Consultation Hours:	**Sec A:** Wednesday 12:30 pm – 2:00 pm
e-mail:	shammi@uap-bd.edu,
Mobile:	+8801713309903

Rationale:

This course is designed to provide fundamental concepts of vector and raster graphics and practices involved in Digital Device like Computer.

Pre-requisite (if any)**: Nill**

Course Synopsis: This course provides a comprehensive introduction to computer graphics. Focuses on fundamental concepts and techniques, and their cross-cutting relationship to multiple problem domains in graphics (rendering, animation, geometry, imaging). Topics include: Introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms.

Course Objectives : The objectives of this course are:

- To identify and explain the core concepts of computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends.
- To apply graphics programming techniques to design, and create computer graphics scenes.
- To create effective OpenGL programs to solve graphics programming issues, including 3D transformation

Course Learning Outcomes (CLO) and their mapping with Program outcomes (PO) and Teaching-Learning Assessment methods:

CO No.	CO Statements: Upon successful completion of the course, students will able to:	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO1	**Interpret** the mathematical foundation of the concepts of computer graphics: parametric curves and surfaces, order of continuity	1	Cognitive/ Understand	Lecture, multimedia,	Written Exams, Viva
CO2	**Explain** the core concepts of computer graphics, including, modelling, object transformation, viewing transformation, projection, perspective, homogeneous coordinates, object coordinates, camera coordinates, world coordinates	1	Cognitive/ Understand	Lecture, multimedia	Quiz, Written Exams, Viva
CO3	**Apply** various algorithms for clipping, hidden surface removal, scan conversion, color models, lighting and shading models, textures, and animation.	1	Cognitive/ Apply	Lecture, multimedia	Quiz, Written Exams, Viva
CO4	**Identify** a typical graphics pipeline and apply graphics programming techniques to design and create interactive computer graphics application including 3D transformation, objects modelling, color modelling, lighting, textures etc, using OpenGL	5 10 12	Cognitive (thinking and analysis) Communication skills (personal and academic) Practical and subject specific skills (Transferable Skills)	Assignment	Quiz, Presentation, Viva

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3	CO4
Final Exam	**50%**	10	40	100	
Mid Term	**20%**	30	20	10	
Class performance, Assignments, CTs	**30%**	5	5	10	10
Total	**100%**	45	65	120	10

Minimum attendance: 60% class attendance is mandatory for a student in order to appear at the final examination.

Grading System: As per the approved grading scale of University of Asia Pacific (Appendix-3).

Required References: 1. Fundamentals of Computer Graphics by **Peter Shirley et al.**,
2. Interactive Computer Graphics: A Top-Down Approach Using OpenGL by **E. Angel and Dave Shreiner**
3. OpenGL Red Book : http://www.glprogramming.com/red/

Recommended References: **1.** Computer Graphics principles and practices by **Foley et al.**
2. Schaum's Outline of Computer Graphics by **Zhigang Xiang and Roy A. Plastock**

Lecture Schedule (Tentative)

Weeks	Lecture #	Topics	Course Outcome	Delivery methods and activities	Reading Materials
1	1	Introduction, Motivation, Applications, History	CO1	Lecture, multimedia	Slides, Chapter 1 (Required References: 1 and 2)
	2	Introduction to OpenGL Description and Assignment of OpenGL Programming problem	CO4	Lecture, multimedia, Discussion	Notes, Required Reference: 3
2	3, 4	Math preliminaries, Curves and Surfaces	CO1	Lecture, Problem Solving	Slides, Chapter 3 and 15 (Required Reference: 1)

					Chapter 10 (Required Reference: 2)
3	5, 6	Coordinates and Transformations	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 6 (Required Reference: 1) and Chapter 3 (Required Reference: 2)
4	7	CT1			
	8	View Transformation	CO2	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 7 (Required Reference: 1) and Chapter 4 (Required Reference: 2)
5	9,10	3D Object Representation and Hierarchical Modeling	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 8 (Required Reference: 2)
6	11	Color	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 20 (Required Reference: 1) and Chapter 2 & 6(Required Reference: 2)
	12	CT2			
7	13, 14	Clipping	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 12 (Required Reference: 1) and Chapter 6 (Required Reference: 2)
Mid Term					
8	15, 16	Hidden Surface Removal and Collision Detection	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 8 (Required Reference: 1) and Chapter 4 &

					6(Required Reference: 2)
9	17, 18	Illumination and Shading	CO3	Lecture, multimedia, Discussion Problem Solving	Slides Chapter 9 (Required Reference: 1) and Chapter 5 (Required Reference: 2)
10	19	CT3			
	20	Texture Mapping and Shaders	CO3	Lecture, multimedia, Discussion	Slides Chapter 11 (Required Reference: 1) and Chapter 7 (Required Reference: 2)
11	21, 22	Graphics Pipeline and Rasterization (Scan Conversion)	CO3	Lecture, multimedia, Discussion, Problem Solving	Slides Chapter 3 (Required Reference: 1) and Chapter 6 (Required Reference: 2)
12	23	Basics of Computer Animation	CO3	Lecture, multimedia, Discussion	Slides Chapter 16 (Required Reference: 1) Chapter 8 (Required Reference: 2)
	24	Particle Systems and ODEs	CO3	Lecture, multimedia, Discussion	Slides Chapter 16 (Required Reference: 1) Chapter 9 (Required Reference: 2)
13	25	CT4			
	25, 26	Advanced Rendering: Ray Casting and Ray Tracing	CO3	Lecture, multimedia, Discussion,	Slides Chapter 11 (Required Reference: 2)

14	27	Presentation on Assignment by the Groups	CO4	multimedia, Discussion,	Slides, handouts
	28	Review			
Final Exam					

Student's responsibilities: Students must come to the class prepared for the course material covered in the previous class (es). They must submit their assignments on time. No late or partial assignments will be acceptable. There will be no make-up quizzes.

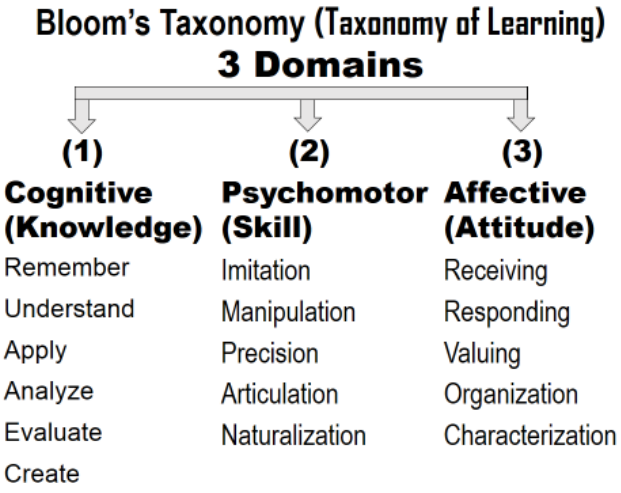
Prepared by	Checked by	Approved by
Course Teacher	Chairman, PSAC committee	Head of the Department

Appendix-1:

Washington Accord Program Outcomes (PO) for engineering programs:

No.	PO	Differentiating Characteristic
1	Engineering Knowledge	Breadth and depth of education and type of knowledge, both theoretical and practical
2	Problem Analysis	Complexity of analysis
3	Design/ development of solutions	Breadth and uniqueness of engineering problems i.e. the extent to which problems are original and to which solutions have previously been identified or codified
4	Investigation	Breadth and depth of investigation and experimentation
5	Modern Tool Usage	Level of understanding of the appropriateness of the tool
6	The Engineer and Society	Level of knowledge and responsibility
7	Environment and Sustainability	Type of solutions.
8	Ethics	Understanding and level of practice
9	Individual and Team work	Role in and diversity of team
10	Communication	Level of communication according to type of activities performed
11	Project Management and Finance	Level of management required for differing types of activity
12	Lifelong learning	Preparation for and depth of Continuing learning.

Appendix-2



Appendix-3: Grading Policy

Numeric Grade	Letter Grade	Grade Point
80% and above	A+	4.00
75% to less than 80%	A	3.75
70% to less than 75%	A-	3.50
65% to less than 70%	B+	3.25
60% to less than 65%	B	3.00
55% to less than 60%	B-	2.75
50% to less than 55%	C+	2.50
45% to less than 50%	C	2.25
40% to less than 45%	D	2.00
Less than 40%	F	0.00