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

Course Outline

Program:	Computer Science and Engineering (CSE)
Course Title:	Computer Graphics Lab
Course Code:	CSE 426
Semester:	Spring 2024
Level:	8th Semester (4th Year, 2nd Semester)
Credit Hour:	1.5
Name & Designation of Teacher:	**Md. Rasheduzzaman, Lecturer;** **Jayonto Dutta Plabon, Lecturer;** **Md. Al-Amin Sany, Lecturer**
Office/Room:	7th Floor, Teachers' Area
Class Hours:	**According to the routine**
Consultation Hours:	**Office Hours**
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Rationale:	The goal of this course is to provide an introduction to the application of the theory and practice of computer graphics. The course will assume a solid background in programming in C or C++, as well as a strong foundation in mathematics, including familiarity with the theory and application of coordinate geometry and linear algebra.
Pre-requisite (if any)**:**	Students are expected to complete the following courses— MTH 205 (Math IV), CSE 103 (Discrete Mathematics)
Course Synopsis:	Standard Graphics Primitives, Graphical User Interface; Graphics Hardware: Display devices, Raster refresh graphics display, Use of frame buffer and look up table. Coordinate convention: Device coordinate and world coordinate system. Raster Scan Graphics: Mid-point Line and Circle Creation Algorithms, Animalizing. Polygons: Difference types of polygons, Point location, polygon filling, triangulation,

Windowing and Clipping, Window Viewpoint, Zooming, panning, line text, and polygon clipping. Transformation: Homogeneous coordination, Transformation matrices, Transformation in 2D, Translation, rotation, sealing, Transformation in 3D, translation, rotation, scaling. Projection: Parallel and perspective, isometric projection. Three-dimensional Viewing and representation: Curves, surfaces, and volumes with cubic and bi-cubic spines, B-Reb, CSG, Spatial Occupancy Representations. Hidden Lines and Surface removal: Painter's algorithm, Z-Buffering. Rendering: Light Models, Shading Interpolation Technique constant, Ground and Phong, Ray Tracing. Image File Format: PPM file, BMP file. Introduction to Graphics Programming: The nature of computer animation, simulation, kinematics, barometries, dynamics, and meta-morphosis.

Course Objectives:

The objectives of this course are to—

1. **Provide** knowledge and understanding of principles of Computer Graphics.
2. **Introduce** the concept of different types of transformation and projection.
3. **Emphasize** the design and implementation of different types of computer graphics and animation techniques to simulate the real world.

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

CO No.	CO Statements: Upon successful completion of the course, students should be able to—	Corresponding POs (Appendix-1)	Bloom's taxonomy domain/level (Appendix-2)	Delivery methods and activities	Assessment Tools
CO 1	**Understand** the objectives and terminology associated with Computer Graphics.	1	Cognitive / Understand	Lecture, Group discussion	Quiz
CO 2	**Apply** the techniques and algorithms of Computer Graphics and Data Visualization.	5	Cognitive / Apply	Problem Solving	Quiz, Lab Test
CO 3	**Design** the methodologies of Computer Graphics for the data visualization of various geometric objects of both 2D and 3D objects.	10	Cognitive / Analyze	Project	Assignment

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3
Assessment	**30%**		50%	
Assignment	**10%**			
Mid	**20%**			
Project	**20%**			40%
Report and Viva	**10%**	10%		
Continuous Project Evaluation	**10%**			
Total	**100%**			

Grading Policy: As per the approved grading policy of UAP (Appendix 3)

Course Content Outline and mapping with COs

Lecture	Topic	Course Outcome	Delivery methods and activities	Reading assignment
Lecture 1	Introduction to Computer Graphics, OpenGL basic syntax and environment setup. Points, lines, triangles, quads, polygon drawing using OpenGL.	CO1	Lecture, Group discussion	An introduction to Graphics Programming in OpenGL
Lecture 2	Translation, scaling, and rotation of 2D objects in OpenGL. Complex shape changing of 2D objects using OpenGL.	CO1, CO2	Lecture, Problem Solving	An introduction to Graphics Programming in OpenGL
Lecture 3	Create groups of 2 members and assign Projects.	CO1, CO2	Lecture, Problem Solving	Web Content

	Introduction to Unity Game Engine. Hands-on experience in Unity.			
Lecture 4	Unity Programming Introduction in C#. Problem Assignment: Syntax and Basic C# programming in Unity.	CO1, CO3	Lecture, Problem Solving	Web Content
Lecture 5	Movement and Camera flow in Unity. Problem Assignment: Viewing Objects from different aspects and positions, and camera views.	CO3	Lecture, Problem Solving	Web Content
Lecture 6	Collision Simulation in Unity. Problem Assignment: Collision simulation between two objects.	CO2, CO3	Lecture, Problem Solving	Web Content
Midterm Examination				
Lecture 7	Animations in Unity. Problem assignment: Apply the projection technique in animations.	CO3, CO4	Lecture, Problem Solving	Web Content
Lecture 8	Simulations in Unity. Problem Assignment: Using the Physics feature and applying it in a simulation.	CO3, CO4	Lecture, Problem Solving	Web Content
Lecture 9	Movement of objects. Problem Assignment: Apply Movement is a game idea.	CO3, CO4	Lecture, Problem Solving	Web Content
Lecture 10	Game UI. Updates on the Game development project.	CO3, CO4	Lecture, Problem Solving	Web Content
Lecture 11	Console Design. Problem assignment: Game controls.	CO3, CO4	Lecture, Problem Solving	Web Content

Lecture 12	Data Visualization in Python using Matplotlib. Project Submission.	CO4, CO 5	Lecture, Problem Solving	Web Content
Final Examination				

Required References:

Special Instructions:

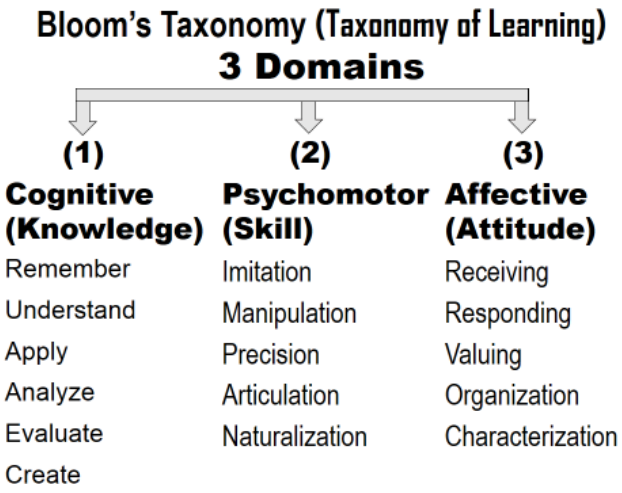
- Minimum Required Attendance is 70%
- No make-up for quizzes and mid-term exam
- Plagiarism policy: zero tolerance in case of plagiarism

Prepared by	Checked by	Approved by
Md. Rasheduzzaman; Jayonto Dutta Plabon; Md. Al-Amin Sany		

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 Teamwork	Role in and diversity of the team
10	Communication	Level of communication according to the 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

UAP 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