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:	Fall 2021
Level:	8th Semester (4th Year, 2nd Semester)
Credit Hour:	1.5
Name & Designation of Teacher:	S M Rafiuddin Rifat, Lecturer
Office/Room:	7th Floor, Teachers' Area
Class Hours:	**Section A1:** **Thursday: 02:00PM – 04:45PM** **Section A2:** **Monday: 02:00PM – 04:45PM** **Section B1:** **Tuesday: 08:00AM – 10:45PAM** **Section B2:** **Monday: 11:00AM – 01:45PM**
Consultation Hours:	**Section A1:** **Sunday: 11:00AM – 12:15PM** **Section A2:** **Wednesday: 12:30PM - 01:45PM** **Section B1:** **Wednesday: 05:00PM – 06:15PM** **Section B2:** **Thursday: 12:30AM - 01:45PM**
E-mail:	rifat.cse@uap-bd.edu
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Rationale:	The goal of this course is to provide an introduction of the application to the theory and practice of computer graphics. The course will assume a good background in programming in C or C++ and a background in mathematics including familiarity with the theory and use of coordinate geometry and of 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 wild coordinate system. Raster Scan Graphics: Mid-point Line and Circle Creation Algorithms, Animalizing. Polygons: Difference type 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 on principles of Computer Graphics.
2. **Introduce** the concept of different types of transformation and projection.
3. **Emphasize** the design and implement of different types 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, 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.	2, 5	Cognitive / Apply	Problem Solving	Quiz, Lab Test

CO 3	**Design** the methodologies of Computer Graphics on data visualization of various geometric objects of both 2D and 3D objects.	3, 9, 10	Cognitive / Analyze	Project	Assignment

Weighting COs with Assessment methods:

Assessment Type	% weight	CO1	CO2	CO3
Assessment	**50%**			
Project	**50%**			
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	OpenGL basic syntax and environment setup. Points, line, triangle, quads, polygon drawing using OpenGL.	CO1	Lecture, Group discussion	An introduction to Graphics Programming in OpenGL, Chapter 2, 3
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, Chapter 4, 5
Lecture 3	Create groups of 2 members and assign Projects. Introduction to Unity Game Engine. Hand on experience in Unity.	CO1, CO2	Lecture, Problem Solving	Web Content
Lecture 4	Unity Programming Introduction in C#.	CO1, CO3	Lecture, Problem Solving	Web Content

	Problem Assignment: Syntax and Basic C# programming in Unity.			
Lecture 5	Movement and Camera flow in Unity. Problem Assignment: Viewing Objects from different aspects and position and camera view.	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
Mid Term 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 Physics feature and apply it in 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 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: An introduction to Graphics Programming in OpenGL, Toby Howard

Special Instructions:

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

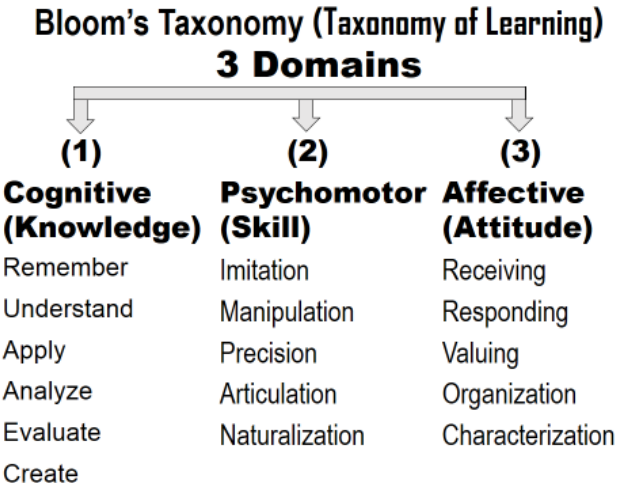
Prepared by	Checked by	Approved by
S M Rafiuddin Rifat (Course Teacher)	Chairman, PSAC committee	Head of the Department

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

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