MULTIMEDIA UNIVERSITY®

COURSE INFORMATION

1 .	**Name of Course**	Computer Graphics Fundamentals
2 .	**Course Code**	TGD2151
3 .	**Type of Course** **(e.g. : Core, major, elective etc.)**	Specialization Core for BCS (GD)
4 .	**Synopsis**	This course provides an introduction of the fundamental algorithms in computer graphics, their theoretical as well as implementation aspects. The course includes important topics on two and three dimensional transformations, projections, viewing functions, and advanced topics on three dimensional modelling and rendering.
5 .	**Version** **(State the date of theSenate's approval - previous and the current approval date)**	Current: January 2018 Previous: June 2016
6 .	**Name(s) of Academic Staff**	Ng Kok Why Wong Lai Kuan Aziah Binti Ali Ban Kar Weng
7 .	**Semester and Year Offered**	Trimester 2 (Gamma)
8 .	**Credit Value**	4
9 .	**Pre-Requisite**	TCP1201 Object-Oriented Programming and Data Structures

10 . **Objective of the course in the programme:**

- To equip students with fundamentals of the modern Computer Graphics pipeline.
- To equip students with the skill to manipulate lighting effects and application of mathematics in Computer Graphics.
- To equip students with hands-on experience at developing interactive, real-time rendering applications using OpenGL.
- To equip students with program writing skill from a practical specification and produce realistic graphics output.

11 . **Justification for including the course in the programme:**

To provide students with knowledge on graphics pipeline, graphic rendering, interactive and real-time graphics development and technical programming skill to produce realistic and smooth graphics output.

12 . **Course Learning Outcomes (CLO)**

		Domain	Level
CLO1:	Describe and interpret the components that make up the Computer Graphics system	Cognitive	2
CLO2:	Illustrate and identify the basic concepts of 2D graphics	Cognitive	3
CLO3:	Express and interpret the basic concepts of 3D graphics	Cognitive	3
CLO4:	Develop OpenGL graphics applications by applying the concepts, theories and algorithms of 2D and 3D graphics	Cognitive	6

13 . **Mapping of the Course Learning Outcomes to the Programme Learning Outcomes, Teaching Methods and Assessment:**

Course Learning Outcomes (CLO) (Must tally with CLOs in item 12)	Programme Learning Outcomes (PLO)												Teaching Methods	Assessment Method
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12		
CLO1							✓						Lecture/Practical	Test/Final Exam
CLO2							✓	✓					Lecture/Practical	Test/Final Exam
CLO3							✓	✓					Lecture/Practical	Test/Final Exam
CLO4								✓	✓				Lecture/Practical	Assignment
Total							**3**	**3**	**1**				*Indicate the relevancy between the CLO and PLO by ticking "✓" the appropriate relevant box (This description must be read together with standards 2.1.2, 2.2.1, and 2.2.2 in Area 2 – pages 16 & 18 of COPPA 2.0)*	

14 . **Transferable Skills:**

Skill: Critical thinking.
How it is developed: Trough discussion on the algorithms and analysis on the pros and cons of the techniques applied.
Assessment: Presentation and written report.

15 . **Distribution of Student Learning Time (SLT)**

	Course Content Outline	**CLO	Teaching and Learning Activities – Guided Learning (F2F)* *L	*T	*P	*O	Guided Learning (NF2F)*	Independent Learning (NF2F)*	Total SLT
1	**Overview of Graphics Systems** Display devices, Hardcopy devices, Interactive input devices, Display processors, Graphics software, Colour models.	**1**	2		2			4	8
2	**Graphics Primitives** Output primitives (points and lines), Line-drawing algorithms (Analytical method, Digital Difference Analyzer, Mid-Point algorithm, Bresenham algorithm), Anti-aliasing lines, Circle generating algorithms, Attributes of output primitives (lines styles), Mathematics for Computer Graphics (line & plane equations), Colour intensity, Area filling, OpenGL related commands and implementation.	**2**	2		4		4	6	16
3	**2D Viewing Algorithm** 2D viewing pipeline, Window-to-viewport transformation, Clipping algorithms (Cohen-Sutherland line clipping, Liang-Barsky line clipping).	**2**	2		2			4	8
4	**2D & 3D Transformations** 2D and 3D transformations (translation, scaling, rotation, shear, reflection), Composite transformations, Affine transformation, Matrix representations and homogeneous coordinates.	**2**	4		4			8	16

5	**Object Modelling** Polygon surfaces, Wire-frame models, Solid models, Bezier curve, Bezier patch, Sweep representations.	**3**	1		1		4	2	8
6	**3D Viewing & Projection** Camera model, U-V-N viewing coordinate system, Pin-hole camera, 3D viewing pipeline, Orthogonal projection, Oblique projection, Perspective projection.	**3**	6		6			12	24
7	**Visible Surface Detection** Classification of visible-surface detection algorithms, Back-face culling, Depth-sorting method, Depth-buffer method (Z-buffer), Painter algorithm.	**3**	2		2			4	8
8	**Rendering** Light sources, Surface lighting effects (ambient, diffuse, specular reflection), Phong Illumination model, Phong-shading, Gouround-shading methods, Colour materials, Texture mapping, Bump mapping.	**4**	2		4		4	6	16
9	**Advance Topic** Introduction to Graphics Processing Unit (GPU), Concept of shaders, Shaders programming, Terrain rendering using GPU, Ray tracing, transparency and shadow.	**4**	2		2			4	8
								Total SLT	**112**

SUMMATIVE ASSESSMENT

1. Continuous Assessment	**Percentage %**	**Total SLT**
Test	20%	12
Assignment	30%	14
Total SLT for Continuous Assessment		**26**

2. Final Assessment	**Percentage %**	**Total SLT**	
		F2F	**ILT**
Final Exam	50%	2	20
Total SLT for Final Assessment (F2F + NF2F)		**22**	
Grand Total	**100%**	**160**	

****Indicate the CLO based on the CLO's numbering in Item 12.**
***L= Lecture, *T= Tutorial, *P= Practical, *O= Others, F2F*= Face to Face, NF2F*= Non Face to Face**

16 . **Identify Special Requirement to Deliver the Course (e.g., software, nursery, computer lab, simulation room):**
computer lab + Codeblock MinGW

17 . **Main References:**
Edward Angel & Dave Shreiner (2011), Interactive Computer Graphics: A Top-Down Approach With Shader-based OPENGL (6th Edition), Addison Wesley. ISBN-10: 027375226X, ISBN-13: 9780273752264

18 . **Additional References:**
Dave Shreiner, Graham Sellers, John M. Kessenich and Bill M. Licea-Kane (2013), OpenGL Programming Guide: The Official Guide to Learning OpenGL, Version 4.3 (8th Edition), Addison-Wesley Professional. ISBN-10: 0321773039, ISBN-13: 978-0321773036.

Note:
Cells shaded light grey contain formulas / fixed values. Edit these formulas only if needed.