Subject Description Form

Subject Code	COMP4422
Subject Title	Computer Graphics
Credit Value	3
Level	4
Pre-requisite / Co-requisite / Exclusion	**Pre-requisite**: COMP2011
Objectives	The objectives of this subject are to: • learn basic and fundamental computer graphics techniques; • learn 3D image synthesis techniques; and • understand 3D modeling, design and visualization.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: *Professional/academic knowledge and skills* (a) gain proficiency in 3D computer graphics API programming; (b) understand the interactive computer graphics architecture; (c) possess in-depth knowledge of display systems, image synthesis, shape modeling, and interactive control of 3D computer graphics applications; and (d) enlarge their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information. *Attributes for all-roundedness* (e) understand, appreciate and follow the development and advancement of computer graphics technologies, including advanced technologies for 3D modelling, high performance rendering (life-long learning).
Subject Synopsis/ Indicative Syllabus	**Topic** **1. Basic Introduction to Human Vision, Displays, Graphics Pipeline** **2. GPUs, CG Processing, Frame Buffers and APIs** **3. 2D Modeling, Primitives and Rasterization** **4. Polygon Geometry** **5. Geometric Transformations** **6. Two-dimensional Viewing and Clipping** **7. Three-dimensional Viewing and Projections** **8. Three-dimensional Object Representations**

	9. Visible Surface Detection **10. Illumination Models** **11. Shading Models** **12. Color Models** **13. Hierarchical Modeling** **14. Three-dimensional Scene Rendering** **Laboratory Experiments**: Laboratory exercises will normally be conducted using the currently available computer graphics API such as OpenGL. The students will be exposed to basic frame-buffer control, pixel processes, rasterization, 2D drawings, 3D transformations, projections, scene hierarchy, modeling objects, color and interactive animation. **Case Study**: If applicable, case studies may be conducted on modeling and design systems that are used in commercial applications.
Teaching/ Learning Methodology	The teaching methodology is based on these main activities: 1. Lecture delivery 2. Interactive exchange with students in class 3. Laboratory exercises consisting of hands-on programming exercises and tests 4. Tutorial sessions in and/or outside the lecture and laboratory sessions 5. Exposition and training sessions on a commercial grade studio package 6. Sessions on 3D artistic design and special effects 7. Office hours questions, answers and clarification of material 8. Discussion sessions with optional additional workshops, lectures and labs The learning methodology will be based on: 1. Lecture notes 2. Laboratory notes and programming exercises 3. Textbook material 4. Additional reference material 5. Web links to active tutorials and other presentation material Group interactions and supervised discussion sessions.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
Continuous Assessment	**60%**					
1. Assignments	30%	✓	✓	✓		
2. Lab Exercises		✓	✓	✓		
3. Project		✓	✓	✓	✓	✓
4. Mid-term	30%	✓	✓	✓		
Examination	**40%**	✓	✓	✓		
Total	100%					

The assignment weights will be effectively distributed amongst the intended subject learning outcomes to nurture creative thinking, independence, teamwork, technical skills and a global perspective towards the technological base of this subject. Specifically, the assignments and the lab exercises are selected to develop the technical skills and knowledge to solve problems in computing and software development as well as to realize effective solutions, understand, evaluate and develop a critical perspective in the development of both small and large systems and integration of systems. Critical thinking, effective communication and a demonstrable global outlook will be incorporated at every level of exercises and mid-term examinations. The final examination accounts for a global and comprehensive understanding of the entire subject material and serves as the final checkpoint for the learning outcomes against technical skills and critical problem solving with respect to all components of computer graphics and 3D modeling.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial/Laboratory	13 Hrs.
Other student study effort:	
▪ Assignments	24 Hrs.
▪ Course Work: Reading, Discussions	42 Hrs.
Total student study effort	105 Hrs.

Reading List and References

Textbook:

1. Marschner, Steve and Shirley, Peter, *Fundamentals of Computer Graphics*, 4th Edition, CRC Press, 2016.

Reference Books:

	1. Cantor, Diego and Jones, Brandon, *WebGL Beginner's Guide*, 1st Edition, PACKT Pub, 2012. 2. *Blender Reference Manual*, https://docs.blender.org/manual/en/latest/index.html 3. Hearn, D. and Baker, M., *Computer Graphics with OpenGL*, 4th Edition, Prentice-Hall, 2011. 4. Hill, F.S. Jr., *Computer Graphics Using Open GL*, 2nd Edition, Prentice Hall, 2001.