

Subject Description Form

Subject Code	COMP407
Subject Title	Computer Graphics
Credit Value	3
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: COMP305 Co-requisite/Exclusion: Nil
Objectives	<p>This subject allows students to:</p> <ul style="list-style-type: none">• learn basic and fundamental computer graphics techniques;• learn image synthesis techniques;• examine applications of modelling, design and visualization.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><i>Professional/academic knowledge and skills</i></p> <p>(a) gain proficiency in 3D computer graphics API programming;</p> <p>(b) understand the interactive computer graphics architecture;</p> <p>(c) possess in-depth knowledge of display systems, image synthesis, shape modeling, and interactive control of 3D computer graphics applications;</p> <p>(d) enhance their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information.</p> <p><i>Attributes for all-roundedness</i></p> <p>(e) understand, appreciate and follow the development and advancement of computer graphics technologies, including advanced technologies for 3D modelling, high performance rendering.</p> <p>Alignment of Programme Outcomes:</p> <p>Programme Outcome 1: This subject contributes to communicative effectively by having students practice programming in small groups in the lab and solving digital image design in small teams.</p> <p>Programme Outcome 2: This subject contributes to the global outlook by having students understand the use of computer graphics for different applications and their uses.</p> <p>Programme Outcome 4: This subject contributes to critical thinking through tutorial and lab exercises as well as direct exchanges on novel uses of 2D</p>

	<p>image construction and 3D rendering algorithms. They will also practice in written assignments, programming exercises, and potential projects.</p> <p>Programme Outcome 5: This subject contributes to technical problem solving by initiating a wide variety of application design and implementation skills through lab exercise and mini-project with proper design and implementation.</p> <p>Programme Outcome 7: This subject contributes to team work by employing a small group-based approach to lab problem solving, assignments and mini-projects.</p>					
<p>Subject Synopsis/ Indicative Syllabus</p>	<table border="1" data-bbox="483 468 1378 1108"> <thead> <tr> <th data-bbox="483 468 1378 506" style="text-align: center;">Topic</th> </tr> </thead> <tbody> <tr> <td data-bbox="483 506 1378 716"> <p>1. Basic computer graphics hardware/software interfaces Graphical input/output devices; 2D primitive drawing; rasterization; 2D transformation; 3D transformation and projection; synthetic camera and viewing volume; clipping; object modeling and hierarchical structures.</p> </td> </tr> <tr> <td data-bbox="483 716 1378 926"> <p>2. Image synthesis and generation techniques Some of the important image generation techniques including hardware-based rendering, scan-conversion, local illumination models, reflections and shading; related issues such as anti-aliasing and texture mapping.</p> </td> </tr> <tr> <td data-bbox="483 926 1378 1066"> <p>3. Applications of computer graphics Introduction to OpenGL and device independent Application Programming Interfaces (API); virtual reality; hardware supported 3D modeling and rendering.</p> </td> </tr> <tr> <td data-bbox="483 1066 1378 1108" style="text-align: right;">Total</td> </tr> </tbody> </table> <p>Laboratory Experiment:</p> <p>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.</p> <p>Case Study:</p> <p>If applicable, case studies may be conducted on modeling and design systems that are used in commercial applications.</p>	Topic	<p>1. Basic computer graphics hardware/software interfaces Graphical input/output devices; 2D primitive drawing; rasterization; 2D transformation; 3D transformation and projection; synthetic camera and viewing volume; clipping; object modeling and hierarchical structures.</p>	<p>2. Image synthesis and generation techniques Some of the important image generation techniques including hardware-based rendering, scan-conversion, local illumination models, reflections and shading; related issues such as anti-aliasing and texture mapping.</p>	<p>3. Applications of computer graphics Introduction to OpenGL and device independent Application Programming Interfaces (API); virtual reality; hardware supported 3D modeling and rendering.</p>	Total
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<p>Teaching/Learning Methodology</p>	<p>The teaching methodology is based on three main activities:</p> <ol style="list-style-type: none"> 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	
1. Assignments	30%	✓	✓	✓			
2. Lab exercises		✓	✓	✓			
3. Project							
4. Mid-term	30%	✓	✓	✓			
5. 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

Class contact:

Effort Expected	▪ Lecture	26 Hrs.
	▪ Tutorial	13 Hrs.
	Other student study effort:	
	▪ Class participation	4 Hrs.
	▪ Course work: reading, discussion, assignments	52 Hrs.
	Total student study effort	95 Hrs.
Reading List and References	<p>Textbooks:</p> <ol style="list-style-type: none"> Hearn, D. and Baker, M., <i>Computer Graphics with OpenGL</i>, Third Edition, Prentice-Hall, 2004. <p>Reference Books:</p> <ol style="list-style-type: none"> David Eck, <i>Fundamentals of Computer Graphics with Java and OpenGL</i>, http://math.hws.edu/graphicsnotes, 2010. Peter Shirley and Steve Marschner, <i>Fundamentals of Computer Graphics</i>, Third Edition, A. K. Peters, 2009. Angel, E.S., <i>Interactive Computer Graphics</i>, A top-down approach with OpenGL, Second Edition, Addison-Wesley, 2000. Angel, E.S., <i>OpenGL: A Primer</i>, Addison-Wesley, 2000. Watt, A., <i>3D Computer Graphics</i>, Third Edition, Addison-Wesley, 2000. Hill, F.S. Jr., <i>Computer Graphics Using Open GL</i>, Second Edition, Prentice Hall, 2001. 	