

Subject Description Form

Subject Code	COMP4422
Subject Title	Computer Graphics
Credit Value	3
Level	4
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: COMP2011
Objectives	<p>The objectives of this subject are:</p> <ol style="list-style-type: none">1. To learn basic and fundamental computer graphics techniques;2. To learn 3D image synthesis techniques;3. To understand 3D modeling, design and visualization.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><u>Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none">(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;(d) enlarge their perspective of modern computer system with modeling, analysis and interpretation of 2D and 3D visual information. <p><u>Attributes for all-roundedness</u></p> <ol style="list-style-type: none">(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	<p>Main topics covered:</p> <ol style="list-style-type: none">1. Basic introduction to human vision, displays, graphics pipeline2. GPUs, CG Processing, frame buffers and APIs3. 2D Modeling, primitives and rasterization4. Polygon geometry5. Geometric transformations

	<ol style="list-style-type: none"> 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 <p>Laboratory Experiments:</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>
<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 <p>The learning methodology will be based on:</p> <ol style="list-style-type: none"> 1. Lecture notes

	<ol style="list-style-type: none"> 2. Laboratory notes and programming exercises 3. Textbook material 4. Additional reference material 5. Web links to active tutorials and other presentation material <p>Group interactions and supervised discussion sessions.</p>																																																																		
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1" data-bbox="440 519 1458 1102"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> <th>d</th> <th>e</th> <th></th> </tr> </thead> <tbody> <tr> <td>1. Assignments</td> <td rowspan="3">30%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2. Lab exercises</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3. Project</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> </tr> <tr> <td>4. Mid-term</td> <td>30%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>5. Examination</td> <td>40%</td> <td>✓</td> <td>✓</td> <td>✓</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Total</td> <td>100 %</td> <td colspan="6"></td> </tr> </tbody> </table> <p>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.</p>							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 %						
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Reading List and References**Textbooks:**

1. Hearn, D. and Baker, M., *Computer Graphics with OpenGL*, Fourth Edition, Prentice-Hall, 2011.

Reference Books:

1. David Eck, *Fundamentals of Computer Graphics with Java and OpenGL*, <http://math.hws.edu/graphicsnotes>, 2010.
2. Peter Shirley and Steve Marschner, *Fundamentals of Computer Graphics*, Third Edition, A. K. Peters, 2009.
3. Angel, E.S., *Interactive Computer Graphics*, A top-down approach with OpenGL, Second Edition, Addison-Wesley, 2000.
4. Angel, E.S., *OpenGL: A Primer*, Addison-Wesley, 2000.
5. Watt, A., *3D Computer Graphics*, Third Edition, Addison-Wesley, 2000.
6. Hill, F.S. Jr., *Computer Graphics Using Open GL*, Second Edition, Prentice Hall, 2001.