

## Subject Description Form

<b>Subject Code</b>	COMP4122
<b>Subject Title</b>	Game Design and Development
<b>Credit Value</b>	3
<b>Level</b>	4
<b>Pre-requisite / Co-requisite / Exclusion</b>	<b>Pre-requisite:</b> COMP2011
<b>Objectives</b>	<p>The objectives of this subject are to:</p> <ul style="list-style-type: none"> <li>• provide students with a broad view of the nature of computer games and digital entertainment;</li> <li>• equip students with the knowledge and skills in the analysis, design and development of interactive computer games and mixed reality applications;</li> <li>• allow students to explore and use the different algorithms, techniques and tools in rendering and producing animations in 3D computer games;</li> <li>• equip students with knowledge in game AI, multi-user games and networking games;</li> <li>• guide students to study and evaluate the social impact of computer game.</li> </ul>
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <p><u>Professional/academic knowledge and skills</u></p> <ul style="list-style-type: none"> <li>(a) understand the history, evolution and recent development in computer games;</li> <li>(b) understand the overall hardware and software architecture of a typical 3D computer game;</li> <li>(c) familiarize with the different practical analysis, design and implementation techniques that apply to the development of computer games across different platforms;</li> <li>(d) learn game design, testing, and playability principles;</li> <li>(e) learn the computing game programming aspects, such as event loops, execution threads, rendering, animation, terrain and background representation, polygonal models, texturing, collision detection and physically-based modeling, game AI, and multi-user games and networking; and</li> <li>(f) understand the social impact of computer games.</li> </ul> <p><u>Attributes for all-roundedness</u></p> <ul style="list-style-type: none"> <li>(g) work in a team to build a 3D computer game;</li> </ul>

	<p>(h) communicate effectively and present, both in terms of an oral presentation and a written report, the result of developing a 3D computer game; and</p> <p>(i) appreciate the broader perspectives of digital entertainment, and social impact of computer games.</p>								
<p><b>Subject Synopsis/ Indicative Syllabus</b></p>	<table border="1"> <thead> <tr> <th data-bbox="384 344 1473 412"><b>Topic</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="384 412 1473 573"> <p>1. Introduction and game history. Early origins of video games and computer game design and programming; arcade games; some popular home game systems; game design methodology and principles; current development in computer game industry.</p> </td> </tr> <tr> <td data-bbox="384 573 1473 703"> <p>2. Game software, hardware and platforms. Different game platforms: Web-based, console-based (e.g., play station, X-box, Switch), PC-based, handheld games, mobile and wireless game platforms.</p> </td> </tr> <tr> <td data-bbox="384 703 1473 833"> <p>3. Game design principles. Game psychology and game sociology. Human characteristics as information processors and players in gaming environment. Cognitive principles for game design.</p> </td> </tr> <tr> <td data-bbox="384 833 1473 994"> <p>4. Programming and implementation techniques in computer games. 3D models, geometry, rotation, and quaternion interpolation; camera control, texturing, terrain, lighting, level of details (LOD), collision detection; shading, non-photorealistic rendering, image-based rendering.</p> </td> </tr> <tr> <td data-bbox="384 994 1473 1155"> <p>5. Game behavior and game AI. Algorithms in game animations: acceleration, motion analysis, game physics, path finding, chasing and evading, pattern movement, flocking, obstacle avoidance, swarming, learning the opponent behaviors; search and heuristics in games, finite state machines, decision trees.</p> </td> </tr> <tr> <td data-bbox="384 1155 1473 1285"> <p>6. Languages and tools in game programming. C#, C, Unity 3D, and other authoring tools for various components in the game, such as graphics, audios, sound digitizer, and the like.</p> </td> </tr> <tr> <td data-bbox="384 1285 1473 1415"> <p>7. Social impacts of computer games. Gender, race, social and cultural characteristics in computer games; youth violence and digital entertainment software rating; future of computer games.</p> </td> </tr> </tbody> </table>	<b>Topic</b>	<p>1. Introduction and game history. Early origins of video games and computer game design and programming; arcade games; some popular home game systems; game design methodology and principles; current development in computer game industry.</p>	<p>2. Game software, hardware and platforms. Different game platforms: Web-based, console-based (e.g., play station, X-box, Switch), PC-based, handheld games, mobile and wireless game platforms.</p>	<p>3. Game design principles. Game psychology and game sociology. Human characteristics as information processors and players in gaming environment. Cognitive principles for game design.</p>	<p>4. Programming and implementation techniques in computer games. 3D models, geometry, rotation, and quaternion interpolation; camera control, texturing, terrain, lighting, level of details (LOD), collision detection; shading, non-photorealistic rendering, image-based rendering.</p>	<p>5. Game behavior and game AI. Algorithms in game animations: acceleration, motion analysis, game physics, path finding, chasing and evading, pattern movement, flocking, obstacle avoidance, swarming, learning the opponent behaviors; search and heuristics in games, finite state machines, decision trees.</p>	<p>6. Languages and tools in game programming. C#, C, Unity 3D, and other authoring tools for various components in the game, such as graphics, audios, sound digitizer, and the like.</p>	<p>7. Social impacts of computer games. Gender, race, social and cultural characteristics in computer games; youth violence and digital entertainment software rating; future of computer games.</p>
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<p><b>Teaching/ Learning Methodology</b></p>	<p>During the lectures, students will come across the common concepts, methods, and issues in computer game analysis, design and development, and will be supplemented by exercises in games evaluation, and development.</p> <p>During the labs / tutorials, students will have the opportunity to practice, apply, and present what they have learned, and form in groups to develop a computer game which forms a major output of this subject.</p>								

<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)									
			a	b	c	d	e	f	g	h	i	
	<b>Continuous Assessment</b>	<b>55%</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	<b>Examination</b>	<b>45%</b>	✓	✓	✓	✓	✓	✓				
	<b>Total</b>	<b>100%</b>										
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Students need to complete a major game development project starting from concept development, tools and techniques analysis and final implementation in an appropriate setting and platform. This project is used to develop students' ability in game design and development.</p> <p>Students also need to complete a survey / evaluation of some popular computer games in the market based on the principles, concepts and techniques learnt in class. This will help student to apply all these learning in analyzing real products in the market.</p> <p>Students also need to get familiar with some successful / popular games by playing them using the game lab facilities so as to understand the characteristics and limitations as a game player and game designer of computer games.</p>												
<b>Student Study Effort Expected</b>	Class contact:											
	▪ Lecture								26 Hrs.			
	▪ Tutorial/Lab								13 Hrs.			
	Other student study effort:											
	▪ Coursework and Project								80 Hrs.			
Total student study effort								119 Hrs.				
<b>Reading List and References</b>	<p><b>Textbook:</b></p> <ol style="list-style-type: none"> <li>Rarent, Rick, <i>Computer Animation: Algorithms and Techniques</i>, 2<sup>nd</sup> Edition, 2008.</li> <li>Schell, Jesse, <i>The Art of Game Design: A Book of Lenses</i>, 2<sup>nd</sup> Edition, Kindle Edition, 2008.</li> <li>Gregory, Jason, <i>Game Engine Architecture</i>, 3<sup>rd</sup> Edition, 2018.</li> </ol>											