Unit title:	Computer Games Design and Development
Unit number:	24
Level:	5
Credit value:	15
Guided learning hours:	60
Unit reference number:	Y/601/1518

UNIT AIM AND PURPOSE

Learners will develop an understanding of the nature and variety of computer games and their implications. Learners will design, develop and test a commercial-level computer game developing practical skills. Skills and knowledge which are specific to game design and development will be acquired during the completion of this unit.

LEARNING OUTCOMES AND ASSESSMENT CRITERIA

A pass grade is achieved by meeting **all** the requirements in the assessment criteria.

Learning Outcome (LO)	Pass
The Learner will:	The assessment criteria are the pass requirements for this unit. The Learner can:
LO1 Understand computer games development	1.1 critically compare different types of computer games and platforms
	1.2 evaluate the characteristics of user interaction
	1.3 evaluate the impact of computer-based gaming
LO2 Be able to design computer games	2.1 design a computer game for a given requirement
	2.2 identify the components and data and file structures required to develop a computer game
	2.3 evaluate alternative designs and solutions to meet a given requirement
LO3 Be able to develop computer games	3.1 implement a computer game to a given design using a suitable programming environment
	3.2 implement components to meet design requirements
	3.3 implement a game user interface to meet design requirements
	3.4 identify and implement opportunities for error handling and reporting

LO4 Be able to test and document computer games	4.1 critically review and test a computer game
	4.2 analyse actual test results against expected results to identify discrepancies
	4.3 critically evaluate independent feedback on a developed computer game and make recommendations for improvements
	4.4 create documentation for the installation, set-up and support for a developed computer game

GRADING CRITERIA

A merit grade is achieved by meeting **all** the requirements in the pass criteria **and** the merit descriptors.

A distinction grade is achieved by meeting **all** the requirements in the pass criteria **and** the merit descriptors **and** the distinction descriptors.

Merit Criteria (M1, M2, M3) (M1, M2, and M3 are mandatory to achieve a merit grade. Each must be achieved at least once per unit to achieve a merit grade.)	Distinction Criteria (D1, D2, D3) (D1, D2, and D3 are mandatory to achieve a distinction grade. Each must be achieved at least once per unit to achieve a distinction grade.) (In order to achieve a distinction grade, all merit criteria must also have been achieved.)
MANDATORY TO ACHIEVE A MERIT GRADE	MANDATORY TO ACHIEVE A DISTINCTION GRADE
M1 Analyse concepts, theories or principles to formulate own responses to situations.	D1 Evaluate approaches to develop strategies in response to actual or anticipated situations.
M2 Analyse own knowledge, understanding and skills to define areas for development.	D2 Evaluate and apply strategies to develop own knowledge, understanding and skills.
M3 Exercise autonomy and judgement when implementing established courses of action.	D3 Determine, direct and communicate new courses of action.

TEACHING CONTENT

The Teaching Content describes what has to be taught to cover **all** Learning Outcomes.

Learners must be able to apply relevant examples to their work although these do not have to be the same as the examples specified.

LO1 Understand computer game development	
Game genres	e.g. action 1st person, adventure, RPGs, sports, simulations, strategy, puzzles
Motivation of games	Entertainment, education/'serious' games, advertising/merchandising, social, casual
Gaming platforms	Bespoke games consoles, multipurpose mobile devices (e.g. mobile phones, tablet computers) PC/ desktop computer, web-based software platforms/operating systems, 2D/3D games
User interaction	Generic hardware control (e.g. keyboard, mouse, accelerometer, touch screen), purpose-built games controllers (e.g. joysticks, motion controllers), voice control, motion detection
Impact of gaming	Social aspects (e.g. positive and negative effect of game playing on personal development, game rating systems, legislation), economic aspects (e.g. size and influence of the gaming industry, transfer of technology from computer gaming to other areas).
LO2 Be able to design computer games	
Overall design	Statement of purpose of the game, genre, target audience, platform, storyboards
Game components	Characters/avatars, levels, backgrounds/static meshes, assets (e.g. weapons, tools), interactions with objects, sound/music
Data and file structures	Character/object attributes, location/positioning, game state (including saving and resuming), scoring, level generation, configuration data
Program design	Algorithms (e.g. pseudocode, flow charts), top down designs, object hierarchies, state transition diagrams, mathematics/physics (e.g. for location, movement), AI (e.g. programing non-player entities' perceptions, heuristics, strategies).

LO3 Be able to develop computer games	
Programming environment	Games engine, event-driven programming language, object-oriented programming language, graphics libraries (e.g. DirectX, OpenGL), RIA platforms (e.g. HTML5, Adobe Flash, Microsoft Silverlight, JavaFX)
Programming techniques	Modularity (e.g. objects, functions, libraries, appropriate use of variable scope and parameter passing), code annotation, use of IDE/code snippets, debugging, game loop and input/output management, error detection and recovery (e.g. exception handling, state validation), hidden content e.g. Easter eggs.
LO4 Be able to test and document computer games	
Test strategies	Functional testing (e.g. playability, multiplayer mode), compatibility testing (especially if developed in emulator), beta testing (including subjective criteria such as difficulty, enjoyment), compliance testing against rating system, endurance testing
Test documentation	Description of test strategies that will be used, test plan (to include test number, subject/component to be tested, test data expected results vs actual results, action required), analysis of actual results, evaluation of game and recommendations.

GUIDANCE

Delivery guidance
It will be beneficial to deliver this unit in a way that uses actual events, industry forecasts or sector specific contexts which offer the learner the opportunity to explore, develop and apply the fundamental principles of the sector or subject area. Typically the context for delivery could involve the learner working as a game developer designing and producing a game to a client's requirements to suit a specific purpose. This scenario fits well with LO2, LO3 and LO4 and can also be adapted to fit LO1. For example, the learner may produce a report for the client explaining the advantages and drawbacks of using a game to achieve their objectives. Such a task will enable learners investigate and focus on the field of computer game technology. Learners will benefit from being encouraged to exercise autonomy and judgement to both the design of their games, and in acquiring the necessary skills (beyond general pre-acquired programming skills) to realise the design. The defined requirements should be sufficiently vague to enable a significant proportion of the design to be produced by the learner.

Learners should be encouraged to adapt their thinking and reach considered conclusions, in particular when testing and evaluating their games, including remedial action, or making recommendations.

Learners would benefit from being presented with subject/sector-relevant problems from a variety of perspectives and from being given the opportunity to explore them using a variety of approaches and schools of thought.

Assessment evidence guidance

Evidence must be produced to show how a learner has met each of the Learning Outcomes. This evidence could take the form of a portfolio comprising a report covering LO1; the documentation of the design, including all aspects listed in the Teaching Content as relevant to the context for LO2; access to the executable game as well as supporting documentation in the form of a development log and program source code for LO3 (if learners keep a contemporaneous log of their work while they are developing the game – which is good industry practice – an additional write-up should not be necessary for this LO); the documentation of testing including the test strategy, actual results, analysis and recommendations for LO4.

Working in small groups, learners will have the opportunity to simulate similar development work in Industry. This strategy would enable teams of learners to produce larger scale, commercial level games within the time constraints of the unit while also allowing them to learn vital transferable skills in team working, particularly within software development.

Typically, each learner should have prime responsibility for the development of clearly identified sections of the reports, software and documentation. Learners should be careful to apportion the tasks in such a way as to give each learner the opportunity to achieve all learning objectives. Where group work/activities contribute to assessment evidence, the sections of the work which contain the individual contribution of each learner must be clearly identified.

All evidence must be available for the visiting moderator to review. Where learners are able to use real situations or observations from work placement, care should be taken to ensure that the record of observation accurately reflects the learner's performance. This should be signed, dated, and included in the evidence. It is best practice to record another individual's perspective of how a practical activity was carried out. Centres may wish to use a witness statement as a record of observation. This should be signed and dated and included in the evidence.

RESOURCES

Books

Kelly, Charles. *Programming 2D games*. Boca Raton: CRC Press, 2012. Print.

McShaffry, Mike. *Game coding complete*. Australia United States: Charles River Media/Course Technology Cengage Learning, 2009. Print.

Miles, Rob S. *Microsoft Xna Game Studio 4.0 : learn programming now*. Redmond, Wash: Microsoft Press, 2011. Print.

Rogers, Scott. *Level up! : the guide to great video game design*. Chichester: Wiley, 2010. Print.

Strougo, Rod, and Wenderlich, Ray., *Learning Cocos2D : a hands-on guide to building iOS games with Cocos2D, Box2D, and Chipmunk*. Upper Saddle River, NJ: Addison-Wesley, 2012. Print.

Zechner, Mario, and Green, Robert., *Beginning Android games*. New York, N.Y: Apress, 2012. Print.

Journals

Eludamos, Journal for Computer Game Culture (Print and online at www.eludamos.org)

Game Studies, The International Journal of Computer Game Research (online at http://gamestudies.org)

Games and Culture, *A Journal of Interactive Media* (Print)

LNCS Transactions on Edutainment, Springer (Print)

Simulation and Gaming (An International Journal of Theory, Practice and Research) (Print)

Websites

Several tutorials and guides are available on the Internet, either directly from the producers of different games engines, or independently produced, for example:

www.cocos2d.org
www.game-editor.com
www.monogame.codeplex.com
www.udk.com
www.thegamecreator.com

www.GameDev.net
www.IndieGamer.com