Short Title:	3D Environments APPROVED
Full Title:	3D Environments

Module Code:	DMED H3030

ECTS credits:	10

NFQ Level:	7

Module Delivered in	[2 programme(s)](#)

Module Contributor:	Hugh McCabe

Module Description:	Interactive 3D virtual environments are proving increasingly useful in a wide variety of fields and contexts: these include training, commerce, architectural design, digital games, online museums and art. This module will explore such interactive media systems, and equip the learners with the critical, design and technical skills necessary to produce high-quality work of in this field.

Learning Outcomes:
On successful completion of this module the learner will be able to
1. Describe examples of interactive 3D environments, explain the components of such systems and their relationships.   2. Create complex 3D models and worlds (both static and animated) using a variety of modelling approaches and explain the underlying algorithms and techniques involved in modelling, rendering and texturing.   3. Author detailed design documentation for interactive media systems such as computer games.   4. Design and produce collections of media assets (3D and other) given a detailed design specification for an interactive 3D system   5. Produce a high quality interactive 3D system to meet a detailed design specification; locating, modifying and importing existing 3D content for a design-consistent final product   6. Critically evaluate the quality of an interactive 3D system

Module Content & Assessment

Indicative Content
Context History and applications of interactive 2D and 3D environments, influences and applications (sculpture, film, animation, architecture, games), use of 3D in Digital Media, the 3D production process
3D Basics Geometric primitives; vertices; faces; texturing and materials; cameras; perspective and orthographic projections; clipping planes and viewing frustrums;
Modelling Polygon representation, polygon editing, box modelling, subdivision surfaces, alternative modelling techniques (csg, sculpting, NURBS), texturing approaches, mesh optimisation.
Design Processes and Documentation Treatments, scoping, game/system concept, functional and technical design, interface design, documentation standards. High Level Design: Interactive System Project Life Cycle. Virtual Environments (user + information search or object loctiton task) vs. Games (player + challenges) in environment setting. Virtual World System Development Life Cycles. System Concept documents / System-Game Design Documents (level list & descriptions, scene sketches, level tasks summaries). Detailed Design: Feature Lists / Software Road Maps / Detailed Level Descriptions / Class diagrams mapping entities to media objects (like models / colliders) and objects of scripted classes
Building Interactive Environments Frame rate, delta-time for frame-rate independence, count-down and count-up in-game timers, progressive and delayed events and properties (e.g. text/images fading over time), text and icon status indicators, inventories, progress bars (e.g. for countdown timer), direction keys; mouse; free-text-entry; collision detection and event logic.
Rendering Nature of light and colour, colour representation and colour models, light reflection and refraction, lighting models, surface shading and rendering, lighting the scene, virtual cameras, composition and effects, textures, maps and materials, normal maps and environment maps, realism
Audio for Virtual Environments Audio clips and encoding choices, audio sources and listeners in 3D environments, audio events and messages.
Positions, Coordinates and Transformations 3D coordinate systems; spawnpoints and respawning; falling off the edge of the world; speed and velocity; rotation, translation and scaling transformations
3D Animation Key framing and path animation, inverse and forward kinematics, hierarchical models, constraints, character representation and skeletons, rigging and skinning, character animation techniques
Testing and Evaluation Quality aspects of computer games and interactive multimedia systems. Quality criteria for interactive systems. Alpha and Beta Testing. User testing.

Indicative Assessment Breakdown	%
Course Work Assessment %	100.00%

Course Work Assessment %				
Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Lab work	Weekly lab exercises on 3D modelling and interaction using software such as Blender and Unity.	2,4,5	10.00	n/a
Project	3D Modelling and Animation project - The students carry out a substantial 3D modelling and animation project. This project involves modelling, texturing, rendering and animating some kind of 3D environment along with associated 3D assets. The purpose of the project is to allow the students to develop strong modelling skills. The project would normally be completed using the Blender modelling and animation program.	2,4	30.00	n/a
In-class test	In class 3D modelling and rendering test.	2	10.00	n/a
Project	Interactive Media Project - team-based project to create interactive media application (e.g. a game) that incorporates 3D and other forms of media content. It is divided into a number of stages with associated deliverables at each stage. Stage 1(concept & high level design document) - system design including argument of the influences of existing systems and novel aspects of your proposed system. Stage 2 (detailed design document) - detailed design of proposed system. Stage 3 (the system) - interactive 3D system such as a computer game (including updated design documentation & marketing website/video). Stage 4 (critical evaluation) - usability evaluation and reflective critical evaluation.	1,2,3,4,5,6	50.00	n/a

No Final Exam Assessment %

Indicative Reassessment Requirement
Coursework Only *This module is reassessed solely on the basis of re-submitted coursework. There is no repeat written examination.*

ITB reserves the right to alter the nature and timings of assessment

Indicative Module Workload & Resources

Indicative Workload: Full Time

Frequency	Indicative Average Weekly Learner Workload
Every Week	30.00
Every Week	60.00
Every Week	110.00

Resources

Recommended Book Resources

Matt Smith & Chico Queiroz 2013, *Unity 4.x Cookbook, 1st Ed.*

Supplementary Book Resources

Jesse Schel 2008, *The Art of Game Design: A book of lenses*

Lance Flavell 2014, *Beginning Blender*

Minhua Ma (Editor), Andreas Oikonomou (Editor), Lakhmi C. Jain (Editor) 2011, *Serious Games and Edutainment Applications*

This module does not have any article/paper resources

This module does not have any other resources

Module Delivered in

Programme Code	Programme	Semester	Delivery
BN_DDMED_8	Bachelor of Arts (Honours) in Creative Digital Media [240 ECTS credits]	6	Elective
BN_DDMED_7	Bachelor of Arts in Creative Digital Media [180 ECTS credits]	6	Elective