MCAST

MQF Level 6

IT6-A3-21

Bachelor of Science (Honours) in Multimedia Software Development

Course Specification

Course Description

This course is intended for those students who are keen on developing interactive and media rich software applications such as games and mobile applications. In this course you will learn how to develop software applications, create the required multimedia content and integrate this content with the created application. This course covers 2D and 3D Graphic Design, Computer Animation, Sound Design, Visual Effects, Object Oriented Programming, Mobile Application Development and other similar modules. This course is intended for individuals who have an artistic inclination and are also good in programming.

Within this degree students will be required to choose one minor stream of 5 units (amounting to 30 ECTS) from the following 4 options: Advanced Software Applications; Organizational Decision Making; Engineering Manufacture; Creative Design.

Programme Learning Outcomes

At the end of the programme the learner will be able to:

1. *Design, create and document the multimedia content needed in software applications;*
2. *Design, implement and document the game and mobile applications for a given requirement;*
3. *Integrate and synchronize the multimedia content with application events;*
4. *Test and secure the software application and its content to conform to industry standards.*

Entry Requirements

MCAST Advanced Diploma in IT
(recommended stream: “Multimedia Software Development”)
or
MCAST Advanced Diploma in Electronics (Computer Engineering)
or
2 A-Level passes and 2 I-Level passes
Compulsory A-Level: Computing
Compulsory A-Level or I-Level: one subject from Pure Mathematics, Applied Mathematics and Physics

Current Approved Programme Structure

Unit Code	Unit Title	ECTS	Year
ITMMD-506-2001	Object Oriented Programming	6	1
ITSFT-506-1606	Software Engineering	6	1
ITMSD-506-2001	UX Design I	6	1
ITSFT-506-2009	Mobile Applications Development	6	1
ITSFT-506-1608	Data Structures and Algorithms	6	1
ITMSD-506-1602	Sound Design	6	1
ITMTH-506-1602	Applied Maths	6	1
ITDSN-506-2004	Design and Development	6	1
ITSFT-506-2007	Software Test Automation	6	1
CDKSK-503-1907	English I	3	1
CDKSK-503-1908	English II	3	1
ITMMD-506-2002	Client Side Scripting	6	2
ITCGR-506-2003	Programming for Computer Graphics	6	2
ITMSD-506-1604	Soft Computing for Games	6	2
ITMMD-506-2003	Client Side Scripting II	6	2
ITMSD-506-2002	UX Design II	6	2
ITMSD-506-1606	3D Graphics	6	2
ITMSD-506-1607	Game Level Design	6	2
ITRSH-506-2101	Research Design 1	6	2
CDKSK-604-1909	Entrepreneurship	4	2
CDKSK-602-2105	Community Social Responsibility	2	2
CDWBL-506-1901	Work Based Learning I	6	2
ITMSD-606-2101	3D Visual Effects	6	3
ITIMG-606-1601	Image Processing and Computer Vision	6	3
ITMSD-606-1608	Mobile Game Development	6	3
ITMSD-606-1609	Connected Gaming	6	3
ITMSD-606-1610	Sound Engineering	6	3
ITSFT-606-1620	Programming for the Cloud	6	3
ITRSH-606-2102	Research Design 2	6	3
CDWBL-506-1902	Work Based Learning II	6	3
ITDIS-612-1601	Dissertation	12	3
Elective Units*			
ITBCK-606-2101	Blockchain	6	2
ITDVP-606-2101	Devops	6	3
	Total ECVET/ECTS	**180**	**/**

*These units are to be used to replace the *Work Based Learning I and Work Based Learning II* units in exceptional circumstances.

ITMMD-506-2001 Object Oriented Programming

Unit level (MQF): 5

Credits: 6

Unit Description

This unit builds on the previous programming and games development courses, namely Introduction to Object Oriented Programming and Programming for Computer Games. The purpose of this unit is to focus on applying Object Oriented Programming principles in multimedia design and development.

The aim of this unit is to provide the learner with the programming skills and logic needed to develop a game or multimedia project with more advanced code, gameplay, mechanics and AI. This unit will help the learner learn abstract OOP concepts through a more visual and pragmatic approach. It Is envisaged that during lectures OOP concepts like abstraction, encapsulation, inheritance, polymorphism, are presented using practical and visual game examples. Learners will be required to practice hands-on the different OOP concepts learnt in class, by developing their own game projects. Other important concepts and features like persistence, File IO, event handling and state machines will also be introduced.

This unit requires prerequisite programming knowledge of data types, variables, and constants, basic use of classes/ objects, selection, iteration, arrays/lists and string handling. The prerequisite game development knowledge required includes: how to use sprites and game objects, include physics, write simple scripts, attach scripts to the appropriate game objects as components, implement user input controls, and add text UI output.

The first aspect of this module will be to revise together with the learner, basic object-oriented concepts and game development skills. This revision includes classes, methods, constructors, encapsulation, inheritance, game objects, components, physics, user input, and event-driven UI.

Following this, learners learn to understand and apply encapsulation, abstraction, inheritance and polymorphism through the development of game examples. Statics singletons, coroutines, exception handling, state machines and event management are also introduced with the aim of learning how to develop robust code and scalable game designs. Finally, learners will be encouraged to implement a complete small 2D/3D game or multimedia application utilising the concepts learnt.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand object-oriented programming concepts and their usefulness in game or multimedia development.*
2. *Apply understanding of object-oriented concepts in the design of games or multimedia applications.*
3. *Produce game solutions that leverage object-oriented design principles, to be able to address requirements and ensure best practices are adhered to.*
4. *Implement solution algorithms, which include well-scripted gameplay, state machines, exception handling, event management, menus, persistence and data storage.*

ITMSD-506-2001 UX Design I

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based and practical unit, which will allow learners to demonstrate they have the necessary skills to be able to create a satisfying user experience. Learners will develop a deeper understanding of UX design which incorporate utility, ease of use, and efficiency by determining what people want to experience from websites, apps and games. Learners will learn to analyse popular markets, how users search for information and how to structure their content to take advantage of this.

The unit is relevant to learners wishing to use graphics to help rather than distract visitors, balance advertising and content in a way to benefit the product owner and integrate any necessary media to explain all information without overloading the user. On completion of the Unit learners will understand how to understand the progressive navigation and format the information exchange provided on a page to guide users into the ideal user experience intended. This unit will provide the learner with the ability to understand user's problems through research and insight, be able to communicate their designs through deliverables by using personas, sitemaps, user flows and wireframes. Learners will also be thought how to monetize and generate money from an ideal user experience by concentrating on the user flow and timing of their experience provided.

Learners will carry out formatting and presentation features to prepare their documentation for publication or sharing with other users which will prepare them to adapt to the industry. This will therefore require learners to be confident in carrying out more advanced interactions breeching out of their comfort zone and deeper knowledge of a user's psychology, while applying different types of fundamental features in their UX designs.

Learners will analyse and implement basic HTML and CSS code to understand the role of these languages in UX design. Learners will use Adobe XD to design a basic website, app or game interface and build wireframes to implement a working prototype.
Finally, learners should have the underpinning knowledge and understanding to how to present, defend and critique design decisions.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Recognise the different types of websites, mobile applications and games and recognize a designer's role in the industry*
2. *Analyse different planning design structures to transform an abstract idea into a concrete project*
3. *Plan web and application use, as well as game play, to adapt to users by understanding how to combine the fun element with functionality*
4. *Illustrate an original idea in full depth to be able to generate a design document and a prototype*

ITSFT-506-2009 Mobile Applications Development

Unit level (MQF): 5

Credits: 6

Unit Description

Mobile Phones have evolved significantly in technology and application within the short period of their existence. From the original purpose of providing voice calls for travelling office executives these devices have now evolved into handheld, multi-media, smart devices boasting an array of sensors, multi-core processing power and a market penetration across young and old, personal and professional use. A significant factor behind the success of smart phone devices is the ability for the user to personalise with well designed, productive mobile applications. This unit is designed to introduce the learner to key aspects in mobile application development from Operating System and development environment through to application state and data storage.

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to design, program and test a mobile application. The unit will guide learners through the basics of Operating Systems (OS), development environments, device sensors and data storage. Learners will use software programming concepts and as a consequence should able to operate effectively at more than a basic level of competence before commencing this unit.

Outcome 1 introduces the mobile Operating System of choice as well as the development tools available. The learner will familiarise themselves with the development environment and test device/simulator.
Outcome 2 concentrates on implementing the application (Graphical) User Interface (UI). Learners will explore the fundamentals behind building a GUI for the particular OS. They will investigate the various libraries and classes as well as designing and using OS menus.

Outcome 3 focuses on working with differing user states. Learners will understand how to handle application start up, background and resuming as well as considering state changes associated with screen rotation or notifications.

Outcome 4 looks at various options for storing/loading context data internally or externally (through the use of memory cards) and cloud based services.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Examine the fundamental components of mobile application.*
2. *Develop a practical mobile application user interface.*
3. *Manipulate a mobile application depending upon state change.*
4. *Use the appropriate methods to store and load data in a mobile application.*

ITSFT-506-1608 Data Structures and Algorithms

Unit level (MQF): 5

Credits: 6

Unit Description

The basis of solving a problem requires an understanding of how to break it down into a series of much more manageable small parts. In order to do this, students need to be able to assess the complexity of a problem. Once the algorithm has been broken down into smaller sections, a student should start to write logical instructions using pseudocode. Each instruction in turn will manipulate data, which may be for instance array structures, which are similar to vectors in mathematics or abstract data types such as pointers, these are similar to how machine code uses memory addresses to access data.

In this unit students will learn about writing algorithms for common problems such as Queues and thereby choosing the most appropriate data structure.

Students need to implement a series of algorithms which are well known in Computer Science. For a given algorithm a student will need to analyse the complexity and make a decision on how this may affect the efficiency of the algorithm in terms of run time. Although computers now have very powerful processors, students still need to estimate the time it would take for their algorithm to process a given amount of data. In particular as the amount of data becomes larger the amount of time it takes to process the data can grow exponentially.

Students will learn and appreciate that algorithms can be translated into programming code. This in turn will give them an insight into solving problems on paper before typing their code into a text editor for a given programming language. This experience will allow them to see how their programs run as originally indented in the specification. Also it has been written in such a way that it runs efficiently, avoiding complexity in their solution as well as making best use of the processing power of their computer system.

Data structures such as pointers, which allow a programmer to use memory addresses to access data, give the student a much more flexible method to manipulate data. For each algorithm a student needs to select the most appropriate data structure, in order to produce a solution which will carry out the required tasks as set out in the specification for a computer program.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Construct programs using Abstract Data Types and Structured Data types.*
2. *Design efficient algorithms for commonly encountered problems using existing examples.*
3. *Make use of algorithm analysis to determine the efficiency of an algorithm.*
4. *Compare algorithms in terms of their correctness, proof and intractability.*

ITMSD-506-1602 Sound Design

Unit level (MQF): 5

Credits: 6

Unit Description

This unit is designed to provide learners with the knowledge, understanding and skills involved in sound design for the games industry. It should be learner centred and lecturers should use discussion, both individual and group, for analysis of existing sound designs from a variety of software applications platforms. The learner will also acquire the underpinning knowledge of the properties and processes of sound, and the effects on sound with different settings applied. They will plan a sound production, using a sound editor to create their sound and present it as a final product for their chosen game.

Discussion and analysis should be integrated into structured tuition in techniques specific to software/hardware being used and also specific to sound design practice in a software application/multimedia setting. Learners will develop technical skills in the creation of audio files and will apply these skills in the creation of a finalized sound design for a game as well as learning how to use the hardware and software related to the production of a sound design.

Learners will be able to experiment and gain hands on experience of audio equipment and audio applications in the creation of a sound design which will also enhance their skills in critical thinking, planning, organisation and production. They can work as part of a team or individually in all aspects of the practical development and production of a sound design for a sound design brief. If working as a team each learner could be given a specific role within the team or alternatively, roles could be rotated. Each learner's role should be meaningful to the development and production of the sound design and the individual contribution of each learner must be apparent.

This Unit is suited to learners who have an interest, and may be considering a career, in the multimedia and software applications industry as well as the information technology industry. It would also suit learners who wish to enter the audio technology industry.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand the influence of sound and recognize the properties of digital audio*
2. *Plan the acquisition of audio in accordance with a sound design brief for software applications*
3. *Prepare a sound design project using a sound editor*
4. *Produce a finalized audio track in accordance with a sound design brief*

ITMTH-506-1602 Applied Maths

Unit level (MQF): 5

Credits: 6

Unit Description

This unit is designed to introduce learners to the mathematical concepts they need to solve problems that can be met while developing multimedia content and any other content involving computer graphics. The unit also gives learners a head start to some mathematical concepts related to the rapidly developing industry of online betting. Although nowadays we have a lot of graphical tools which aid in the development of such content, it is still of fundamental importance to understand the mathematical concepts that lie beneath. This would lead to a better understanding, appreciation and usage of these tools, better adaptability to other tools, and more ability to solve unseen problems that may arise.

All the content of this unit is not only delivered, but also applied, to actual multimedia/graphics scenarios. This helps to better gauge the learners' understanding and interest, as well as realise its applicability in different scenarios.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand basic mathematical concepts and apply them to a graphical context*
2. *Understand the mathematical foundations of lighting and apply them in graphical contexts*
3. *Understand the mathematical foundations of mechanics (such as acceleration, and collisions) and apply them in graphical contexts.*
4. *Understand the mathematical foundations of combinatronics and probability theory and their application in online betting/gambling scenarios*

ITDSN-506-2004 Design and Development

Unit level (MQF): 5

Credits: 6

Unit Description

This unit aims to give a practical overview using Scalable Vector Graphics (SVG), how to embed SVG paths with codes in HTML, CSS and with a Client-side scripting language for interaction. The unit will also cover SVG coordinate system works for websites and other online objectives.

The learner will learn how to create rectangles, circles, ellipses, lines, polylines, and polygons as well as coding the shapes to understand the concepts of SVG for online interactive animation content.

The learner will further his knowledge covering important concepts in SVG such as Paths and Groups, how to group multiple elements in SVG so they can be manipulated together using calculations and measurement. Also, how to create complex graphics with the Path element.

SVG elements that don't come under a particular category are included in this unit, such as; embedding images, creating links, definitions, symbols and more. This unit, will cover most of the design attributes and properties offered by SVG as well as properties to create multiple designs for shapes and elements to design, create and develop professional interactive front-end design and other online interactive content.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Use embedded Scalable Vector Graphics (SVG) in HTML, CSS and client-side scripting language, for design, animation, and interaction techniques.*
2. *Illustrate an interactive project design including interactive development specifications and practical solutions for a targeted audience.*
3. *Develop a project solution with specific requirements for a targeted audience applying online visual interactive techniques.*
4. *Analyze project outcomes and recommendations*

ITSFT-506-2007 Software Test Automation

Unit level (MQF): 5

Credits: 6

Unit Description

Like for other products, it is essential that software works correctly and carries out the specific tasks which were promised by the developers. In order for software to meet quality standards, it is important to thoroughly test programs using well known techniques in Computer Science. While manual testing will always have a role, the industry is moving towards automating significant parts of the software testing.

Test automation is the practice of using tools to repeatedly run tests to ensure the tested software meets the requirements. Such automation brings several advantages including the repeatability of the tests and the speed at which tests can be executed. Continuous Integration and Continuous Delivery (CI/CD) tools are essential for testing to become an integral part of the development cycle.

Test Driven Development (TDD) is an approach, where a test written before writing the code which will make sure that the source code is tested well and the resulting code is modular. The resultant code is flexible to changes and easier to extend and adapt to future requirements. The stages involved in TDD include: adding a test, running all tests and checking if the new code fails, writing code, running automated tests, re-factoring code and finally repeating the cycle as in previous steps with a new test.

The initial testing process would start by resolving syntax errors and producing a runnable program. Secondly, test data would need to be used check whether the program has any logic errors and confirm that the program meets the specification. The computer program needs to ensure the integrity of the data is maintained by means of a data verification and validation processes.

This module is geared towards enabling students to familiarise with the current methods of automated software testing, and learn about the different levels at which testing can be automated including Unit Testing, Integration Testing and System Testing.

The ideas of Alpha and Beta in acceptance testing are also covered. Alpha testing is the initial testing carried out internally to identify issues that were not found originally through previous tests. Beta testing involves the distribution of pre-release software to a select group of users so that they can test it in a realistic environment.
Modern software development processes are highly and responsive and agile, with software being delivered in much shorter cycles than the past. This makes achieving the required level of software quality more challenging and only achievable using

automated tests. Software developers need to choose the right test automation tools and integrating them in their processes, typically a CI/CD.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Compose tests using Test Driven Development methodology. LO2.*
2. *Explain the process involved in the different levels of automated testing. LO3.*
3. *Analyse the Fundamentals of Testing. LO4.*
4. *Use the automated tests in relation to developing a computer system. LO5.*
5. *Produce tests to Verify and Validate software.*

ITMMD-506-2002 Client Side Scripting

Unit level (MQF): 5

Credits: 6

Unit Description

The unit starts with a brief introduction of why developers felt the need to create frameworks and a revision of client-side scripting, whereby the learner is shown how HTML, CSS and JavaScript can be used together to build the presentation layer of a web application. This includes basic tasks covered in pure JavaScript and being able to react to user input and update the screen dynamically without the need to refresh the page. Learners are introduced to the Single-Page-Application (SPA) approach where the Server sends an HTML page and thereafter the JavaScript framework/library takes over and controls the UI. Following this, learners will be introduced to the Document Object Model (Model) which encompasses not only the structure of a document but also the behavior of a document and the objects of which it is composed. Then learner will be introduced to CSS and JavaScript frameworks/libraries, which simplify the development of a responsive single-page application. Learners will learn how to bind to DOM elements via a JavaScript framework/library and hence how to manipulate DOM objects. They will also learn how to listen for changes in the DOM and react accordingly with JavaScript functions. Learners will also be introduced to asynchronous JavaScript whereby pages load faster since the browser isn't waiting for the server to respond in the middle of a page render since requests and transfers happen in the background. Using these libraries and JavaScript, the learners are then shown how to create and consume data in a JavaScript Object Notation (JSON) format.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Apply basic requirements to build the presentation layer of a web application using HTML, CSS and JavaScript.*
2. *Develop a responsive web application using a CSS Framework.*
3. *Implement using a JavaScript Framework/Library a Web Application that fetches and consumes data.*
4. *Deploy a web application with proper navigation which can handle and validate user input data through forms.*

ITCGR-506-2003 Programming for Computer Graphics

Unit level (MQF): 5

Credits: 6

Unit Description

This unit focuses on understanding how to generate computer graphics programmatically with an emphasis on generating computer graphics for digital games. More specifically, this unit provides the learners with a theoretical and practical knowledge about Procedural Content Generation (PCG) in digital games.

PCG is the algorithmic creation of game content with limited or indirect user input [1]. In other words, PCG refers to computer software that can create digital game content on its own, or together with one or many human players or designers [2]. Content can be anything presented to the user. However, this unit focuses on utilising PCG methods to generate computer graphics such as objects and terrain.

Learners will learn fundamental aspects of computer graphics and the different types of computer graphics. This unit also introduces the learners to the computer graphics pipeline and how this pipeline works to render computer graphics. Learners will learn how to procedurally generate meshes, and how to program two and three dimensional shapes. Learners will therefore learn how to create basic primitives. Moreover, learners will learn how to add colours, and work with UVs, normal and tangents programmatically.

Through this unit, learners will also learn how to procedurally generate terrain which enables the learners to learn how to program and work with: Vornoi Tessellation, Midpoint Displacement, Perlin Noise, L-systems, Textures, Trees and Vegetation, Weather, Erosion and Water. Learners will also learn the design principles involved in producing aesthetically pleasing terrains and how to manipulate render settings to produce better looking camera results.

This unit will also provide the learners to learn how to generate random levels. In the end, learners will have a solid fundamental working knowledge of how to generate computer graphics programmatically.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Examine the importance of procedural content generation and its role within programming for computer graphics*
2. *Apply procedural content generation techniques to generate meshes and shapes*
3. *Apply procedural content generation techniques to generate terrain*
4. *Apply procedural content generation techniques to generate levels*

ITMSD-506-1604 Soft Computing for Games

Unit level (MQF): 5

Credits: 6

Unit Description

This unit will introduce students to various soft computing and artificial intelligence techniques aimed at giving them advanced tools for developing games or multimedia. The students will be introduced to some game artificial intelligence middleware where applicable and will use the different artificial intelligence techniques learnt to develop and augment games or multimedia. The game or multimedia development will be visually communicated through storyboards.

The unit will also delve into navmesh agents, which are components in unity which do the pathfinding themselves as independent agents. Furthermore, students will have the opportunity to implement and utilise readymade artificial intelligence solutions from other projects .

This is a skills based unit and will allow students to demonstrate that they have the necessary skills to be able to use a variety of tools and techniques. The unit will guide the student through a range of soft computing and artificial intelligence options, including readymade solutions which they will be able to utilise to enhance their ability to storyboard and develop games and multimedia.

Outcome 1 concentrates on building the students working knowledge of the variety of soft computing and artificial intelligence techniques and tools. The learner will familiarise themselves with these in a classroom setting as well as during laboratory time and will be able to describe and explain the benefits they have within gaming and multimedia.

Outcome 2 focuses on the learner being able to apply the knowledge they have gained through Outcome 1 and begin to map out their ideas using storyboarding techniques. They will be able to develop their ideas using informed decisions.

Outcome 3 emphasises application of the skills and knowledge that have been developed throughout Outcome 1 and 2 in the creation of an augmented game or multimedia. The learner will be able to justify the decisions they have made and say how it has impacted on the game or multimedia.

Outcome 4 will see the learner successfully implementing available readymade artificial intelligence solutions and utilising them to support and inform their own code development skills.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Demonstrate knowledge of a variety of soft computing and artificial intelligence techniques for games or multimedia.*
2. *Apply understanding of various soft computing and artificial intelligence techniques in the storyboarding of games and multimedia.*
3. *Produce an augmented game and/or create multimedia.*
4. *Implement and utilise available readymade artificial intelligence solutions.*

ITMMD-506-2003 Client Side Scripting II

Unit level (MQF): 5

Credits: 6

Unit Description

This unit is designed to introduce learners the intermediate and advanced concepts of client-side scripting. In particular emphasis will be placed on building a CRUD web application using a JavaScript Framework. It is intended for learners who already have advanced understanding of HTML, CSS, JavaScript and basic concepts of a JavaScript Framework/Library.

The unit starts with a brief introduction of what a CRUD web application is and the different backend frameworks that can be used with frontend projects. The learner is shown how the frontend communicates with the backend. HTML, CSS and JavaScript together with a CSS framework/library and a JavaScript framework/library will be used together to build the presentation layer of a single-page application. This includes basic tasks covered in pure JavaScript and being able to react to user input and update the screen dynamically without the need to refresh the page.

Learners will learn how to bind to DOM elements via a JavaScript framework and hence how to manipulate DOM objects. They will also learn how to listen for changes in the DOM and react accordingly with JavaScript functions. Learners will also be introduced to asynchronous JavaScript whereby pages load faster since the browser isn't waiting for the server to respond in the middle of a page render since requests and transfers happen in the background. Using these libraries and JavaScript, the learners will then create and consume data in a JavaScript Object Notation (JSON) format.

Learners are introduced to the concept of state management to make sharing of data across different components possible and how data is stored in memory versus storing data on a server. Authentication and authorization will then be explained from a Single-Page-Application (SPA) point of view where the server sends a token back to the client. Following this, learners will be exploring form handling, validation and sending http requests. At this point adding different kind of animations and transitions effects will be applied. Finally, learners will also learn how to deploy to production a single page application, which files to upload and where, and will also look at optimization techniques.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Apply different animations and transitions effects within the presentation layer of a web application. LO2*
2. *Develop a web application with state management in place and provides users authentication. LO3*
3. *Implement using a JavaScript framework/library a web application that allows users to create, read, update and delete data. LO4*
4. *Deploy a web application with proper navigation which can handle and validate user input data through forms.*

ITMSD-506-2002 UX Design II

Unit level (MQF): 5

Credits: 6

Unit Description

User experience/User Interface (UX/UI) design is changing as new technologies are emerging. With the evolution of Augmented Reality (AR) and Virtual Reality (VR) complexities for UX/UI designers will increase in the coming years. To achieve respective goals, both UX and UI designers need to enhance their skills set required for the day-to-day tasks.

There is a tight relationship between UX/UI designers and developers. Designers must understand the developers' job to work together on projects and create attractive and appropriate aesthetics, user interface, and clean code.

The objective of this unit is to introduce interactive design coding besides the use of prototyping applications with the aim to enhance UX/UI designers' skills set for next-generation with industry outlook in mind.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand prototyping interaction design techniques and the importance of design for the emerging technologies.*
2. *Use appropriate coding and applications for the best practices of UX design principles and usability.*
3. *Develop an artefact addressing specific requirements for a targeted audience applying design principles and visual interactive techniques.*
4. *Analyze outcomes and produce recommendations based the developed artefact.*

ITMSD-506-1606 3D Graphics

Unit level (MQF): 5

Credits: 6

Unit Description

3D animation is part of the art form which creates moving images by using 3D computer graphics formats. Often the platform for the animation is the computer itself, or it is another media such as photo or film. The animations are often referred to as 'computer-generated images' (CGI). Animators of 3D media are given responsibility for the correct portraying of behaviour and movement. This is often applied to bring creatures and characters to life, but on occasions animations are applied to other entities such as scenery, vegetation, objects and environmental matter. A number of Specialist software packages can and are used to create the animated features and the animators try to give portrayal of behaviours and moving in such a way that makes best use of the available technology.

The Unit will allow students to have the opportunity to use types of 3D animation software applications to produce a 3D animated piece of work. Students will develop an awareness of the basics of 3D geometry definition how to translate, scale, rotate and properly combine all transformations together through the basic principles of 3D model structure such skeletons and meshes for game characters .

Students will develop skills in preparing assets for game engines and be able to implement their 3D creation during their game development and drafting by using pre-visualisation work and storyboards. Preparation and workflow management skills will take place, develop and become habitual when preparing works as well as creating 3D resources for the use of game development and implementing the appropriate programming language for interaction.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Identify the basic elements in the process of creating a 3D scene;*
2. *Construct 3D models using well proven techniques;*
3. *Apply appropriate techniques and methods to refine and render 3D models;*
4. *Apply 3D transformation on the 3D models.*

ITMSD-506-1607 Game Level Design

Unit level (MQF): 5

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to create a satisfying gaming experience by developing a deeper understanding of game design and the use of social and ethical context in which video games are developed, marketed and played. Learners will learn to analyse popular games from commonly used genres, examining from both form and functionality. The learners will apply game design concepts and principles to solve problems.

The Unit is relevant to learners wishing to further develop their knowledge of games as a tool to help provide them with informative knowledge on how to apply the skills learnt in their games. On completion of the Unit learners will understand how to produce games documentation that may be more technically complex in content and analysis, as well as developing the understanding, knowledge and skills required to produce them. This Unit will provide the Learner with the ability to use any type of game design and analyse it to be able to use the data extracted and apply it to any type of game genre. The learner will also be able to learn the impact of the games and how they affect their players, which will tie into the learners understanding of different types of players.

Learners will carry out formatting and presentation features to prepare their documentation for publication or sharing with other users which will prepare them to adapt to the game industry. This will therefore require learners to be confident in carrying out more advanced game types and deeper knowledge of player psychology, while applying different types of fundamental features in their game designs.

Finally learners should have the underpinning knowledge and understanding to check completed games and understand how to evaluate, understand the game mechanics behind it, solve the final outcome and also explain the core loop of the game

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Recognize the different types of games and recognize a Game Designer's role in the gaming industry*
2. *Analyse the importance of understanding the target audience and the different designs applied to each*
3. *Manipulate and plan game play using core mechanics present in games to adapt to targeted players by understanding how to achieve the "fun" element in a game*
4. *Communicate and illustrate a game idea in full depth to be able to generate a game design document*

ITRSH-506-2101 Research Design 1

Unit level (MQF): 5

Credits: 6

Unit Description

The purpose of this unit is to give the learner the necessary skills to start researching in an area of personal interest yet also of relevance to the area of studies and to the benefit of the local/regional community. This module differentiates itself from the rest in the manner that the criteria focus on how research is to be performed, whilst it is the learner who will determine the subject area and tools to be utilized to build the prototype necessary.

Therefore, this unit requires the learner to identity a theme such as the study of beach deterioration in local beaches, then through guidance, determine the sources of data (Satellite imagery) and tools needed to conduct such research. Every other learner will focus on areas that are either of personal interest, subject areas communicated by other researchers (potential future mentors), topics of funded projects, or recommendations by various parties such as key external partners. This unit will give a structure to how research is conducted in a scientific manner, following industry standards and common practice.

The fundamental objective of this unit is to introduce the learner to hypothesis testing. Therefore, after a theme is selected, a hypothesis needs to be formulated together with research questions. A research pipeline highlighting the methods to be used in order to address the research questions follows. A preliminary literature review will be undertaken by the researcher in order to familiarize themselves with the current state of the art and to justify key decisions made in their individual research.

The learner is expected to work on a proof-of-concept, prototype or working solution in order to gather the necessary data from research experiments so to be able to argue and answer the set research questions. Upon analysis and reflection, the learner should be in a position to understand what a scientific research process is, what is expected of him/her from a dissertation and how to undertake such a research endeavor at a larger scale as expected in the final dissertation.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Formulate a research hypothesis and research methodology.*
2. *Evaluate, after research, the current state of the art.*
3. *Evaluate project outcomes critically.*
4. *Report project outcomes and recommendations within a structured framework.*

ITIMG-606-1601 Image Processing and Computer Vision

Unit level (MQF): 6

Credits: 6

Unit Description

This unit is designed to give the students a basic yet solid understanding of Image Processing techniques, as well as the application of such techniques in the rapidly developing area of Computer Vision. The latter has been known to be a difficult problem, due to the complexities involved in the human vision system.

Nonetheless, it is finding its way through many sectors such as safety and security, health, and entertainment. Moreover, methods of acquiring such data (digital images and videos) have become even more available and affordable.

The unit first introduces the theory behind Image Processing and Computer Vision, and moves on to the application of fundamental operations in Image Processing, such as quantisation and removal of noise. These fundamental operations are then used in more complex problems, such as finding edges, corners and other interest points or shapes in the image.

Finally, some typical problems of Computer Vision will be examined. These include object detection, recognition and tracking. These problems will serve as challenges as well as motivation to students, as they highlight the relevance and practicality of the material covered. As much as possible the unit will adopt a learn-by-doing approach, in that for most of the topics the underlying theory will be explained followed by a practical example or implementation. This will ensure comprehension and engagement of the student.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Understand the basic concepts and relevance of Image Processing and Computer Vision.*
2. *Apply fundamental techniques in Image Processing.*
3. *Apply techniques to identify shapes and features in images.*
4. *Demonstrate Object Detection, Recognition and Tracking Techniques.*

ITMSD-606-1608 Mobile Game Development

Unit level (MQF): 6

Credits: 6

Unit Description

This unit assumes students are already familiar with game design and development concepts completed in level 5 Game Level Design module. It is both a theoretical and a skills based unit and is designed to allow the students to understand and apply the necessary skills to create games for mobile devices.

This unit presents the theory and practice of mobile game development for mobile devices using the Unity game engine. This is a practical unit and the focus is to produce high quality production games.

Initially students will learn how to setup a mobile developer environment for Unity and how to use 'Unity Remote' app for testing. Following this setup, the unit exposes learners to mobile scripting and covers functionalities found in the Input and Handheld classes such as multi-touch, accelerometer, device vibration, location services and others.

Usability for gaming is an important issue and therefore students will learn how to build responsive GUI and optimised 2D textures in relation to game usability.
Social app development serves an important role for mobile games. Students will learn how to develop social media authentication and use 'share and send' dialogs. For example, The 'Facebook SDK for Unity' could be used to integrate mobile games with Facebook. Students will also learn how to develop web services integrated with Unity to store persistent player data.

Finally, students will learn how to manipulate the mobile player settings, create app icons, build the game for mobile and publish their own game on the app store.

Learning Outcomes

On completion of this unit the learner will be able to:

1. Plan and design usability for mobile games
2. Plan and develop gameplay for a mobile game
3. Manipulate a mobile game application based on device sensors
4. Plan and integrate social networking in a mobile game
5. Show the ability to prepare a mobile game for an online app store

ITMSD-606-1609 Connected Gaming

Unit level (MQF): 6

Credits: 6

Unit Description

In this unit, students will be applying their knowledge of programming to develop complex computer games which allow multiple users online to interact and communicate with each other in a structured and interesting way. Connected games allow for players connecting to each other over the internet or through social media. This unit will guide learners through the process of creating their own connected game, and building software which allows for decentralized networking to share information both for the multiplayer gaming aspect, as well as for data mining requirements. Some examples of connected games include games built to be published on online social platforms, as well as massively multiplayer online games which allow for players to interact on a network game server. Students will need to cater for the issues that can affect gameplay with respect to synchronization as well as communications between players in a lag-free way.

Learning Outcomes

On completion of this unit the learner will be able to:

1. Understand and implement a variety of infrastructures for connected games
2. Build a connected game infrastructure
3. Evaluate a connected game infrastructure.
4. Implement a connected game with a working data mining API

ITMSD-606-1610 Sound Engineering

Unit level (MQF): 6

Credits: 6

Unit Description

This unit assumes that the students are already familiar with both sound design and game development.

In this course the students will learn concepts that are key in assisting a sound engineer during a sound project. Learners will embrace the concept of dynamic music and apply such techniques in their sound projects. This may involve the incorporation of several (smaller) sound projects that are blended together with sound effects to define the goals of a game. Such goals will be established by the use of a Digital Application Workstation (DAW), whereby it is assumed that learners already have prior knowledge about the basic aspects. Although learners would already have previous experience with a Digital Application Workstation(DAW), the unit still provides flexibility so that it is not linked to a specific DAW. For example, one may use Ableton Live or Prosonus Studio One in the creation and modification of sound projects.

The unit will start with a revision of Musical Instrument Digital Interface (MIDI)/Audio channels and effects in a DAW to ensure that all learns are on track with the required knowledge for this course.
A study of the frequency spectrum will follow where a number of frequency ranges are identified. Learners will understand the importance of each individual frequency range and its application in relation to a particular sound. Comprehension of gain amplification and reduction will enable learners to increase or decrease the amplitude of the particular waveform in that particular frequency range. Such knowledge can be applied with the use of Equalisation. Learners can therefore acquire know-how by applying Equalisation on sound.

Following topics include dynamic range compression and expansion and the use of plug-ins in a DAW. Compressors and Expanders in a DAW help empower the richness of an overall sound mix by defining certain sounds in the mix. The use of plug-ins in a DAW such as Virtual Studio Technologies (VSTs) enables learners to obtain a more realistic sound on a particular instrument.

Learner will apply the above tools via MIDI automation to achieve sound dynamics. The application of basic sound dynamics can be achieved by the use of MIDI automation.

Finally, the learner needs to identify and script the different stages in a game. An appropriate sound mini-project needs to adhere with the relevant game stage. For example, in a role-playing game if the player discovered a shortcut, higher-tempo matching music will reflect. Thus, an insight into interactive composition will allows learners to comprehend the various sound elements involved in dynamic music.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Demonstrate an understanding of audio and frequency response making use of equalisation in order to obtain a quality sounding overall mix.*
2. *Produce and configure audio, MIDI and auxiliary channels.*
3. *Implement sound improvements with an improved dynamic range that result in a superior audio quality.*
4. *Design and apply proper sound dynamics in a game.*

ITSFT-606-1620 Programming for the Cloud

Unit level (MQF): 6

Credits: 6

Unit Description

This subject will add on to the concept of cloud computing. The unit will introduce the motivating factors, benefits, challenges and the service models i.e., software-as-a-service, platform-as-a-service and infrastructure-as-a-service. Moreover, the unit will provide the learner hands-on experience with the commonly found tools within the cloud infrastructure industry such as storage technologies, security measures, highly elastic scalability in delivery of enterprise applications and software as a service (SaaS), caching techniques, and different hosting options.

Practical sessions will be the basis for this unit where a number of technologies will be explored, compared, analysed and then selected to be used within a much larger project to make use of the discussed advantages they will bring about in today's applications.

Moreover, the students taking this unit will be provided with a cloud account were they will undertake the task to configure the necessary settings to make use such mentioned technologies. In the end their work should be deployed on this cloud account.

Learning Outcomes

On completion of this unit the learner will be able to:

1. Describe the main concepts and benefits behind Cloud Computing.
2. Use Cloud Storage solutions to store structured and large data.
3. Use other services provided by the Cloud services provider.
4. Use Cloud services available to host and consume web applications, APIs or other services.

ITRSH-606-2102 Research Design 2

Unit level (MQF): 6

Credits: 6

Unit Description

The main focus of Research Design II unit is to help learners gain a more in-depth understanding of research design in ICT, thereby, enabling them to evaluate the different ways in which research may be conducted and to choose the approaches that most suit their goals based on already published research and academic theories.

Amongst the most important topics to be covered are the analysis of a hypothesis to better define the scope of a research and to clarify the aim and objectives of a research in view of an applied problem in a specific domain. Knowledge of different research approaches and testing strategies is also paramount; this will lead to the selection and justification of the most appropriate approaches/strategies for the chosen research based on sound academic theories and past research published through conference proceedings and journal articles. Such knowledge will provide the learners with the necessary know-how to present data gathered from results in a manner that is clear and effective for inferring patterns and developing sound and unbiased conclusions with regards to their hypothesis. Critical reflection upon decisions taken throughout the research journey, especially with regards to the chosen research approach, methodology and testing strategies is also an important aspect of this unit for evaluating one's own research in the light of future improvements
.
The delivery of the unit should also capitalize on the opportunity to foster a collaborative research environment between learners where they can discuss their research ideas with each other, as peers, and provide constructive criticism/suggestions on how a research idea/approach can be improved. Sharing of knowledge, ideas, opinions and academic resources for carrying out such research is to be encouraged and viewed as an integral part of healthy academic discussion and knowledge sharing.

Proper presentation of the learner's own work carried out during research is also an important part of the unit; tools that support the management of references and the formatting of scientific documents to adhere to well known, pre-defined formats suitable for submission of papers for conference proceedings or articles in scientific journals will be explored.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Propose the most suitable methodology for a chosen research.*
2. *Analyse testing strategies used for validating a hypothesis.*
3. *Analyse collected data to arrive to findings and conclusions for a chosen research.*
4. *Produce scientific documents using appropriate writing styles, document formats and tools.*

CDWBL-506-1901 Work Based Learning

Unit level (MQF): 6

Credits: 6

Unit Description

The aim of this unit is to provide learners reading a degree at MCAST with the opportunity for work-based learning (WBL) with a registered MCAST partner. WBL provides learners with real-life work experiences where they can apply academic and technical skills and develop their employability. Work-based learning deliberately merges theory with practice and acknowledges the intersection of explicit and tacit forms of knowing.

Learners will be doing this unit in the summer of their first year and they will have a follow up unit in the summer of their second year so as to provide them with experience as their knowledge of the subject increases. This will enable them to develop holistically in the area they have chosen enabling them to enter the world of work fully prepared and with experience to show in the sector they have chosen. This unit will assist learners in preparing themselves to take responsibility for their own learning in the workplace and to develop the necessary confidence and attitudes to carry out tasks responsibly in real life work situations. Learners are able to gain practical, hands on experience in their chosen field of study whilst producing a work based learning portfolio and journal demonstrating their achievements and learning experiences.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Evaluate the relationship between theory, college practice and their application and development in a real world work-based activity.*
2. *Evaluate critically own performance and learning experiences at the place of work through a reflective journal.*
3. *Set SMART objectives for own improvement following the reflective exercise.*
4. *Develop an action plan for personal and professional development to reach set objectives.*

ITSFT-506-1606 Software Engineering

Unit level (MQF): 5

Credits: 6

Unit Description

This unit has been designed to introduce learners to the main concepts behind the science of software engineering. Throughout the course of their studies, students will acquire the skills to understand and support the complete life cycle of a software system – from inception, requirements elicitation and design, through the various stages until release and maintenance. Students will gain an understanding of different software development techniques and will learn how to critically select which technique is best suited to the development of different systems.

The unit places focus on some of the more recent software development processes, making particular emphasis on the Agile philosophy of software development. Students will understand the agile process and its constituent components, its applicability to modern software development and the various actors involved in the process together with their roles and responsibilities. Another core component of this module will be that of introducing students to the Unified Modelling Language, UML, as a tool to facilitate and speed up the software development process. The various constructs of this modelling language will be covered, together with explanations of how they can be utilised to specify and document the software and business processes.

This unit will also present students with a range of advanced software engineering concepts and approaches which will give them the skills required to be able to support new and evolving developments. Students will be introduced to a number of different software architectures and design approaches and they will be encouraged to analyse which setups are most adequate as solutions for diverse scenarios.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Plan and tackle a small software design project as part of a team using an Agile approach.*
2. *Perform a requirements acquisition exercise in order to identify the main functional and non-functional requirements of a proposed software system.*

3. *Identify and construct the most applicable UML modelling diagrams to use in particular phases in a software system's development process to achieve a specified goal.*
4. *Design a solution to a problem by proposing the most suitable architecture and utilising known design patterns.*

CDWBL-506-1902 Work Based Learning II

Unit level (MQF): 5

Credits: 6

Unit Description

Work-based learning is an instructional method that provides a direct link between work experience and college based learning. A key element in such experiences, is the development of critical thinking. The ability to think critically is fundamental and is sought after by employers in various sectors. Critical thinkers will approach and solve problems methodically rather than by intuition or instinct. Critical thinking is important because it helps individuals and teams more effectively diagnose problems and identify possible solutions that aren't entirely obvious at first. WBL exposes learners to real world environments in order to promote and develop critical thinking. Apprentices, particularly at degree level, are also expected to take initiative and propose solutions to different problems that are faced day to day in various workplace settings. Through their apprenticeship experience, learners are expected to develop strong problem solving skills and use particular incidents as learning opportunities

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Examine the significance of critical thinking in degree apprenticeships.*
2. *Discuss the role of critical reflection within an experiential learning cycle.*
3. *Apply the IDEALS approach to effective thinking and problem solving.*
4. *Evaluate critical incidents and compile a critical incident journal.*

ITBCK-606-2101 Blockchain

Unit level (MQF): 6

Credits: 6

Unit Description

This unit has been designed to teach learners the core concepts and advanced programming techniques with regards to public blockchains. Learners will have the opportunity to understand how a public blockchain works and how this technology can be applied for different use cases. It is a skills-based unit and is designed to allow the learners to understand and apply the necessary skills to create a decentralised application.

Initially learners will learn the fundamentals of a public blockchain. They will experiment with different wallet types and learn how to create wallets via code. Following this setup, the unit exposes the learner to the core principles behind a public blockchain. This includes node hosting, mining, transaction fees, having events, difficulty adjustment, memory pools, forking and different types of consensus algorithms.

Following this, learners will be exposed to smart contracts. Learners will learn how to create Turing-complete programs (contracts) by making use of programming concepts such as conditionals, functions, mapping, arrays, and events. Later, they will learn how to deploy contracts on a public blockchain. Then they will be required to design and develop a decentralised application that makes use of smart contracts.

Learners will learn the design patters recommended for smart contract programming. This includes behavioural patterns, security patterns, upgradeability patterns and economic patterns. Learners are also required to experiment with smart contract templates such as fungible and non-fungible tokens. Learners will be also required to make use of a peer-to-peer hypermedia protocol. This will help them understand how to build a robust decentralised application.

Finally, the learners are required to understand that once a smart contract is deployed, it cannot be modified or removed. Therefore, they are required to learn how to conduct unit testing and deploy an error free decentralised application.

Once leaners complete this unit, they will have a clear understanding how blockchain technology works and how to build decentralised applications.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Outline the core components and use cases for public blockchains.*
2. *Build a functional decentralised application.*
3. *Develop secure and robust smart contracts.*
4. *Examine a decentralised application for release.*

ITDVP-606-2101 Devops

Unit level (MQF): 6

Credits: 6

Unit Description

DevOps is the practice of combining the software development process with IT operations. Whereas in the past, people working in these two sectors were considered disjoint, with the emergence of DevOps these are now working together with the ultimate goal of delivering good quality software, through Agile methodologies.

This unit is intended for learners aspiring to work in IT operations. It exposes them to the principles of DevOps and how to work along with software developers to take a system to production.

This unit specification is technology independent and the lecturer is to use own professional judgement to choose the most appropriate solutions.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Implement a version control system within a DevOps environment.*
2. *Create production ready containers.*
3. *Use a container orchestration system to manage containers.*
4. *Implement a continuous integration / continuous deployment pipeline.*

ITMSD-606-2101 3D Visual Effects

Unit level (MQF): 6

Credits: 6

Unit Description

This unit covers the process of creating and manipulating 3D animations using visual effects techniques. This includes the motion-based compositing of real and computer-generated 3D content and also the generation of motion graphics.

This module is designed to examine the modelling and development of 3D assets for animation and integration within VFX productions by introducing complex modelling, rigging and animation techniques for the creation of 3D content. Students will examine the design and development of 3D objects and their associated assets, and their animation for visual effects. Other essential topics will include lighting, sculpting, rigging, particle and physics simulation, motion graphics, camera work, rendering, and sound for animation and visual effects.

Creation of VFX in 3D environment for gaming material and 3D simulations is an essential part of any audio-visual production. The process of editing 3D visual effects involves making creative decisions about source material. It provides an opportunity for the creativity of the design stage to be continued through to the finished product. Through study of the development and principles of editing VFX effects, learners will develop an insight into the language of how to create VFX and the technical conventions used by editors to communicate with audiences.

Skills will be practiced through 3D VFX material and software applications. In this module the basics of 3D workflow will be investigated and implemented by using 3D software applications such as AutoDesk Maya, Blender or AutoDesk 3ds Max. Students will be introduced to a number of industry practices and concepts in Visual Effects (VFX). Learners will also develop an understanding of how their work can affect the final outcome of a production.

Learners will be able to experiment with appropriate applications and use their skills in the production of their VFX products. VFX should be learnt as well as the importance that learners develop knowledge of VFX, not just the technical process but the aesthetics too. Learners will then be able to have a clear knowledge and understanding shown through practical skills and by the end of the unit be able to implement an entire project, starting from design stage and ending with the final product.

There are several employment opportunities in the industry for skilled VFX animators. This unit can help the student consider several employment areas, mainly in the gaming industry and film industry, such as VFX designer, VFX animator, multimedia programmer, 3D modeller or 3D animator.

Learning Outcomes

On completion of this unit the learner will be able to:

1. *Examine and discuss the evolution of digital compositing of 3D visual effects.*
2. *Analyse critically and discuss the implications of emerging technologies in the 3D visual effects design process.*
3. *Design and develop a range of creative 3D visual effects solutions to design problems.*
4. *Interpret the influence of 3D visual effects in the creation of innovative digital media.*