



MCAST

Malta College of Arts, Science & Technology

MQF Level 4

Advanced Diploma in IT (Multimedia Software Development)

IT4-03-19

Course Specification

Course Description

This course is the first step towards becoming a Multimedia software developer. It will provide the learners with the core software development skills along with the necessary knowledge for multimedia artefact development, manipulation and integration. The first year of this course will be common for all advanced diploma students. During the second year, students will focus on Multimedia development oriented subjects such as mobile application and game development. This is a technical course for students with an artistic inclination.

Programme Learning Outcomes

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

1. *Identify the appropriate software infrastructure for a given requirement.*
2. *Understand the core design and mathematical concepts needed for multimedia software applications.*
3. *Design multimedia content prepared for integration with software systems.*
4. *Implement media rich software application.*

Entry Requirements

MCAST Diploma in IT or

4 SEC/O-Level/SSC&P (Level 3) passes

Compulsory: Mathematics and one subject from Computer Studies, Physics,

Preferred: English Language and one subject from Art and Graphical Communication

Current Approved Programme Structure

Unit Title	ECVET
Database Concepts and Design	6
Computer Systems	6
Fundamentals of Scripting	6
Operating Systems	6
Networking Concepts	6
Website Design	6
Embedded Systems	6
Introduction to Multimedia Design	6
Programming Concepts	6
Introduction to Mobile Applications Development	6
Programming for Computer Games	6
Interactive Animation	6
Digital Visual Effects	6
Relational Databases	6
Graphic Design	6
Project	6
English	6
Mathematics	6
Entrepreneurship	6
Critical Thinking	6
Total ECVET	120

Database Concepts & Design

Unit level (MQF): 4

Credits: 6

Unit Description

Today, in a challenging and fast paced environment, businesses and organizations need to be able to make quick responses in order to remain competitive and meet information demands. Databases are central in supporting core business processes and information systems and therefore need to be as efficient and accurate as possible.

This unit is relevant to learners wishing to develop a sound understanding of the features and functions of databases, and skills in designing and building an efficient database to meet specified requirements and provide accurate information. The unit will introduce the background database concepts and key design methods integral to creating a working database with validity and integrity. No previous competence with a database is assumed.

Learners should develop the underpinning knowledge and understanding through the database design and build process to enable efficiency and accuracy in terms of both structure and data. Learners will design and construct relationships through the process of normalisation, identifying entities and attributes, applying appropriate data types and other properties for implementation within a database application. Database structures will be enhanced by the learner using a variety of software and SQL features that allow for the creation and alteration of tables.

On completion of the unit learners will be familiar with essential database theory and design methods. Learners will be able to implement these within database application software and use a range of SQL techniques to manage the database structure.

Learning Outcomes

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

1. *Explain the features of a database and a database management system (DBMS).*
2. *Explain and use database design methods to create a relational database structure.*
3. *Implement a relational database design with the use of structured query language.*

Computer Systems

Unit level (MQF): 4

Credits: 6

Unit Description

The purpose of this unit is twofold: to understand the main components of a computer system including the principal aspects and functions of both the hardware and the software components. Secondly it addresses the general skills to recommend the appropriate systems for business purposes which includes the setup, testing and the maintenance of a system.

The unit will start off describing different hardware components and their application of use. It will then go into the different flares of operating systems and illustrate the use of some. Software utilities will be mentioned and a few examples will be given.

Computer Security is an integral part in computer systems and some recommendations will be pointed out.

Learners will be assessed on all of the above and they will also understand the true meaning of computer systems. This involves having the student appreciate the skill set required to be knowledgeable in computer systems and relate to several technical terminologies.

The specific objective of this unit is that the learner undertakes a logical / correct sequence of what computer systems are and be able to recommend different setups to a business environment.

Learning Outcomes

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

1. *Explain the main components of a computer system.*
2. *Evaluate the scope of operating systems and the different uses.*
3. *Demonstrate different types of software utilities.*
4. *Apply knowledge to recommend, setup and configure systems.*

Fundamentals of Scripting

Unit Level (MQF): 4

Credits : 6

Unit Description

This unit has been designed to teach learners the fundamentals of scripting in the context of procedural paradigm irrespective of framework or delivery platform. The development of procedural code is still at the core of many embedded systems even when it comes to event driven systems and object oriented platforms.

This unit enables learners to become familiar with the underpinning concepts of scripting languages and assumes no prior knowledge of scripting. An introduction is given to the concepts of programming, particularly as contrasted with scripting. A scripting language is introduced and the basic sequence such as variables, conversions, expressions, statements and functions will be covered.

Following these basics, conditionals and iterations will be introduced to cover the basic structure of a procedural programming. For data storage, strings and files will be covered with particular focus on file manipulation - a common task in automation scripts.

Learners will use a structured approach to the design and development of scripting applications, ensuring the solution is well documented and thoroughly tested against the original user requirement.

This unit will set the stepping stone for the Embedded System unit which will guide learners through the basis of common system architectures, Operating Systems (OS) management, I/O interfaces and control.

Learning Outcomes

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

1. *Understand the features of a scripting language in context of procedural programming paradigm.*
2. *Use the tools and techniques of a scripting language to build console applications.*
3. *Design and develop console applications using a scripting language for a specific use.*

4. *Demonstrate the use of console applications using a scripting language for a specific use.*

Operating Systems

Unit level (MQF): 4

Credits: 6

Unit Description

The purpose of this unit is to discuss the main structures, functions and operations of the operating system. It will touch various topics and delves into operating system structures, processes and threads, what deadlocks are and how they can be prevented, input / output and the different types of memory. The unit will close off with a basic understanding of virtual machines and why virtualization is important in today's dynamic IT progress.

The learner will also undergo the features and characteristics of different operating systems and learn why some are better than others for certain projects.

Learners will be assessed on all of the above and they will also understand the true meaning of operating systems. This involves having the student appreciate the skillset required to be knowledgeable in operating systems and relate to several technical terminologies.

The specific objective of this unit, is that the learner undertakes a logical / correct sequence of what operating systems are and be able to recommend different setups to a business environment.

Learning Outcomes

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

1. *Explain the core services of the operating system.*
2. *Evaluate how to protect and secure an operating system.*
3. *Demonstrate the ability to understand key concepts of virtual machines.*
4. *Apply knowledge to recommend, setup and configure operating systems.*

Networking Concepts

Unit level (MQF): 4

Credits: 6

Unit Description

This is a theoretical-based unit during which learners will be exposed to basic concepts on data networking as a foundation to other network-related units.

Learners will appreciate the reasons behind the growth of networks, with a quick look at the origin of PC networks and the Internet, and some of the benefits of networks. The role of network standards is also discussed with an overview of the major standards bodies. The Open

Systems Interconnection Reference model (the OSI model) is then discussed in detail. Learners will be exposed to the concept of protocol layering in order to better understand the functions of the OSI stack. The differences between connection-oriented and connectionless services are explained as part of the discussion of the different levels of network quality-of-service required for different Internet applications (ex. SMTP in Email, VoIP, HTTP etc.)

This unit will also cover TCP/IP fundamentals and the two basic protocols from which it takes its name, Transmission Control Protocol (TCP) and Internet Protocol (IP). Learners will understand the TCP, IP, UDP datagrams and TCP/IP addressing. Address assignment is also covered considering that this is a critical part of network design and deployment. Learners will understand how IP addresses are structured, how name resolution and human-recognizable hostnames are resolved to numeric addresses using DNS. The evolution of IPv4 to IPv6 to cater for more flexibility in IP addressing schemes will also be covered.

The unit will also cover practical aspects of networking concepts. Learners will be able to configure TCP/IP properties and make use of TCP/IP utilities for network troubleshooting. Learners will also make use of applications such as wire-shark in order to inspect data packets.

Throughout the unit, learners will be provided with hands-on experience on selected aspects, and discussions will be facilitated, prompting the learners to brainstorm ideas based on the learning outcomes. On completion of the unit, learners would be able to apply theory into practical applications and have a solid foundation for subsequent units related to data networking.

Learning Outcomes

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

1. *Explain the Use of Networks, Network Types and Architectures.*
2. *Explain the Role of Network Protocols and Models.*
3. *Familiarise with the Transmission Control Protocol / Internet Protocol (TCP/IP).*
4. *Configure and trouble-shoot TCP/IP.*

Website Design

Unit level (MQF): 4

Credits: 6

Unit Description

Effective website design is central to successful website production. Designers need to present an appropriate image to consumers and maximize opportunities to capture and retain interest. Sites need to be accessible to all and attention also needs to be given to usability issues such as navigation to enable users to access all aspects of a site with ease. Web users will quickly navigate away from poorly designed sites.

This unit follows the development of a website from initial requirements through design, build, test and review.

Learners will develop skills in using design techniques, together with hypertext markup language (HTML) and cascading style sheets (CSS) and build an interactive website using JavaScript. Learners will prepare the site for publication on the internet. This will require learners to be confident in carrying out more advanced techniques and to have the underpinning knowledge and understanding to test functionality, ensuring the site is fully operational in different browser environments and is compliant with copyright and accessibility guidelines

The unit is relevant to learners wishing to learn and develop skills which can be used to provide website solutions in a variety of contexts.

Learning Outcomes

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

1. *Prepare a website with the latest mark-up language.*
2. *Design a website using the latest styling technology.*
3. *Create interactivity in the website using JavaScript and a JavaScript Framework.*
4. *Upload, test and review created website.*

Embedded Systems

Unit level (MQF): 4

Credits: 6

Unit Description

This unit is a continuation of the unit Fundamentals of Scripting. This unit has been designed to teach learners the knowledge, skills and competence gained from the ‘Fundamentals of Scripting’ unit and put it into practice by implementing the constructs in an embedded system. This is a skills based unit and will allow learners to demonstrate they have the necessary skills to be able to understand and work with an embedded system.

The unit will guide learners through the basics of common system architectures, Operating Systems (OS) management, I/O interfaces and control. Learners will use the scripting language concepts learned in the ‘Fundamentals of Scripting’ unit and as a consequence should be able to operate effectively at more than a basic level of competence before commencing this unit.

An introduction is given to the embedded system covering its major hardware components, installation of the Operating System (OS) and basic configurations.

Following these basics, an introduction to scripting commands such as but not limited to: accessing files, processes and permissions will be covered with a particular focus on administration of the Operating System (OS) with command line.

Scripting language specific features are also revisited from the unit ‘Fundamentals of Scripting’, including the basic constructs, functions and modules. A number of practical tasks can be associated with this module, including programming digital input / output, blinking LED, face detection and scheduling commands with cron.

During this unit, learners will be able to create small projects such as a cron lamp timer, simple soundboard and photo booth.

Learning Outcomes

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

1. *Illustrate and develop the fundamental components of an embedded system.*
2. *Produce and describe a simple embedded system proposal for a specific use.*
3. *Prepare and configure hardware and software to manage an embedded system.*
4. *Manipulate and develop a simple embedded system solution for a specific use.*

Introduction to Multimedia Design

Unit level (MQF): 4

Credits: 6

Unit Description

This unit is designed to introduce the learner to the concepts and principles applied to the design and development of simple yet interactive multimedia applications. The unit will appeal to those with an interest in animation, computing, sound or graphic design. Learners will develop a methodology of working which will take them through the stages of development from analysis and planning through to design and finally the implementation and initial testing of a multimedia product to an advanced prototype state. Learners are prepared for this by providing them with the knowledge needed to carry out this type of development. In addition, they will gain an understanding of current terminology and the wide and varied applications of multimedia.

This is a valuable unit for learners since multimedia is used everywhere from educational applications and product advertising, to games and entertainment. Sound, animation, video and graphical art are expected to be components in most applications, therefore it is important to know how and when to apply these components to enhance the user experience. The learner will be introduced to user-orientated design and prototyping and also to Graphical User Interface (GUI) features and design conventions followed to encourage intuitive interaction.

Following planning and design, the learner will go on to develop a small application; they will use storyboards and mood boards to assist the planning and will learn to integrate multimedia components into the final product. The final product will be developed to an advanced prototype standard.

On completion of the Unit learners will understand the processes involved in the design and development of a small interactive multimedia application. They will be able to develop component parts such as audio, animation and graphics. They will learn about interactivity and user-orientated design, and will apply their learning to develop a small and potentially interactive prototype application.

Learning Outcomes

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

1. *Plan the multimedia components for a small interactive application.*
2. *Use appropriate tools and techniques to develop the design of the application.*
3. *Design the application using a user-orientated approach.*
4. *Build an advanced prototype multimedia application in accordance with the design.*

Programming Concept

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will provide students with a theoretical and practical knowledge of programming concepts, and how easy it can be to transition from developing a program from one programming language to another, with the main difference being the syntax and the tools used.

Through this unit, students will understand what an IDE is, and how to use it. Students will also be able to define different types of variables, such as int, string, double and so on, flow constructs, such as if or switch statements, different types of loops, such as do, while and for loop and give examples of how they can use given a specific business problem.

Through this unit, students will be exposed to practical steps in order to develop a simple windows based software, by going through the various controls available in the toolbox, understand gradually how to structure a code through the various examples to be provided, work with files, and some basic exception handling and debugging the application.

Finally, students will also be able to draw all these concepts together to write a piece of software with a GUI.

Learning Outcomes

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

1. *Demonstrate knowledge of the basic programming language concepts.*
2. *Explain what is and how to use an Integrated Development Environment (IDE).*
3. *Develop a simple windows application.*
4. *Explain a basic concept of exception handling and debug a simple program.*

Introduction to Mobile Applications Development

Unit level (MQF): 4

Credits: 6

Unit Description

Mobile applications design and production is a complex and challenging skill set. Developers require the ability to select suitable application technology and demonstrate an understanding of the benefits, cost, context, user restrictions, target device and the industry structure when developing web based applications for hand held devices. This unit will give the learner an introduction to the theory and development of web based mobile applications.

This is both a theory and practical based unit and will allow learners to demonstrate they have the necessary knowledge and understanding of mobile applications (web based and target device based) development to be able to identify the features affecting the production of applications. Learners will be given an introduction to the understanding of target device, industry restraints and conditions to gain an understanding of user experience and production requirements in the development of web based mobile device applications.

This unit is relevant to learners wishing to further develop their knowledge of application design and development for mobile handheld devices such as tablets, smart phones and laptops.

This unit is aimed at; interface designers, graphic designers, visual designers, programmers, interactive designers and information architects.

Learners will carry out introductory evaluations of the effectiveness of mobile applications on a range of target devices and will evaluate their affecting factors, usability and the user experience.

Finally, learners should have the principal knowledge and understanding of development and should feel confident to extend their experience in the design and production for the mobile user experience.

Learning Outcomes

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

1. *Describe the current technology, features and uses of web based applications on mobile devices.*

2. *Design a web based application for a mobile device.*
3. *Produce a Web Based Application for a mobile device.*

Programming for Computer Games

Unit level (MQF): 4

Credits: 6

Unit Description

This is a skills based unit, and will allow learners to demonstrate that they have the necessary skills to be able to produce computer games in a programming language. Learners will develop an understanding of programming principles as applied to computer game development.

Learners will first demonstrate their knowledge of game programming by selecting an appropriate game engine and programming language for implementation of a particular game design, and justify their choices with regard to factors such as platform compatibility, available features, and so on. At this pre-production stage of the game development process, the learner will also consider the state-driven nature of the game being developed, and design a state machine for implementation.

The learner should understand factors such as as the file format, compression, and resolution of the various types of assets used as content in games, such as graphics, (e.g. tiles, sprites and/or sprite sheets, backgrounds, or user interface elements) audio, (e.g. sound effects, ambient sounds, voice, or music) 3d models, fonts, and so on. The learner should also, on completion of this unit, be able to prepare assets which are suitable for the production of a game design, including at least 2d graphics, and sounds.

This unit, however, primarily provides the learner with the opportunity to learn and apply programming skills to a game development project. At this level, a simple 2d game with sound should be suitable. The learner should take into account the capabilities of the target devices, such as resolution, input devices available, and screen orientation / shape.

Finally, learners will be able to complete a post-production phase by deploying, publishing, and sharing their completed game on suitable distribution media for their target platforms.

Learning Outcomes

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

1. *Select a game engine and programming language for a given task.*
2. *Prepare assets appropriately for the development of a given task.*
3. *Build a simple computer game using 2D graphics, sound, and input devices.*

4. *Deploy, publish and share a simple computer game.*

Interactive Animation

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will deal with a developing field of interactive animation and will look at how traditional methods of animation techniques have evolved to encompass new interactive technological developments. Learners will be introduced to general principles of current interactive animation technology in order to understand of how this subject has evolved and developed through technological evolution. It would be advisable that learners have a basic knowledge of animation concepts and an understanding of how animation can differ within interactive media in a variety of context.

The unit is relevant to learners wishing to further develop their knowledge of current interactive animation in a variety of various interactive scenarios. On completion of the Unit learners will understand the principles used in interactive animation media and how these form a basis for developing ideas and work within the interactive industry. This Unit will provide the Learner with the ability to use a software application in order to create interesting and practical solutions to a wide variety of projects. Other influences such as the use of colour theory, design and typography will also allow a better understanding of how these can be developed in conjunction with the final interactive animation design. The learner will also be able to use synthesis to cross between graphic applications and multiple scenarios in order to integrate their skills and knowledge for better integration into the industry.

Finally, learners should have underpinning knowledge and understanding of interactive media to have a clear knowledge and understanding on each area of layout design and how they will apply this to specific project briefs.

Learning Outcomes

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

1. *Explain the main principles of interactive animation.*
2. *Explain interaction styles in relation to interactive animation.*
3. *Plan a solution for use in a given interactive project.*
4. *Develop a solution for use in a given interactive project.*

Digital Visual Effects

Unit level (MQF): 4

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate that they have the necessary skills to be able to use digital devices and applications to edit pictures and videos for visual effects as well as to create 3D Visual Effects for various purposes. Learners will use a camera and video camera and appropriate applications at a reasonable level and have an understanding of using visual applications to edit images, video, create 3D Visual Effects importing and exporting footages for specific production. Learners must be able to operate effectively at more than a basic level of competence before commencing this Unit. The Unit is relevant to learners wishing to further develop their knowledge of visual effects using applications and digital devices as a tool to help develop their understanding of the subject in all its different areas.

On completion of the Unit, learners will learn about the different techniques and uses of visual effects, from colour manipulation and effects to create explosions, lightsabers, particles and composite them with live action footage and develop skills in visual effects tools and create visual effects sequence for use in digital media products.

Learners will carry out a range of tasks that will give them the knowledge and ability to consider composition and features within visual effects techniques. This will allow them to develop visual skills and give them a better understanding on how to go about creating visual effects according to the subject matter and task at hand. Through the use of photo, video editing and 3D software the learner will develop a good understanding of video, image and 3D manipulation techniques and the requirements to produce professional quality work that may be used to produce a professional portfolio or for use in another context. It is important to highlight the range of possible areas that visual effects can be integrated into and not viewed as a standalone subject.

Learning Outcomes

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

1. *Explain the concepts of visual effects and video compositions.*
2. *Capture and import digital images and video footages.*
3. *Plan and create composited digital videos.*
4. *Export composited video footage for a variety of different output medium.*

Relational Databases

Unit level (MQF): 4

Credits: 6

Unit Description

Today, every business and organization need to have some form of IT system in order to function efficiently and be able to cope with competition. Databases are therefore a necessity in order to persist the data generated on daily basis. Data retrieval from these data sources is a core component in every type of information system.

Relational Databases is a unit which is relevant to learners wishing to develop the skills required to carry out different database operations through the use of Structured Query Language (SQL). SQL is considered as the official language used by database and information system developers to manage and interrogate the information held in Relational Database Systems. The unit will introduce a number of different querying techniques to add, update, remove and retrieve data. The content of the unit is practical in nature and provides the knowledge and skills to create reliable, efficient and effective SQL commands. The learner should be able to generate reports which output all the information indicated by the user, in order to meet the business requirements.

This unit will not require the learner to have any previous knowledge of SQL. It is designed to be delivered as a continuation of Database Concepts & Design as part of the Extended Diploma in IT (Software Development) although it may also be delivered as a standalone unit.

On completion of this unit, learners will be familiar with the majority of the basic querying concepts. Learners will be able to make use of different querying techniques to handle data stored in a DBMS.

Learning Outcomes

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

1. *Create basic queries to manage data held in a relational database management system (RDBMS).*
2. *Use different functions within SQL to meet user requirements.*
3. *Use different querying techniques to retrieve more complex user requirements.*

Graphic Design

Unit level (MQF): 4

Credits: 6

Unit Description

This is a skills based unit and will allow learners to demonstrate they have the necessary knowledge of graphic design to be able to put this into practice within the framework of different design projects. Learners will be introduced to the difference between print and screen design then shown the application of these in a variety of graphic design scenarios. Learners will gain an understanding of bitmap and vector graphics and how these are applied in graphic design. It would be advisable that learners have knowledge of colour, typography and layout concepts and an understanding of how these elements differ within the area of graphic design and interactive media depending on the project. For this reason, it would be advisable for learners to have completed or be studying the Theory of Design and Graphic Design unit.

The Unit is relevant to learners wishing to further develop their knowledge of graphic design so that they might apply this to other units within the course and also to develop an understanding of the graphic design industry in general. On completion of the Unit, learners will understand the principles used in graphic design projects and how these form a basis for working within the design industry. This Unit will provide the Learner with the ability to use graphic software applications in order to create interesting and practical solutions to a wide variety of projects. Other influences such as the use of colour in design and typography will also allow a better understanding of how these can be developed and used alongside layout. The learner will also be able to use synthesis between graphic applications and multiple scenarios in order to integrate their skills and knowledge.

In this unit, learners will become familiar with the basic tools and techniques of digital graphics software used to produce images for a range of media. These techniques form the basis of the development of graphics for print and screen design including: adverts, magazine pages, websites, DVD interfaces, interactive digital publishing and animations. This unit is therefore fundamental to the development of digital design skills.

Learners will carry out practical tasks and present these to the assessor who can feedback and advise on the success of each task. It will also be advisable to give group presentations to encourage sharing of knowledge and to help develop confidence in presentation techniques. This unit may be delivered in conjunction with the Design Theory and Graphic Design Unit and Interactive Desktop Publishing to provide a more cohesive understanding of all that is involved within this varied subject.

Finally, learners should have the underpinning knowledge and understanding to have a clear knowledge and understanding on each area of graphic design and how they will apply this to specific project briefs.

Learning Outcomes

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

1. *Explain graphic design in relation to print and screen design.*
2. *Explain and use vector graphic applications in relation to graphic design.*
3. *Explain and use bitmap graphic applications in relation to graphic design.*
4. *Apply vector and bitmap graphics in a project brief.*

Project

Unit level (MQF): 4

Credits: 6

Unit Description

This unit is intended to demonstrate the learner's ability to plan, develop and evaluate a small software development project. The unit provides learners with the opportunity to consolidate the knowledge and skills they have mastered in the units that form the basis of the qualification and use their creative and technical abilities to satisfy the requirement of the unit. Learners will be provided with a project brief and follow a specific project management approach to complete each stage of the project. The four stages comprise: providing a detailed analysis of the brief in the analysis stage, documenting and justifying the approach to the project in the planning stage followed by design, implementation and testing in the development stage and finally an evaluation of the product and the management of the project in general. This unit is suitable for any learner undertaking a course in software development or computer games development. It is recommended that the brief is provided to the learner prior to the start of the project in order to allow time for familiarisation with the content and requirements. Learners should be encouraged to produce a professional standard of documentation throughout the project and maintain a record of work carried out.

Learning Outcomes

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

1. *Analyse a given brief relating to a software development project and produce a requirements analysis.*
2. *Produce a planning report in response to the brief.*
3. *Develop a software solution that meets the brief.*
4. *Evaluate the project to include a personal reflection and an analysis of the extent to which the solution meets the requirements of the brief.*