



# MCAST

Malta College of Arts, Science & Technology

**MQF Level 3**

**Diploma in Engineering (Electronics)**

**EE3-A2-19**

## **Course Description**

The programme is intended for students who would like to further their studies at higher levels and subsequently find employment in engineering especially in the field of electronics. The programme consists of twelve modules, out of which six are vocational while the other six address the key competences.

Vocational modules focus on functions of electronic components, electronic circuit design, operation of electronic systems, installation and configuration of PC hardware and software, interpreting engineering information and working safely and effectively in the workplace.

The key skills modules provide an opportunity for students to gain adequate skills in Maltese, English, Mathematics, Information Technology, and Science and Technology. Furthermore, students will receive guidance in their personal development

## **Programme Learning Outcomes**

At the end of the programme the students is able to

- 1. Work safely, efficiently and effectively in the engineering workplace*
- 2. Use mathematical principles related to electrical and mechanical science*
- 3. Understand the function and operation of electrical and electronic system components*
- 4. Install, test and configure PC hardware systems, components and software packages.*

## **Entry Requirements**

- MCAST Foundation Certificate ;or
- 2 SEC/O-Level passes/ SSC&P (Level 3) passes  
Compulsory: Mathematics or Physics
- A full “Secondary School Certificate and Profile” (SSC&P) at Level 2 will be accepted in lieu of one (1) O-Level pass.

## **Other Entry Requirements**

A medical certificate for colour blindness is a necessary requirement to attend the course.

## Current Approved Programme Structure

Unit Code	Unit Title	ECVET/ECTS
ETECD-306-1401	Electronics Circuits Design	6
ETELX-306-1401	Interpreting and Using Engineering Document	6
ETELX-306-1402	Electronic Components and Devices	6
ETELX-306-1403	Operating and Basic Troubleshooting of Electronic Systems	6
ETH&S-306-1402	Health and Safety in Engineering	6
ETPCS-306-1401	Configuration of PC Systems	6
CDKSK-304-1403	Mathematics	4
CDKSK-304-1402	English	4
CDKSK-304-1401	Maltese	4
CDKSK-304-1601	Information Technology	4
CDKSK-304-1612	Individual and Social Responsibility	4
CDKSK-304-1609	Science	4
<b>Total ECVET/ECTS</b>		<b>60</b>

# Unit: ETECD-306-1401 - Electronic Circuits Design

Unit level (MQF): 3

Credits: 6

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## Unit Description

This unit will provide learners with the skills and theory required for selecting electronic devices and designing simple circuits. Such skills and knowledge are a requirement in the vocational domain of an electronics technician.

The unit builds up the learner's competence in simple circuit schematics and design by providing sufficient understanding of the fundamental principles of selecting electronic devices to meet given specifications. Learners will also develop the ability to design and prototype a simple electronic circuit using a variety of techniques, including desktop prototyping on breadboards.

In addition, learners will gain an understanding of the safe working practices needed when working with electronic components and circuits as well as the hazards and risks that can occur when assembling electronic circuits in a workshop or laboratory. Learners will understand the characteristics of electronic components, passive and active, up to the level of operational amplifiers, their symbolic representation in circuit schematics as well as their usage and rules of selection

The above is followed by various methods used for electronic circuits prototyping using hand designs of printed circuit boards (PCB) and simple software tools used for PCB layout design. The focus on PCB design is in relation to placing basic elements of electronic circuit such as voltage stabilizing circuitry and separating analogue from digital circuitry in order to avoid interference.

Finally, rules of wiring and shielding within the electronic device housing are explained by carefully selected examples of simple electronic devices.

## Learning Outcomes

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

1. *Use safe working practices in the electronics laboratory and workshop.*
2. *Know the electronic components and their placement in circuit diagrams.*
3. *Demonstrate prototyping skills of electronic circuits, typically used in vocational engineering.*
4. *Construct circuits of moderate complexity involving use of integrated circuits and through hole components.*

# Unit: ETELX-306-1401 - Interpreting and Using Engineering Documentation

Unit level (MQF): 3

Credits: 6

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## Unit Description

This unit aims to provide learners with the knowledge and skills required to use engineering information, such as drawings and instructions, necessary to carry out vocational engineering operations, with particular focus on electronics. The ability to access and use information is probably one of the most critical basic vocational skills required in engineering.

This unit will enable learners to understand how to make effective use of information when working with documentation that consist of engineering drawings, reference tables, specifications, charts or any other medium/ means which carries information, being either printed or digital. Learners will be trained to extract information from engineering drawings and related documents in a fast and reliable way. Learners will also learn how to use drawings and related documentation to determine the work that needs to be done, carry out the work according to specifications and validate their own performance.

Learners will be using standard software tools to retrieve, process and store information within the document. Therefore, Engineering drawings accompanied with related documents, such as parts list and, replacement parts list become useful if they are readily accessible from stored data. Besides getting acquainted with the rules of storing and retrieving documentation, learners will also gain skills in organizing personal documentation.

This unit will enable learners to identify facts and generate conclusions needed to compile a report on technical concepts by using textual, graphical and table data in line with the established organizational policies and procedures for obtaining and using documentation. It is expected that learners will be able do this task with minimum supervision. They are also expected to take own responsibility for their own actions and the quality and accuracy of the work that they undertake.

## Learning Outcomes

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

1. *Use standard software tools to gather information from technical documents.*
2. *Interpret different technical documents to carry out specific tasks.*
3. *Use engineering information when working on electrical and electronic tasks.*

# Unit: ETELX-306-1402 - Electronic Components and Devices

Unit level (MQF): 3

Credits: 6

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## Unit Description

Electronics devices have been shaping the modern world for over half a century with ever-growing use. One of the best examples of such a device is the smartphone which incorporates many technologies which are based on electronics such as: personal information management; communication with text, voice and video; internet navigation; games, etc. The two major uses of electronic devices are in handling signals by amplifying and switching, resulting the applications in information processing, signal processing, and communications. Mixed on a circuit board, electronic devices become part of many household and industrial systems and in contemporary days they are even becoming integral, embedded part of mechatronics systems.

This unit will provide learners with a practical introduction to basic electronic devices as well as analogue and digital electronic principles. It will provide knowledge on how diodes and transistors operate, as the two most important elements in an electronic circuit. Learners will also be exposed to the application of these devices in a higher level of integration, such as within an integrated circuit (of which the most important is the operational amplifier).

Another application follows digital functioning of circuits made of transistors as switching elements thus forming Logic gates and flip-flops. These will also be investigated both in practice and theory, through the use of truth tables. Starting from a simple demonstration circuitry on prototyping breadboard learners are going to be exposed to demonstration of computer-based circuit design and simulation software packages that will allow them to understand the first steps of building and testing analogue and digital circuits. Thus the overall aim of this unit will be to build up confidence in the designing and testing of simple electronic circuits. Many of the complex or real-world systems will be explained in block-diagram form emphasizing only the most important elements and electronics devices therein.

## Learning Outcomes

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

1. *Describe the type of signals used in technical systems.*
2. *Describe the function of basic electronic components.*
3. *Construct and test different analogue electronic circuits.*
4. *Build and test different digital electronic circuits.*

# Unit: ETELX-306-1403 - Operation and Basic Troubleshooting of Electronic Systems

Unit level (MQF): 3

Credits: 6

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## Unit Description

The unit covers the function, operation and regular maintenance of a variety of electric systems, electronic circuits and equipment. The need for regular maintenance in order to ensure proper operation and long lifecycle of these systems introduces this crucial topic in vocational engineering training. As maintenance requires knowledge of functionality and internal operation principles of systems in concern, the unit provides learners with this knowledge as well. It is combined with elements of signals theory and functional block diagram presentations of systems functioning.

Learners will also learn how to use all necessary documentation, including user manuals and service documentation, datasheets of components used, followed by using tools and equipment in a safe and reliable way, necessary for carrying out any given maintenance task. A set of common fault detection procedures are used as examples to relate theoretical knowledge and practical aspects of engineering thus gaining functional skills in common fault detection procedures. Staff safety during maintenance is also considered.

At the end, learners will be able to demonstrate that they can perform inspection, fault detection, repair and regular maintenance of common electronic systems and applications such as bench power supply, motor drivers, various control circuits and alarm systems, communication modules and others met in modern electronic systems.

## Learning Outcomes

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

1. *Understand practical skills and safety procedures in workshop and laboratory.*
2. *Explain the function of electronic components and devices using application in basic circuitry and simplified models.*
3. *Use common form of technical specifications and manuals in printed or digital format.*
4. *Perform simple maintenance and fault finding tasks on non-complex electronic systems.*

# Unit: ETH&S-306-1402 - Health and Safety in the Engineering Workplace

Unit level (MQF): 3

Credits: 6

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## Unit Description

The unit introduces effective and safe work to learners, focusing on their wellbeing, on prolonged life of tools and equipment and on economic aspects of work. The primary goal of the unit is to introduce basic working practices in engineering and potential hazards involved. The learner will be introduced to EU regulations adopted for engineering activities and for vocational training. This unit provides learners with knowledge of material and equipment handling, as well as the use of appropriate personal protective equipment (PPE), and their classification: protection of respiratory organs, skin, eye and hearing, protective clothing and ensembles. Learners will become aware of the hazards and risks associated with different engineering tasks, working environments (for example working with high voltages, and static-sensitive devices), use of tools and equipment (both common and special), and working with dangerous materials and substances. The unit covers ways of avoiding hazards and ways to respond correctly and swiftly in case of an incident both in theory and in practice. It is important to emphasize that this represents useful knowledge that could be applied in everyday life. Since completing a job might require team effort, this unit builds team spirit as well by delivering related communication skills. Finally, the unit will introduce some important soft skills in applying knowledge and in continued learning needed for successful professional in engineering.

## Learning Outcomes

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

1. *Apply statutory regulations and organizational safety requirements.*
2. *Prepare PPE and working environment according to the task checklist.*
3. *Carry out engineering task according to safety standards.*

# Unit: ETPCS-306-1401 - Configuration of PC Systems

Unit level (MQF): 3

Credits: 6

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## Unit Description

Through this unit learners are introduced to computer technology usage and maintenance. Besides standard PC desktop computers Learners will also receive knowledge on smartphones and tablets. Learners will also learn on how PC hardware is organized and assembled and will become aware of the basic software needed to install, run application programs and network variety of computer hardware within home or small business environment. Based on this information, learners will be exposed to all major components of the PC system that can be considered as stand-alone modules. These are: PC power supply, motherboards, microprocessors and memory devices. Apart from their function, the current specifications will be covered in particular detail to enable learners to create a configuration that satisfies a given need. Function, connectivity and configuring of common peripherals, like displays, printers and human interfaces, are covered by the unit as well. OS basics and comparison of common OS-s, Windows, Android and iOS are also part of this unit with the practical sessions focusing on learners performing installation and configuration of operating systems. Learners will be also trained in setting up and customising basic office tools such as word processors, Internet browsers and compression software, with the emphasis on functionality and interconnectivity. Learners will be able to quickly detect causes of typical problems in connectivity, operating system (OS) and office tools functioning.

## Learning Outcomes

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

1. *Apply basic knowledge of computer systems and components to perform effective maintenance.*
2. *Install and configure computer hardware components.*
3. *Install and configure common operating systems for communication and basic service software packages.*
4. *Configure computer systems as optimal to task specification.*