



MCAST

Malta College of Arts, Science & Technology

MQF Level 3

Diploma in Electrical Installations

EE3-A1-19

Course Description

This programme is intended for students who would like to further their studies at higher levels and subsequently find employment in engineering especially in the electrical and electronics fields within the construction industry. It contributes towards an understanding of the relevant theory and allows students to develop practical skills required in this field. The programme consists of twelve modules, out of which six are vocational related and the rest are key skills related.

Vocational modules focus on the basics of wiring electrical installation circuits using different cables and containment, electrical installation regulations, and health and safety requirements governing electrical installation processes. The rest of the modules provide an opportunity for students to have 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. *Interpret and follow safety requirements in compliance with the law for electrical installations in construction environments.*
2. *Interpret wiring regulations and requirements for domestic electrical installations.*
3. *Design and implement domestic electrical installations to given requirements.*
4. *Troubleshoot and repair existing single-phase electrical installations.*
5. *Explain different ways in which electrical devices operate, and the science behind them.*

Entry Requirements

- MCAST Foundation Certificate ;or
- 2 SEC/O-Level/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 Title	ECVET/ECTS
Principles of Electro-Technology	6
Principles of Electrical Science	6
Installations (Buildings and Structures)	6
Electrical Principles in Building Services Engineering	6
Electrical Installation Standards and Components	6
Health and Safety in the Engineering Workplace	6
Mathematics	4
English	4
Maltese	4
Information Technology	4
Personal Development	4
Science	4
Total ECVET/ECTS	60

Principles of Electro-Technology

Unit level (MQF): 3

Credits: 6

Unit Description

This unit covers two areas: fundamentals of electricity and electrical circuit theory. Fundamentals of electricity begin with the simplified electron theory including atomic elements and free electrons, the charge and attraction, Coulomb's law, followed by basic properties of conductors, insulators and semiconductors, and ending with the practical principles of the current, voltage and resistance. Electrical symbols and mathematical prefixes are associated to each of the terms. Based on these fundamentals, a simple electrical circuit theory is defined starting from the Ohm's law. Resistance, voltage and current measurements by digital multi-meter are explained with basic measurement principles.

This is followed by practical workshop including the building of simple electrical circuits calculating the expected value of the current and measuring the actual resistance, voltage and value of the current. DC series and parallel circuits are explained first in theory and then in practice.

Electromagnetism includes explanation of magnetic flux, magnetic characteristics of material, relation between current and magnetic field, Faraday's law and forces in magnetic field. Finally, the basic electronic components (diodes, different types of transistors) are explained. The methods for solving some simple analogue circuits are explained.

Learning Outcomes

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

1. *Explain the fundamental principles of electricity.*
2. *Understand basic methods for the analysis of electrical and electronic circuits.*
3. *Recognise basic characteristics related to magnetism and simple motor and generator theory.*
4. *Take practical measurements and analyse simple circuits.*

Principles of Electrical Science

Unit level (MQF): 3

Credits: 6

Unit Description

The first topic covers the principles of waveforms. It shows different waveforms and refers to the different points. It moves to explain the behaviour of ac voltage and current when loads of different nature are connected across ac supply. The topic gives a brief idea of the behaviour of current and voltage when a circuit is connected in series and in parallel. It also deals with ac power and its different behaviour. At this level it is not the intention of this topic to investigate ac theory in detail, but the intention is to give a person working in the electrical field an idea of the performance of ac supply.

This second topic in this unit is three phase systems. Here as well, it is not the intention of this topic to deeply understand the theory behind the issue but to give a learner who is on the field information to operate safely in such environment.

The third topic in this unit deals with motors and gives the basic requirements to a person on the field enough information to skilfully handle motors. In this part, the learner is exposed to different types of motors. The learner is encouraged to recognize the motor as well as to connect different types and configurations of motors.

The last topic in this unit, students are required to produce a small project. The intention is to expose the learners to electronic devices and their applications. It also gives the learner basic experience in the field of electronics.

Learning Outcomes

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

1. *Indicate differences across loads when connected across ac supply.*
2. *Identify basic properties of a three phase supply system.*
3. *Identify and connect different types of electrical machines.*
4. *Use simple electronic devices to produce a project.*

Installations (Buildings and Structures)

Unit level (MQF): 3

Credits: 6

Unit Description

In this unit, learners will revise practical sides of Unit 1: Working Effectively and Safely in The Electro Technical Environment within buildings and structures, with the legal responsibilities, followed by gaining skills in using related sources of technical information and communications. The basic principles of electro - technology are reviewed by applying common technology concepts related to the circuits and cables, used in different tools and equipment for electro - technical applications in construction engineering. It is followed by health and safety consideration at the workplace. Additionally, learners will be introduced to electrical principles with an emphasis on poly-phase or three-phase electrical systems and over current, short circuit and earth fault protection. The main focus is on the installation in buildings and structures, with statutory regulations and codes of practice on electrical installations and wiring systems. Here, the supply systems, electrical installation, components and functions are defined leading to different types of wiring enclosure and the factors that determine the choice of wiring systems. In particular, grounding in apartments and complete buildings, planning and laying electrical installations by using wires and cables, basics of communication and signal installations are going to be demonstrated and guided with supervision in laboratory. Special arrangements required for baths or showers, construction, special installation sites, and agricultural and horticultural premises will be elaborated in detail. A set of practical activities, guided as well as unguided, are going to ensure the knowledge on protection from electric current, such as short circuit protection, over-current protection, hazardous voltages, wiring safety codes, basic protection and fault detection, and additional protection by using Residual-Current Device. These pave the ground for further education towards certification in electrical installations.

Learning Outcomes

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

1. *Understand the requirements for commissioning electrical systems.*
2. *Understand different types of wiring enclosure and the factors that determine the choice of wiring.*
3. *Apply wiring and grounding arrangements for domestic applications.*
4. *Apply the requirements for inspection and testing of electrical installations.*

Electrical Principles in Building Service Engineering

Unit level (MQF): 3

Credits: 6

Unit Description

Building services engineering comprises mechanical engineering, electrical engineering and plumbing or public health (MEP) engineering, with electrical practice tightly linking them into a functional area of technology.

The use of electricity is an essential part of life in the modern world. Electricity provides people with the means to energise many devices, systems and processes that are a part of our technological environment. Electricity, combined with these technologies, is used to transfer energy, to provide mechanisms for control and to transmit information in a variety of forms. Basic electrical theories need to be understood and considered by all those involved in the design or installation of plant, equipment, machinery, control systems or the electrical circuitry that is required to power both mechanical and electrical services within buildings.

In this unit learners will gain essential underpinning knowledge through studying the form and function of electrical devices. They will investigate various ways of transfer, modification, transformation, and control of electrical energy. Learners will also be able to distinguish between the requirements for single and three-phase circuits, and will develop the understanding of fundamentals such as the difference between analogue and digital signals, and the relevance of these to control systems.

Learning Outcomes

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

1. *Identify tools and use them safely and carry out simple electrical tasks.*
2. *Carry out preparation and installation of lighting wiring systems for domestic installations.*
3. *Carry out preparation and installation of a power wiring system for a domestic installation.*
4. *Carry out testing procedure.*

Electrical Installation Standards and Components in Building Services Engineering

Unit level (MQF): 3

Credits: 6

Unit Description

Nowadays, we understand electricity and how it works, transforming it into a tool that has allowed our world to become a comfortable and civilized place. Television, communications, the Internet, lighting, control technologies and many other things would be impossible without electricity. Yet, it is still dangerous, causing fires or even death by electrocution.

The presence of water can make it more dangerous. At high voltages, it can leap several feet through the air and kill anyone unfortunate enough to be in the vicinity. In this unit, learners will be introduced to installation standards and components. Installation standards exist to keep electricity safe and prevent harm. In this unit learners will become aware that the installation industry has to comply with a vast number of regulations and standards. Anyone wishing to become competent in this industry must become familiar with the complete range of regulations.

In fact, the industry has a defined title for anyone practicing in this field -a competent person. In these units, learners will cover the range of regulations and practices. This will set them on the path to be competent in using electrical energy safely. In particular, learners will learn about definitions and applications of home, industrial and construction engineering components, such as fuses, switches, circuit breakers, contactors, relays, timers, up to the rules and practice of installing, wiring and engaging PLCs, and UPSs and terminals.

Learning Outcomes

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

1. *Work safely in an electrical installation environment.*
2. *Carry out preparation and installation of industrial extra low voltage systems.*
3. *Carry out preparation and installation of metallic wiring systems.*
4. *Carry out preparation and installation of low current single / three phase circuits and basic electric motor maintenance.*

Health and Safety in the Engineering Workplace

Unit level (MQF): 3

Credits: 6

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.*