MCAST

Malta College of Arts, Science & Technology

MQF Level 4

EE4-A2-14
EE4-A2-14G

MCAST Advanced Diploma in Electrical Systems

Course Specification

Course Description

The MCAST Advanced Diploma in Electrical Systems enables participants to acquire competence in more advanced areas of electrical installations and maintenance.

The course has been carefully designed and structured to integrate practical skills with the related technology. This will enhance the candidates' knowledge and skills to a higher stage into the electrical installation industry.

The course will provide an understanding of the local regulations and health and safety requirements governing electrical installation processes. Students will also gain knowledge of the organisation and structure of the industry within which these activities are carried out. Successful students will gain knowledge and experience in a domestic and in an industrial electrical installation environment. This course includes work-related training and practice. Applicants have to be able to work within the industries concerned.

Programme Learning Outcomes

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

1. *Work safely, communicate effectively and take responsibility of own and others' work in engineering*
2. *Understand domestic and industrial electrical principles to apply them in real electrical installation situations*
3. *Design, perform and test domestic and electrical installations and machinery according to regulations and requirements*
4. *Troubleshoot, repair and modify existing domestic and industrial electrical installations, motors and switch*

Entry Requirements

- MCAST Diploma in Engineering (Electronics);or
- MCAST Diploma in Electrical Installations; or
- MCAST Diploma in IT; or
- MCAST Diploma in Heating, Ventilation and Air Conditioning; or
- MCAST Diploma in Building Services Installations (Plumbing or Plumbing and Electrical);or
- MCAST Diploma in Welding and Fabrication; or
- MCAST Diploma in Automotive Repair (Body and Paint);or
- MCAST Diploma in Automotive Maintenance and Repair; or
- MCAST Diploma in Mechanical Engineering; or
- 4 SEC/O-level/SSC&P (Level 3) passes; or
- Compulsory: Physics, Mathematics; or
- Preferred: English, Computer Studies, Design and Technology, BTEC L2 Extended Certificate in Engineering
- A medical certificate for colour blindness is a necessary requirement to attend the course.

Current Approved Programme Structure

Unit Code	Unit Title	ECVET
ETMTH-406-1502	Mathematics 1	6
ETMTH-406-1503	Mathematics 2	6
ETELE-406-1502	Electrical Technology 1	6
ETELE-406-1503	Electrical Technology 2	6
ETELX-406-1502	Analogue Electronics	6
ETH&S-406-1506	Health and Safety at Work	6
ETELE-406-1504	Basic Wiring and Cable Systems	6
ETELE-406-1505	Consumer Switchgear, Earthing and Protection	6
ETELE-406-1506	Power Factor Correction & Three Phase Theory	6
ETELE-406-1507	Cable Selection	6
ETELE-406-1508	Electrical Power Systems	6
ETELE-406-1509	Regulations and Specialist Installations	6
ETELE-406-1510	Transformation and Rectification	6
ETELE-406-1511	Electrical Plant Maintenance	6
ETELE-406-1512	Inspection and Testing	6
ETELE-406-1514	3 Phase Motors and Drives	6
CDKSK-406-1602	Mathematics	6
CDKSK-406-1604	English	6
CDKSK-406-1603	Entrepreneurship	6
ETCMP-406-1605	Vocational Competences in Electrical Systems	6
Total ECVET		**120**

Unit: ETMTH-406-1502 Mathematics 1

Unit level (MQF): 4

Credits : 6

Unit description

This unit has been designed to build upon previous theoretical mathematical knowledge, to be used in a more practical context. Furthermore, it acts as an essential basis for the successful completion of many of the other units within the qualification. Delivery of the unit should be set within the context of the award to which it contributes.

Learners will be able to, understand and apply algebraic techniques to manipulate expressions and solve algebraic equations commonly found in engineering. This includes linear simultaneous, logarithmic and exponential equations.

Moreover, will develop the necessary knowledge and skills to plot, analyse and solve equations from straight line, quadratic and logarithmic graphs.

It provides them also with the skills to carry out calculations involving area and volume of both standard and compound shapes. Circular measure formulae including circumference, arc length, segment and area will also be presented.

The analysis of trigonometric functions and their graphs is an important part of this unit as well. This involves finding the sides and angles of any triangle using either Pythagoras' Theorem or the Sine and Cosine rule.

Towards the end of the unit, learners will be provided with the knowledge and skills to solve problems involving vectors and phasors, together with their applications in Engineering.

Learning Outcomes

On completion of this unit learners should be able to:

1. Apply algebraic techniques to manipulate expressions and solve equations
2. Represent equations as graphs to solve them graphically
3. Use trigonometry and mensuration to solve simple shapes
4. Manipulate vectors and phasors

Unit: ETMTH-406-1503 Mathematics 2

Unit level (MQF): 4

Credits : 6

Unit description

This unit builds upon the mathematical tools learned in Mathematics 1 to provide the learner with a wider range of mathematical techniques. Moreover, these techniques are applied to solve engineering problems. Therefore, it is assumed that the learner has successfully completed this unit prior to commencing Mathematics 2.

The first learning outcome will provide the skills necessary to analyse numerical data using simple statistical techniques such as the mean and standard deviation. It also illustrates how to create and use histograms and cumulative frequency curves to determine the mean, median, mode and standard deviation of grouped data. The use of spreadsheet software to determine statistical techniques is also shown. It also introduces power series functions and arithmetic and geometric series.
Learning outcome two, outlines the skills required to add, subtract, multiply and divide complex numbers in rectangular and polar form. This knowledge gives the learner the ability to use phasors and complex numbers in engineering applications.

The underpinning knowledge of proving trigonometric identities in learning outcome three provides the learner with further trigonometric techniques to be able to analyse simple waveforms. Spreadsheets are again utilised in this outcome.

The fourth learning outcome provides the learner with the knowledge, understanding and the ability to apply differential and integral calculus to Engineering problems.

Learning Outcomes

On completion of this unit learners should be able to:

1. Use statistical techniques
2. Manipulate complex numbers
3. Manipulate trigonometric identities and solve trigonometric equations
4. Produce the derivative and integral of functions

Unit: ETELE-406-1502 Electrical Technology 1

Unit level (MQF): 4

Credits : 6

Unit description

Electrical Technology is the basis of all Electrical Engineering and Electronic Engineering subjects. The principles that are outlined in the course are fundamental to a learner's knowledge for a successful career in this area. Although Electrical based the knowledge contained in the course will be important across all engineering and technical disciplines as so many are interrelated. The topics covered allow the learner to consider what is happening when practical activities are taking place and to appreciate Electrical Technology's power and consequences

This unit is the first in a series that looks at the building blocks of Electrical and Electronic Engineering. By undertaking this unit knowledge will be gained that is required to progress towards more advanced Electrical and Electronic subjects. The first outcome considers the physical structure of electricity in terms of charges which is fundamental to understanding current and voltage which are the foundations of all related subjects. The second and third outcomes consider capacitors and inductors which form the main components in Electrical and Electronic Engineering and the final outcome moves into AC theory and the use of phasors in calculations.

The knowledge gained from this unit and subsequent Electrical Technology units can be carried through to many different types courses and can be looked on as giving the learner a broad and flexible base for further Electrical and Electronic studies.

Learning Outcomes

On completion of this unit learners should be able to:

1. Perform basic calculations on units of electricity and simple DC circuits.
2. Perform basic calculations applying the principles of electrostatics.
3. Show how magnetic principles are used to perform basic calculations on motors and generators.
4. Investigate the relationships between voltage and current in RLC series AC circuits by applying the concept of phasors in electrical calculations.
5. Apply DC transient theory to problems in C-R and L-R DC circuits.

Unit: ETELE-406-1503 Electrical Technology 2

Unit level (MQF): 4

Credits : 6

Unit description

Electrical Technology is the basis of all Electrical Engineering and Electronic Engineering subjects. The principles that are outlined in the course are fundamental to a learner's knowledge for a successful career in this area. Although Electrical based the knowledge contained in the course will be important across all engineering and technical disciplines as so many are interrelated. The topics covered allow the learner to consider what is happening when practical activities are taking place and to appreciate Electrical Technology's power and consequences

This unit is the second in a series that looks at the building blocks of Electrical and Electronic Engineering. By undertaking this unit knowledge will be gained that is required to progress towards more advanced Electrical and Electronic subjects. The first outcome considers the basic DC theorems that apply to DC networks and which are fundamental to this and related disciplines. The second covers the operation of different types of stepper motors transient characteristics of components when applied DC is switched on or off. The third outcome covers the is a bridge from mathematics into Electrical and Electronic Engineering with the concept of complex numbers being explored analysis and applications of single phase circuits and motors and the fourth is a demonstration of how this concept is applied to AC networks.deals with the analysis of three phase systems and induction motors.

The knowledge gained from this unit and subsequent Electrical Technology units can be carried through to many different courses and can be looked on as giving the learner a broad and flexible base for further Electrical and Electronic studies.

Learning Outcomes

On completion of this unit learners should be able to:

1. Explain and apply DC network theorems and circuit analysis to networks and DC machines.
2. Investigate the operation of different types of stepper motors.
3. Explain and apply AC theory to single phase circuits and motors.
4. Explain and apply AC theory to three phase systems and induction motors.

Unit: ETELX-406-1502 Analogue Electronics

Unit level (MQF): 4

Credits : 6

Unit description

This unit aims to give learners an understanding of basic principles of Analogue Electronic devices and circuits. It is delivered with a high practical content which will build learners' confidence in their ability to simulate and test a variety of electronic circuits.

The learners are first introduced to the different types of discrete analogue electronic device which form the building blocks of analogue electronic circuits. The unit will present learners with applications of analogue circuits, their structure, their operation, and the way in which they are differentiated from each other.
Learners are then introduced to the discrete transistor amplifier circuits and examine in detail their configuration, operation and applications. Both small signal amplifier circuits and power amplifier circuits are examined.

The learners will then investigate the configuration, operation and applications of diodes and linear voltage regulator circuits.

This unit also presents to learners essential material concerning electronic signal conditioning circuits such as passive filters and transducers that are used in analogue i/o circuits. Additionally it introduces learners to analogue waveform generation circuits based upon both discrete and integrated circuits.

This unit also provide hands on applications, such as building circuits on breadboard and soldering of electronic components.

Learning Outcomes

On completion of this unit learners should be able to:

1. Describe and verify the purpose, structure, operation, transfer characteristics and applications of identified analogue semiconductor devices.
2. Investigate, describe and demonstrate the operation, and applications of identified discrete transistor amplifier circuits.
3. Analyse, describe and verify the operation and applications of linear power supply circuits.
4. Describe and verify the operation and application of analogue input / output circuits.
5. Analyse, describe and demonstrate the operation and applications of analogue waveform generating circuits.

Unit: ETH&S-406-1506 Health and Safety at Work

Unit level (MQF): 4

Credits : 6

Unit description

Integrated Workplace Health and Safety legislation can best be defined as the pre-requisite requirement necessary to maintain the well-being and protection of employers, employees and the environment.

Organisations are legally bound to adopt a proactive approach, educating employees on the importance of promoting safe working practices, in order to maintain a safe and healthy working environment.

Taking cognisance of the aforementioned, the aim of the unit is to introduce candidates to key elements relating to fundamental Health, Safety and Environmental legislation. The unit seeks to highlight the Health and Safety is an issue for everyone, no matter the level at which they are employed. It aims to inform individuals about their responsibilities in the working environment, in the context of say, what constitutes a safe working area and what's required to achieve this in differing scenarios. These items can be paper based in the sense of risk assessments, but also practical in how the specifics of this would be complied with or addressed.

A sound grounding in how safety legislation is formulated and controlled, provides a very useful basis, from which the student's understanding of how these requirements are applied in the workplace. Gives a platform, which allows their understanding of this area to become more detailed and considered as their technical capabilities and knowledge expands across all of the subjects contained within the course.

Note that specific safety issues in subject areas will be addressed within the content and workings of the unit concerned, the purpose of this unit is to provide an overall viewpoint to the topic area of Health and Safety at Work.

Learning Outcomes

On completion of this unit learners should be able to:

1. Explain the key features of Local and EU Health and Safety legislation.
2. Explain and describe employers and employees specific roles and responsibilities in relation to the act.
3. Carry out a suitable risk assessment within a workplace environment.
4. Identify and describe the methods used when reporting and recording workplace Incidents
5. Explain the handling, storage and disposal of dangerous substances.
6. Explain work equipment safety requirements.

Unit: ETELE-406-1504 Basic Wiring and Cable Systems

Unit level (MQF): 4

Credits : 6

Unit description

This unit is suitable for candidates with limited or no electrical wiring skills and/or electrical containment skills. The unit will benefit any individual studying to become an electrical tradesperson or looking to further their knowledge of electrical wiring systems and gain experience in setting up an electrical installation. The unit would be suitable for persons who have a background in another trade but want to increase their electrical knowledge.

On successful completion of this unit, candidates will be able to install and terminate an array of cable options which could include Poly Vinyl Chloride (PVC) sheathed cables. They will also be able to mount electrical accessories and wire up simple electrical installations in accordance with the latest version of the BS7671 Wiring Regulations.

The unit also introduces candidates to cable containment as a means of providing a route and protection for electrical wiring and to provide candidates with opportunities to learn the skills and practice the techniques required for the fabrication of electrical containment. They will be able to identify types and sizes of cable tray.

The issues that the student will address within the unit will mainly be practical in nature and rely upon suitable manual demonstration to guide and direct the students towards the assessment requirements specific to the unit.

Learning Outcomes

On completion of this unit learners should be able to:

1. Select suitable hand tools and accessories when performing tasks related to electrical installations.
2. Install different cable enclosures and perform different methods of installations.
3. Carry out wiring techniques in power, lighting and basic communication systems.
4. Carry out testing procedures.

Unit: ETELE-406-1505 Consumer Switchgear, Earthing and Protection

Unit level (MQF): 4

Credits : 6

Unit description

The unit will allow the students to understand that the Maltese Electrical system is an earthed system, which means that the star or neutral point of the secondary side of distribution transformers is connected to the general mass of earth. In this way, the star point is maintained at or about 0 V.

The unit will provide competence, understanding and knowledge of common Switchgear, Bonding, Earthing and Protection methods that are popular in LV Electrical Installations. This will include common terminology and drawings associated with the above.

There are three main methods of earthing used; these are the TT system, the TN-S system, and the TN-C-S system. The letter T is the first letter of the French word for earth 'terre ', and indicates a direct contact to the general mass of earth. The letter N indicates that there is also the connection of a conductor to the star or neutral point of the supply transformer, which is continuous throughout the distribution system and terminates at the consumer's intake position. The letters C and S mean 'combined' and 'separate', respectively.

Some of the common practical aspects of earthing, bonding and protection can be reinforced within other workshop units contained within the course. At this level hands on bonding and earthing should be encouraged. Calculations, use of tables, and time/current curves are also used to facilitate the learning process in this topic. The safety aspects of protection, earthing & bonding must be reinforced throughout the learning programme.

The unit will provide a platform of specific safety requirements related to the Electrical Installations environment and associated work activities to be carried out both in college and in an employment context.

Learning Outcomes

On completion of this unit learners should be able to:

1. Understand the terminology associated with, and the different types of consumer protection and switchgear.
2. Understand the terminology associated with earthing systems and be able to explain the differences between them.
3. Describe the terminology associated with earthing and methods of earthing used to give ADS.
4. Describe the terminology associated with bonding and methods of bonding used to give ADS.

Unit: ETELE-406-1506 Power Factor Correction + Three Phase Theory

Unit level (MQF): 4

Credits : 6

Unit description

This Unit is suitable for learners with little or no prior knowledge of electrical power theories, but who wish to gain some basic knowledge and insight of these principles and theories.

The aim of this Unit is to introduce learners to electrical principles and theories such as Power Factor Correction, Three Phase Systems and Load Balancing.

Power networks consist of resistive and reactive components. This Unit deals specifically with the electrical power aspects in such networks. It is shown that the power associated with a resistor is a double frequency sinusoid displaced with regard to the time axis so that it is always positive. This indicates the irreversible conversion of electrical energy into heat. In contrast, the power associated with reactive components is symmetrically disposed with regard to the time axis with zero average value. This indicates the oscillatory nature of this power. Next the concepts of active, reactive and apparent power as well as power factor are defined and the convention of assigning positive and negative labelling to the active and reactive power is explained. The practical implications of low power factor and the practice of power factor correction are then outlined. It is then shown how reactive and active power can be easily calculated using the complex notation of voltage and current. Finally, the single and three-phase systems for generation, transportation and utilisation of energy are discussed and the advantages of three-phase over other configurations are outlined.

On successful completion of this Unit learners will be able to understand the theory and purpose of Power Factor Correction, the theory and principles of three phase electrical generation and calculate the electrical parameters of three phase balanced loads.

Learners will be able to utilise the appropriate electrical units, symbols and unit-symbols. Learners will also be able to calculate the power relationships in inductive loads draw and utilise power triangles, phasor diagrams and draw and measure the electrical properties of three phase waveforms.

Learning Outcomes

On completion of this unit learners should be able to:

1. Understand the generation and operation of three phase supply systems.
2. Understand the behavior of star and delta connected loads
3. Understand the behavior of power in three phase balanced and unbalanced systems.
4. Understand the implications of tariffs for an economical approach to electrical engineering

Unit: ETELE-406-1507 Cable Selection

Unit level (MQF): 4

Credits : 6

Unit description

This unit has been designed to introduce the student to the process of selecting a cable size. The circuit conductors are those parts of the circuit which the current passes through, these are the cables. Cables have two components to them. One is the conductor itself. This is usually made of copper. The other part is insulation, usually made from PVC, which forms a sheath around the conductor. The insulation is required to prevent the conductors touching together; this could short the circuit and preventing it from working prevent users of the circuit from coming into contact with the conductors and receiving an electric shock. The type of insulation required is determined by the voltage which is to be applied to the cable.

Cables come as either single or multicore cables. Both have an overall sheath to keep all the associated cables together and to provide a minimal degree of mechanical protection. Appendix 4 of BS 7671 gives details on the sizes and types of cables available to us. With this unit, from the basic knowledge of cables, students would be required to undertake single phase and three phase cable calculations, correctly using relevant formula and information extracted from relevant conformance documentation. The student will learn the factors that can influence the size of a cable. They should ensure a safe relationship between the circuit current, the protective device and the size of the cable chosen. Other factors such as voltage drop and thermal constraints will also be considered. Re-calculation may be necessary if any part of their calculations fail to comply with stipulated Regulation requirements.

It is envisaged that the unit will be mainly theoretical in nature, but visual aids and actual cable samples should be utilized to reinforce learning involved with the subject. Although manual calculations for sizing will be required suitable computer software on cable sizing should also be used where relevant.

Learning Outcomes

On completion of this unit learners should be able to:

1. Choose appropriate types of cable for given installation conditions.
2. Identify and understand the factors which can influence cable sizes.
3. Understand why voltage drop can affect cable sizing.
4. Calculate cable sizes in single phase and three phase installations for various different circuits.

Unit: ETELE-406-1508 Electrical Power Systems

Unit level (MQF): 4

Credits : 6

Unit description

This Unit is suitable for learners with little or no prior knowledge of electrical systems but who wish to gain some basic knowledge and insight of these systems, such as the fundamentals of electrical supply, distribution, control and protection.

The aim of this unit is to introduce leaners to electrical systems, from generation to the point of utilisation within consumer's premises. The very nature of the grid system is such that power has to be transmitted over large distances. This immediately creates a problem of voltage drop. To overcome this problem, a high voltage is used for transmission (400 or 132 kV), the 400 kV system being known as the 'Super Grid'. We cannot, however, generate at such high voltages (the maximum in modern generators is 25 kV) and transformers are used to step up the generated voltage to the transmission voltage. At the end of a transmission line is a grid substation, where the requirements of the grid system in that area can be controlled and where the transmission voltage is stepped down via a transformer to 132 kV. It is at this stage that the different DNOs distribute the power required by their consumers around that particular area. The system voltage is then further reduced at substations to 33 000, 11 000 and 415/240 V.

On successful completion of this unit learners will be able to understand the purposes of High Voltage (HV) electrical plant, transmission and distribution systems and be able to identify the component parts of these basic systems.

Learners will also be able to describe the need for isolation, control and protection of Low Voltage (LV) installations and recognise the components parts of these systems. The unit will utilise graphical representations of the aforementioned areas of generation and distribution to highlight relevant topics within the unit.

Learning Outcomes

On completion of this unit learners should be able to:

1. Describe HV electricity generating and transmission systems.
2. Describe HV electrical distribution systems.
3. Describe LV isolation, control and protection systems within an electrical installation.

Unit: ETELE-406-1509 Regulations and Specialist Installations

Unit level (MQF): 4

Credits : 6

Unit description

This unit is designed to introduce learners to regulations for wiring systems- including a range of commonly employed cables. Wiring enclosures addressing containment systems to include PVC conduit and trunking, metal conduit and trunking and cable tray options. The unit will also address some of the special locations that exist in electrical installations.

The unit takes on-board changes in recent years, primarily the 17th Edition Wiring Regulations which brings the requirements into line with Europe, as part of a global move involving the British Electro-Technical Commission (BEC) – part of the BSI and the UK member of the International Electro-Technical Commission (IEC) and the European Committee for Electro-technical Standardisation (CENELEC). The IEC and CENELEC aim to create common electrical installations standards throughout the world and Europe, therefore the 17th edition has new regulation numbers in line with IEC numbers.

It will be suitable for learners following an electrical installation programme. It could be taught in conjunction with other hands on practicals in other subject areas that will be carried out in the workplace/workshop to reinforce the knowledge gained and augment this topic. The special locations to be considered within the unit are the most popular, and most likely to be encountered in the future. However the unit will also outline other less commonplace locations to ensure the leaner progresses through the unit with a knowledge base relevant of the level of study being undertaken

Learning Outcomes

On completion of this unit learners should be able to:

1. Understand the Electrical Installation Regulations applicable to wiring systems.
2. Understand the Electrical Installation Regulations applicable to wiring enclosures.
3. Explain the Electrical Installation Regulations applicable to special locations.

Unit: ETELE-406-1510 Transformation and Rectification

Unit level (MQF): 4

Credits : 6

Unit description

This Unit is designed to lead the student in an in depth study of the transformer including power transformers, and rectification circuits, which are used to transform (convert) alternating electrical energy (ac) to direct electrical energy (dc)in small transformer circuits.

Transformation - AC voltage is the standard form of electricity distributed to homes and offices. This energy is delivered as alternating current, which is not appropriate for electronic equipment, especially those which contain integrated circuits and memories. This is the core reason why arbitrarily alternating voltage is first shaped into a regular voltage in DC power supplies by a device called a transformer. Transformers are electrical circuits which convert alternating voltage from the wall into direct voltage and perform inclusion between input and output voltages respectively.

The process of rectification refers to the generation of direct current through a device called a rectifier. In a DC power supply, rectification is done after the shaping of alternate voltage, i.e., post-transformation. A rectifier is a set of diodes which takes its input as a waveform from a transformer and directs it in a single direction, either positive or negative. In simple words, the process of rectification serves as the base of DC power supplies, providing pulsating direct current for further processing.

This Unit is suitable for candidates wishing to embark upon a career in electrical and/or electronic engineering. Candidates will be able to understand the principles of operation of transformers and also of simple power supply circuits. It is envisaged that the unit will adopt both theoretical and practical approaches to the coverage of these areas.

Learning Outcomes

On completion of this unit learners should be able to:

1. Describe the theory of Electrical Transformation and undertake associated practical exercises and calculations.
2. Produce a transformer
3. Describe the theory of Electrical Rectification and undertake associated practical exercises and calculations.

Unit: ETELE-406-1511 Electrical Plant Maintenance

Unit level (MQF): 4

Credits : 6

Unit description

This Unit is suitable for those candidates who wish to learn about basic electrical plant maintenance, both on theoretical and practical basis

This Unit has been designed to introduce students to electrical plant maintenance and provide opportunities to develop their knowledge of safety procedures- in the context of general electrical safety and safety implications in the work undertaken. And specifically relevant regulations and codes of practice for the safe operation and maintenance of electrical plant and equipment.

This unit also explores systems of work used on electrical plant, this would relate to issues such systematic approaches to practical work to be undertaken. And a relationship to the concepts of various maintenance strategies - Planned Preventative, Reliability Centred and Condition Based maintenance. Students will also study the various factors involved in the maintenance of electrical equipment as well as the relative benefits of various maintenance methods and regimes.

Emphasis will also be place on fault diagnosis and probable causes and this would relate to electrical plant items such as -rotating electrical plant, transformers and switchgear.

In addition, students will be provided with the opportunity to demonstrate their ability to undertake safe maintenance procedures on electrical equipment, undertaking practical exercises, in this context the unit will utilize real examples and equipment to augment the learning process and give reality to the subject area of Electrical Plant Maintenance.

Learning Outcomes

On completion of this unit learners should be able to:

1. Identify the safety and operational measures to be taken when working on electrical plant and equipment.
2. Identify the factors to determine the maintenance requirement of electrical plant.
3. Explain the maintenance methods and the factors used in determining their selection for electrical plant and equipment.
4. Demonstrate basic routine maintenance and fault diagnosis on an item of electrical equipment.

Unit: ETELE-406-1512 Inspection and Testing

Unit level (MQF): 4

Credits : 6

Unit description

The unit will allow students to show competence, understanding and knowledge in the verification of Low Voltage Electrical Installations. BS 7671 Part 6 states that every electrical installation shall, either during construction, on completion, or both, be inspected and tested to verify, so far as is reasonably practicable, that the requirements of the Regulations have been met. In carrying out such inspection and test procedures, precautions must be taken to ensure no danger is caused to any person or livestock and to avoid damage to property and installed equipment. It is important that electricians are not just able to construct; they should also be able to recognise faults and take action to help prevent them. As such, using the correct means to test and inspect material is vital. Not all faults will be easily visible. Some will be concealed and only take effect over a long period of time. Regular inspection, tests and maintenance will limit such faults, this will form part of what the unit will consider.

The unit will address issues such as –the requirements and procedures for testing, to include Visual Inspection, Testing & Completion of Relevant Certificates, Schedules & Reports. Both Initial and Periodic Installations should be considered. Some of the inspection & Test Procedures can be introduced during practical work carried out within the unit. At this level, hands on Tests should be carried out on a new Installation as a starting point for the students to understand. This will enable the student to progress to the more advanced practical Involved in a periodic inspection if required. The unit will also describe and explain specific test requirements and their theoretical and practical application.

Learning Outcomes

On completion of this unit learners should be able to:

1. Explain the requirements and the procedures for inspection of an electrical installation.
2. Explain the dangers and the precautions / requirements necessary before testing an electrical installation.
3. Perform the tests necessary on a New Electrical Installation.
4. Complete the relevant Electrical certificates for a New Electrical Installation.

Unit: ETELE-406-1514 3 Phase Motors and Drives

Unit level (MQF): 4

Credits : 6

Unit description

The purpose of the unit is to address learners with little or no prior knowledge of electrical motors, but who wish to gain some basic knowledge and insight of these machines, and apply this knowledge to the selection of appropriate electrical motors for different industrial applications.

The principles of magnetism are central to many of the tasks you will carry out as an electrician or similar. Magnetism, like gravity, is a fundamental force. It arises due to the movements in electrical charge and is seen whenever electrically charged particles are in motion. The concepts of magnetism are crucial to understanding how machines and motors work. In essence there are two different categories of motor: those that run on direct current (DC) and those that run on alternating current (AC). As well as magnetic fields, it is also important to remember how current flow and induced motion operate, as together these make a motor rotate.

The Unit will introduce learners to both AC and DC electrical motors. The different types of AC and DC motors, as well as the operation, construction and characteristics of each type of these motors, to select the appropriate machine and enclosure for given industrial situations and to wire, connect, test and reverse an AC induction motor.

On successful completion of this unit learners will be able to describe the operation, constructional features and characteristics of different types of AC and DC motors and identify different rotor and stator parts for different types of motor. Utilise relevant practical data to select an appropriate: motor, enclosure, fixing method, drive method, starting method and motor controls. Wire, connect, test and reverse an AC induction motor, and draw circuit diagrams for a selection of different motors and controls.

The unit will allow learners to utilise the appropriate electrical units, symbols and unit-symbols. In addition to this also gain knowledge of the appropriate regulations concerning all aspects of motors and rotating machines.

Learning Outcomes

On completion of this unit learners should be able to:

1. Describe the construction features and operation of DC motors.
2. Describe the construction features and operation of AC Induction motors.
3. Select appropriate electrical motor and associated equipment for a specified industrial situation.
4. Wire, connect, test and reverse an AC induction motor.