Malta College of Arts, Science & Technology

MQF Level 4

EE4-A2-18
EE4-A2-18G

MCAST Advanced Diploma in Electrical Systems

Course Specification

Course Description

This course is intended for candidates who wish to embark on a career as technicians in electrical power systems, for both domestic and industrial sectors. The course has been designed to include requirements as set by the Regulator for Energy & Water Services (REWS) for Electrical Wireman's Authorisation A and Authorisation B. This provides candidates with a solid technical competence and understanding of the regulations and health and safety requirements governing the electrical installation industry.

This course also contains modules related to Photovoltaic systems, Building Services Engineering and Electronic Control Systems that give candidates a solid grounding in the engineering involved in the building services industry. Candidates will also receive exposure to Mechanical Workshop Practice for a more holistic training programme. Apart from preparing students to become fully fledged technicians, the course design also prepares grandaunts for further studies at degree level should they so desire.

Programme Learning Outcomes

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

1. *Work safely, communicate effectively in a team and take responsibility of work in an engineering context.*
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 switchgear.*

Entry Requirements

MCAST Diploma in Engineering (Electronics)
or
MCAST Diploma in Electrical Installations
or
MCAST Diploma in ICT
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
MCAST Diploma in Aircraft Maintenance
or

4 SEC/O-Level/SSC&P (Level 3) passes
Compulsory:
One subject from Mathematics or Physics
and
One subject from Engineering Technology, Design & Technology, Chemistry, Mathematics, Physics

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	Year
ETENG-406-1801	Engineering Science	6	1
ETELE-406-1804	Authorisation A Part 1	6	1
ETELE-406-1805	Authorisation A Part 2	6	1
ETELE-406-1810	Authorisation B Part 5	6	1
ETMEC-403-1801	Mechanical Workshop	3	1
ETH&S-403-1801	Health and Safety	3	1
ETELX-406-1801	Analogue Electronics 1	6	1
CDKSK-406-2007	Mathematics	6	1
CDKSK-406-2001	English	6	1
ETELE-406-1806	Authorisation B Part 1	6	2
ETELE-406-1807	Authorisation B Part 2	6	2
ETELE-406-1809	Authorisation B Part 4	6	2
ETMTH-406-1617	Mathematics for Engineering	6	2
ETELE-406-1811	Testing of Systems and Documentation	6	2
ETELX-406-1511	Power Electronics	6	2
ETRES-406-1801	Renewable Energy Systems and PV Installation-Single Phase	6	3
ETBSV-406-1801	Building Services Engineering	6	3
ETELX-406-1804	Electronic Control Systems	6	3
ETELE-406-1808	Authorisation B Part 3	6	3
CDKSK-404-1915	Employability and Entrepreneurial Skills	4	3
CDKSK-402-1914	Intrapersonal and Interpersonal Skills	2	3
ETCMP-406-1605	Vocational Competences in Electrical Systems	6	2/3
	Total ECVET	**120**	**/**

Unit: ETENG-406-1801 Engineering Science

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will expose the student to the basic principles of Science necessary to support other engineering units. It will specifically delve into the underlying physics and chemical concepts which would be essential to understand the engineering knowledge concepts.

This unit will start by outlining the principles of physics underlying the basic electrical AC and DC concepts. It will then go on to explain the fundamental differences between Insulators and Conductors as well as outline the basic circuit theorems.

Another area of relevance to this unit would be the electrostatics and electromagnetic induction on which the student would then be able to build further technical knowledge.

The final part of the unit is aimed to give the student a solid understanding of materials including their chemical properties. This would allow the students to have sufficient knowledge required when selecting the proper material to use for particular applications.

As all the other units in this course this unit is expected to include a strong practical component.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Understand the basic physical principles of electricity and the basic concepts of AC and DC.*
2. *Understand the physical differences between insulators and conductors.*
3. *Perform basic calculations by applying Ohm's Law and other circuit theorems.*
4. *Understand and apply the basic principles of electrostatics and electromagnetic induction.*
5. *Describe different materials and their chemical properties.*

Unit: ETELE-406-1804 Authorisation A Part 1

Unit level (MQF): 4

Credits: 6

Unit Description

This unit leads the student to understand the basic concepts of simple single phase standard electrical circuits commonly used in domestic installations. Assessment of load maximum demand and use of diversity factors are important concepts in the design of electrical installation circuits. This unit gives the student the background knowledge to design reliable and safe electrical systems.

To do this the student learns to design systems which sustain the design load currents, prevent fire risks, and ensure that faults are cleared if the case requires. Standard methods of labelling are also thought and also circuit cable design with the inclusion of simple voltage drop calculations.

The unit will also detail how a single phase 40A consumer unit need to be set up with the relevant metering and protection switchgear in place. Standard colour coding will be used throughout all circuits and will also be introduced to the learner in the three phase scenario.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Carry out installations of single phase final circuits commonly used in domestic installations.*
2. *Install all the control / protection required for a single phase domestic installation and calculates the supply Maximum Demand with the use of Diversity.*
3. *Design a domestic electrical supply circuit from protection to load; taking discrimination, circuit cable design and voltage drop into consideration.*
4. *Understand earthing systems and their applications for single phase and three phase installations up to 300A.*

Unit: ETELE-406-1805 Authorisation A Part 2

Unit level (MQF): 4

Credits: 6

Unit Description

This unit starts by looking at the fundamental laws of magnetism and then continue on to simple transformers, where one will be led to understand the principles of operation. The student will look into simple construction details of core and shell type transformers. The concepts underpinning the transformer's operations will be essential for the learner to understand the principles of operation of various electrical and electromechanical devices.

Different cable systems will be looked into and practiced to give the student knowledge in industrial installations, such as small garages and workshops. Earthing and bonding will also be practiced during these practical tasks. Earthing will then be discussed in more detail in further units.

The next topic will then be to look into protective gear where the student will look into various types of over-current protection, earth leakage protection and overvoltage protection.

The unit will finally conclude by looking at micro-renewable energies, efficiencies of appliances and buildings.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Use electrical and magnetic principles to understand transformer principles.*
2. *Install different cable systems for garages and small workshops.*
3. *Apply the operating principles of different protective devices in circuits` protection design.*
4. *Understand modern efficient technologies available for use.*

Unit: ETELE-406-1810 Authorisation B Part 5

Unit level (MQF): 4

Credits: 6

Unit Description

The days where an electrical installation was all about carrying the task and simply making sure that all systems work are over. In today's engineering world, the electrician needs to be familiar with the requirements of law and regulations that regulate the trade.

This unit is designed to offer the learner the possibility to understand the legal framework and main requirements related to electrical installation work. It gives an overview of the local legislation as well as foreign requirements that bind electrical installations and their applications and implications at work.

This unit also has a practical part. The learner is given the opportunity to understand the purpose, operation and requirements of an earthing system. It delves the setup of the system and other requirements such as methods of earthing, cable sizing and other regulations that surround the earthing system.

The final part of the unit deals with special locations. Such locations require special attention mainly due to their particular environmental conditions which make such places riskier. The study of these special locations is about making the electrical system safer. Such locations include zones with damp conditions and construction sites amongst others.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Recognise the electrical legislation framework.*
2. *Understand the purpose of earthing and assemble and test earthing systems.*
3. *Understand the increased risk of shock and apply the necessary electrical safeguards required to ensure safety.*
4. *Recognise the added dangers and electrical requirements of special locations.*

Unit: ETMEC-403-1801 Mechanical Workshop

Unit level (MQF): 4

Credits: 3

Unit Description

This unit is designed exclusively for electrical learners who do not have any experience in engineering workshop practice. It is a skills/theory based unit and will allow learners to demonstrate they have the necessary skills to be able to use machinery and hand tools competently and safely by developing an understanding of the methods used for component manufacture and the use of planning methods and functions for practical and safe business use.

The electrical systems learner will need to be able to manufacture metal items at particular points of his career, such as cable trays, racks, enclosures, cleats and other ancillary items. Therefore, the aim of this unit is to provide electrical learners with the opportunity to develop basic knowledge and skills that are important in a mechanical engineering environment.

Learners will also familiarise themselves with key engineering materials and how these are applied in everyday life. They will carry out techniques commonly used in mechanical engineering workshops to learn how to handle tools, equipment and machinery safely and correctly. While learning these skills and techniques, learners will have the opportunity to fabricate a basic mechanically working device that can be integrated with other areas of engineering.

Learners will carry out planning and observation tasks to prepare the machinery for production or sharing with other users.

Finally, learners should have the underpinning knowledge and understanding to check completed PPE is worn or used at all times and understand the benefits it offers.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Know and apply basic metal forming techniques using the correct tools and equipment.*
2. *Understand and apply basic Oxy-Acetylene or plasma cutting and MMA welding to cut and join steel plates.*

Unit: ETH&S-403-1801 Health and Safety

Unit level (MQF): 4

Credits: 3

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. This unit is intended to be delivered as an intensive 3 credit module to all Level 4 Electrical and Electronics students. This will give them the tools required to work safely in their chosen fields.

The unit seeks to highlight the fact that 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.

The unit is intended to be delivered as practical unit with realistic visits to workshops on MCAST campus in view to conduct assignments such as risk assessments.

Coupled to this 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.

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.*

Unit: ETELX-406-1801 Analogue Electronics 1

Unit level (MQF): 4

Credits: 6

Unit Description

Electronics and electronic devices are used in a wide range of manufactured products. From everyday popular items such as mobile telephones and cameras to the robotics used in industry, jet aeroplanes and medical equipment, the use of electronics is continually growing.

The two major uses of electronic devices is in handling signals by amplifying and switching, resulting in 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 mechatronic systems.

This unit aims to give learners a practical introduction to basic discrete electronic devices and analogue principles. This will build learners' confidence in their ability to simulate and test a variety of electronic circuits.

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 analogue circuits, their structure, their operation and the way in which they are differentiated from each other.

Besides building and testing electronic circuits on a breadboard and veroboard, learners will also be exposed to computer-based circuit design and simulation software packages that will allow them to understand the first steps of building and testing electronic circuits.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Understand the function and operation of basic electronic components.*
2. *Apply the concepts of basic electronic devices to understand the operation of basic analogue electronic circuits.*
3. *Investigate, describe and demonstrate the operation and applications of identified discrete transistor amplifier circuits.*
4. *Simulate, construct and test simple analogue electronic circuits.*

Unit: ETELE-406-1806 Authorisation B Part 1

Unit level (MQF): 4

Credits: 6

Unit Description

Electricity is becoming more important in modern industry. Control systems are becoming more efficient and accurate. Control systems are intended to support larger power systems. Three phase systems form the backbone of electrical power systems.

This unit is intended to introduce the topic of three phase systems to the learner. It provides basic but adequate information for a learner to face everyday issues in industry. The unit gives adequate skills to the learner to understand the performance of a three phase system.

Upon completion of this unit, the learner will become able to assess the system performance, connect three phase loads like motors and heaters, and carry out power factor improving methods for optimum performance of the system. The learner will be also able to discuss the negative impact of low power factor and suggest methods of how and why to improve the power factor.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Carry out calculations on Star and Delta connected 3 phase loads including the design of representative phasor diagrams.*
2. *Demonstrate the concepts of inductive loads, capacitances, charge and potential, use of capacitors in three phase a.c. and know how to calculate impedance in relation to the frequency.*
3. *Understand the concepts of Apparent, Reactive and True Power.*
4. *Calculate successful power factor correction methods based on three phase systems.*

Unit: ETELE-406-1807 Authorisation B Part 2

Unit level (MQF): 4

Credits: 6

Unit Description

The unit starts by looking at the principle concepts of the Enemalta electricity distribution system whereby the student will understand the operation of the key concepts underpinning the Maltese Electrical Distribution network. The student will then learn about the sequence of control and protection used in the consumer's premises.

The unit will provide competence, understanding and knowledge of common Switchgear and protection methods including prospective short circuit (kA) and prospective earth fault currents, leakage currents, arc faults, surge protection and overvoltage protection that are popular in LV Electrical Installations and in accordance with the IET and local regulations. The importance of balancing three phase loads will also be looked into where monitoring of the neutral current will be discussed.

Proper cable selection is imperative as inappropriate cable selection leads to fire and electric shock. Cables come as either single or multicore. Both have an overall mechanical protection to keep all the associated cables together and to provide at least a minimal degree of 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 formulae 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. Factors such as voltage drop will also be taken into consideration and other factors such as harmonics and thermal constraints will be discussed. Re-calculation may be necessary if any part of their calculations fail to comply with stipulated regulation requirements.

Assessment of loads, maximum demand, diversity factors and diversity will be discussed to evaluate technically and financially the choice between single phase and three phase electricity service requirements. Energy efficiency in buildings and schemes towards this topic will also be discussed.

It is envisaged that the unit will be mainly theoretical in nature, but visual aids, actual cable samples and industrial visits should be utilized to reinforce learning involved with the subject.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Understand the principles of the Enemalta electricity distribution systems, including the sequence of installation of equipment, in single-phase and three-phase installation scenarios up to 300A.*
2. *Understand the terminology associated with, and the different types of consumer protection and switchgear including their application.*
3. *Choose appropriate cables and calculate cable sizes in single-phase and three-phase installations for various different circuits taking into consideration the rating factors and voltage drop for loads up to 300A.*
4. *Calculate maximum demand with the use of diversity factors for three-phase installations.*
5. *Discuss energy efficiency in installations including the possibility of government schemes in the use of electricity.*

Unit: ETELE-406-1809 Authorisation B Part 4

Unit level (MQF): 4

Credits: 6

Unit Description

Many processes in industry require some kind of movement. This may be moving objects from one point to another. This may be done using a conveyor or a lifting device. Other processes may need to transfer fluids from a level to another or to increase the pressure of the fluid. There are other processes of different magnitudes that require motion.

In older days, the primary motion used to be a long shaft running through a workshop, driven at one end by a mechanical engine. Machines were connected to the shaft by belts.

Today electric motors are the working horse to provide drive power for many machineries. This is due to their efficiency, cost effectiveness and practicality of the system.

This unit tends to give the learner adequate material to understand the theory behind ac induction motors. It also provides information about different motor starters including any devices used. The unit starts with magnetic theory and is followed by ac motor theory. The unit becomes more hands on when discussing three and single phase induction motors, their respective starters and regulations that effect motor installations. The learners are expected to show their knowledge through practical work by assembling a motor starter.

Finally, learners are also exposed to different transformers like double wound and auto transformers as well as instrument transformers like VTs and CTs and their application with energy meters and maximum demand meters.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Demonstrate the principles of magnetism, magnetic circuits, electromagnetism and electromagnetic induction and the principles of operation of transformers.*
2. *Explain the principle of operation of motors, in particular the operation of three and single phase induction motors.*
3. *Discuss the methods of control of ac induction motors and the relevant regulations.*
4. *Describe the use of instrument transformers with measuring instruments.*

Unit: ETMTH-406-1617 Mathematics for Engineering

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 other units within the program of study. Delivery of the unit should be set within the engineering context.

The learner will be able to understand and apply algebraic techniques to manipulate expressions and solve algebraic equations commonly found in engineering. This includes linear simultaneous equations, logarithmic equations, exponential equations and series. Furthermore, the learner will also learn that algebraic equations can also have complex roots whenever an algebraic expression is found not to have real roots.

This unit was also designed to deal with geometric and trigonometric analysis to give an extra tool to the learner in how to deal with sides, angles, perimeters, areas and volumes. Furthermore, the learner will also know how to find the surface area of irregular shapes by applying numerical integration and by definite integration. All of this will be applied to engineering contexts.

Part of the syllabus will deal directly with graphical techniques in which the learners will further their studies by introducing higher order equations, trigonometric and logarithmic equations. They will also learn how to solve equations graphically and hence how to find the gradient at a point by using differential calculus.

On successful completion of the unit the learner will be equipped with sufficient mathematical skills to be able to deal with mathematical competencies found in the vocational units at level 4 and even further studies at higher levels.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Apply algebraic techniques to manipulate expressions and solve equations.*
2. *Apply techniques to manipulate complex numbers and series.*
3. *Apply trigonometric techniques to solve engineering problems.*
4. *Apply geometric techniques to solve engineering problems.*
5. *Apply graphical techniques to solve equations.*
6. *Apply calculus to solve practical problems.*

Unit: ETELE-406-1811 Testing of Systems and Documentation

Unit level (MQF): 4

Credits: 6

Unit Description

The production of good quality documentation is an essential duty of Electrical Systems professionals. This entails the production of high quality electrical drawings. In today's world, Computer-Aided Design (CAD) technology has become a useful tool for Building Services Engineering. The student will be thought how to read the architect's drawings and how to prepare electrical drawings including specifications and bill of quantities. They will also learn how to provide as fitted drawings on such plans using CAD.

The unit will allow learner 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 however some will be concealed and only take effect over a long period of time. Regular inspection, tests and maintenance will limit such faults and 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 learner 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 including their theoretical and practical application.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Use CAD to produce 'as fitted' Electrical Drawings and Bill of Quantities.*
2. *Explain the requirements and procedures for Initial Verification, Inspection & Testing of an electrical installation, taking into consideration all the safety factors and precautions.*
3. *Perform the Inspection and Testing necessary for Initial Verification on a New Electrical Installation.*
4. *Prepare and complete the relevant Electrical Certificates and Maintenance Schedule for an Electrical Installation.*

Unit: ETELX-406-1511 Power Electronics

Unit level (MQF): 4

Credits: 6

Unit Description

This unit aims to give learners an understanding of basic principles of Power 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 power electronic circuits.

The learners are first introduced to the different types of power electronic device which form the building blocks of power electronic circuits. They study the reason why these circuits are used, their structure, their operation, the way in which they are differentiated from each other, their applications and their electrical and thermal protection methods.

Once they have a firm grasp of power electronic devices the learners are introduced to the power electronic circuits that they are used in. They will examine in detail their configuration, operation and applications. Direct Current, Single phase alternating current and three phase alternating current circuits are examined.

The learners then move onto using the basic design calculations that will allow them to predict a circuits operation to meet a given specification.

The circuits are then operated and tested by the learners who will gather results to confirm their theoretical predictions.

Modern design tools involving electronic computer aided design, schematic capture and simulation will be employed by the students at all stages throughout the course.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Describe the purpose, structure, operation, transfer characteristics, applications and protection requirements of identified power semiconductor devices.*
2. *Explain the configuration, operation and application of simple power electronic convertor circuits.*
3. *Calculate the mean operational output voltage and output current of simple power electronic convertor circuits to meet a given specification.*
4. *Verify that the mean operational output voltage and output current of simple power electronic convertor circuits meets a given specification.*

Unit: ETRES-406-1801 Renewable Energy Systems and PV Installation - Single Phase

Unit level (MQF): 4

Credits: 6

Unit Description

When mankind was using much less machinery, seldom do we find references or concern about environmental issues. With the developments following the industrial revolution, increasing economic necessities took a forefront role at the cost of environmental issues. In modern days there is a drive to balance the economic needs against environmental requirements.

Renewable sources of energy are often a balanced solution. Such sources of energy are highly dependable on the local ambient conditions. This new method of generating electrical energy has introduced a branch in engineering that requires special attention.

This unit is intended to offer adequate knowledge and skills for technicians working in the sector of renewable energy sources with a major interest in photovoltaic (PV) cells. It introduces different PV technologies available and instruct about the complete installation of the systems. The unit also exposes the learner to the legal framework surrounding PV installations, with particular reference to local regulations and requirements.

At the end of the unit, learners are invited to display their knowledge in practice by building an assembly of a PV system to the required standards.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Review regulations related to connecting renewable electrical sources to the national grid.*
2. *Describe different renewable technologies suitable for the local market.*
3. *Build a functional PV system.*
4. *Test a photovoltaic system.*

Unit: ETBSV-406-1801 Building Services Engineering

Unit level (MQF): 4

Credits: 6

Unit Description

Building styles and building requirements have changed over the years. By time new ideas and new systems have been introduced to make new buildings more comfortable for the users. The electrical and water supply were the first commodities that were introduced during this evolution, but other systems such as air conditioning, escalators etc., have been introduced later.

During this module, the learner will learn the symbols used in engineering drawing to be able to understand and interpret installation procedures. The learner will than have some basic information of how different systems work. This will include systems such as electricity, water installation, telecommunication and internet, air conditioning and ventilation systems, fire protection etc.

Finally, the learner will learn about the relationship between the systems involved. The learner will also be given a general understanding of Building Management Systems (BMS) and software to monitor and control.

This unit is intended to give information related to either general or complex systems, as well as smaller or bigger constructions.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Read and interpret engineering drawings of different building services.*
2. *Describe building services systems by illustrating basic block diagrams.*
3. *Distinguish the function of various components in building services.*
4. *Understand the BMS and its functions to control and monitor all the systems installed.*

Unit: ETELX-406-1804 Electronic Control Systems

Unit level (MQF): 4

Credits: 6

Unit Description

This is a practice-based unit to develop learners' underpinning knowledge and enable them to demonstrate practical skills which are then applied to program three-term controllers and also to design, operate and test electronic control systems.

The learners are first introduced to the concept of an electronic system in terms of input, process and output. The learners then move on to study the main components that constitute an electronic control system and the flow of signals through the system including the concept of feedback. The operation and application of a range of analogue and digital sensors transducers and actuators used on the inputs and outputs of electronic control systems are then introduced to the learner.

On completion of the unit learners will know about various types of control systems and their utilization in the industrial world and be familiar with the both open and closed loop systems as well as becoming familiar with different control system types and their applications.

Learners will gain vast knowledge regarding the operational characteristics of the three term controllers and the various tuning methods involved to tune the controllers in order to have the stable and optimum transient response of the system. Learners are encouraged to familiarize themselves with various types of microcontrollers that can be used for electronic control systems.

Finally, the learners will be introduced to the construction and operation of simple control circuits using the sensors, transducers, actuators and control strategies previously studied.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Explain the purpose, structure and operation and also the main components that constitute an electronic control system and the flow of signals through the system.*

2. *Explain the operation, technical characteristics and application of analogue and digital sensors, transducers and actuators.*
3. *Analyse the operation and behaviour of sequential, open loop, closed loop and on/off control systems using simple mathematical modelling.*
4. *Construct and operate simple control closed loop control circuits using sensors, transducers, actuators and control strategies to meet a given specification.*

Unit: ETELE-406-1808 Authorisation B Part 3

Unit level (MQF): 4

Credits: 6

Unit Description

Accidents at work may result in deaths and therefore occupational health and safety is not to be taken lightly. It affects everyone in the workplace in all aspects of work and in all environments. We will be looking at the occupational health and safety from the electrical installations aspect as the legal part of health and safety is covered by another unit.

All cable insulation requires mechanical protection and the electrician must be able to carefully select and install the types of wiring systems and methods of containment and support, depending on the many influencing factors. Through this unit, candidates will obtain the competence, understanding and knowledge for the installation and termination of an array of cable systems according to the IET and local regulations.

The unit will also provide competence, understanding and knowledge of common Switchgear and protection methods including prospective short circuit (kA) and prospective earth fault currents, leakage currents, arc faults, surge protection and overvoltage protection that are popular in LV Electrical Installations and in accordance with the IET and local regulations. The importance of balancing three phase loads will also be looked into where harmonics and monitoring of the neutral current will be discussed. Various enclosures and their applications including the index of protection will also be discussed.

The student will understand the meaning of earth fault currents and look into the design, including calculations to ascertain that such faults do not degrade the system and that the protection performs correctly within the scope of the IET and local regulations.

Learning Outcomes

On completion of this unit learners should be able to:

1. *Demonstrate safe working practice and understand the importance of First Aid.*
2. *Choose appropriate wiring systems and installation methods taking into consideration mechanical protection and containment capacities.*
3. *Choose the appropriate type of consumer protection and switchgear.*
4. *Determine fault currents and select suitable protective conductors.*