MCAST

Malta College of Arts, Science & Technology

MQF Level 4

MCAST Advanced Diploma in Building Services Engineering

CE4-A7-19

Course Description

This course enables learners to enter the industry of building services engineering to support in areas such as design, systems' installation and facilities management. Training is provided in a wide range of building services systems in both Mechanical and Electrical fields. The theme of energy conservation and environmental impact is present throughout. This enables students to carry out duties at a technical level. Qualified technicians are continuously required in building services design offices and/or installation companies working with new installations and/or existing installations that require upgrading to conform with new legislation.

Programme Learning Outcomes

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

1. Explain responsibilities of employers and employees under current health, safety and welfare legislation

2. Identify main equipment, media and techniques in the production of drawings to detailing building services systems and processes

3. Calculate final quantities from dimensions and descriptions of construction and building services systems

4. Apply scientific principles to provide a comfortable internal environment using natural and building services systems including heating, ventilation and air-conditioning designs.

Entry Requirements

MCAST-BTEC First Diploma in Construction
or
MCAST-BTEC Diploma in Construction
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 Electrical Installations
or
MCAST Diploma in Engineering (Electronics)
or
MCAST Diploma in Mechanical Engineering
or
MCAST Diploma in Construction Engineering
or
4 SEC/O-Level /SSC&P (Level 3) passes
Compulsory: Mathematics
Preferred: Physics

Current Approved Programme Structure

Unit Title	ECVET/ECTS
Health ,Safety & welfare for Construction and the Built Environment	6
Science and Materials for Construction and the built Environment	6
Project Management in Construction and the Built Environment	6
Graphical Detailing in Construction and the Built Environment	6
Computer Aided Drafting and Design for Construction	6
Electrical Principles in Building Services Engineering	6
Sustainable Construction	6
Tendering and Estimating in Construction	6
Science and Measurement within the HVACR Industry	6
Refrigeration Technology	6
Plumbing Technology in Building Services Engineering	6
Electrical Installation Standards and Components in BSE	6
Mathematics for Mechanical and Construction Engineering	6
Programmable Logic Controllers and BMS	6
Ventilation and Air Conditioning Technology	6
Electrical Theory and Installation Technology	6
Mathematics	6
English	6
Entrepreneurship	6
Vocational Competences in Construction Engineering	6
Total ECVET/ECTS	**120**

Computer Aided Drafting and Design for Construction

Unit level (MQF): 4

Credits: 6

Unit Description

Nowadays, computer-based technology has facilitated a lot of construction related tasks, ranging from the off-site fabrication of reinforced concrete slabs using dedicated computer numerical controlled machinery to the generation of drawings of buildings. The latter is just one of the capabilities of Computer-Aided Design and Drafting (CADD) technology. This course is intended to anyone who is seeking to acquire skills in basic two-dimensional (2D) and three-dimensional (3D) modelling features of CADD, and who is interested in applying the potential of this technology in the construction industry.

This is a learning-by-doing type of unit and it will provide learners with the opportunity to apply the skills they have learnt to produce accurate detailed drawings, 3D virtual and physical models. The advantages of using CADD technology over manual drawing techniques will be explained at the outset of this unit. Learners will acquire knowledge on the software and hardware requirements needed to run and use effectively a CADD package. One of the most widely used CADD software is *Autodesk® AutoCAD®*. Although this software will be employed in this unit, by the end of this study unit, learners will be able to acquire knowledge on the underlying principle of and the basic skills to apply 2D and 3D modelling functions found across different CADD software packages. Exemplars of such skills include the generation of simple 2D shapes from basic functions (e.g. line, arc), modifying such shapes, manipulate object properties (e.g. layers), annotating drawings with dimensions, text and hatching patterns, inserting and creating blocks in a drawing, using basic functions (e.g. 3D primitives) and applying other 3D modelling function (e.g. extrude) to produce 3D virtual models. In addition, learners will be able to independently select the appropriate CADD functions for the task at hand. Furthermore, learners will be equipped with the necessary skills to independently produce scaled drawings with all required dimensions and other basic information deemed useful by the architect for the completion of a project. Last but not least, learners will gain knowledge on how to obtain a 3D physical scale model on a 3D printer directly from the corresponding 3D virtual model of a building.

Learning Outcomes

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

1. *Describe the advantages of using CADD, compared to manual drawing techniques and the basic hardware and software requirements to install and use a CADD software package.*
2. *Use a CADD software to generate accurate detailed drawings related to the construction industry.*
3. *Use a CADD software to generate and manipulate virtual 3D models of buildings.*
4. *Use a CADD software to plot detailed drawings and obtain a 3D physical scale model directly from the corresponding 3D virtual model of a building.*

Graphical Detailing in Construction and the Built Environment

Unit level (MQF): 4

Credits: 6

Unit Description

The unit gives learners the opportunity to produce two and three dimensional graphical drawings and details for implementation on building construction sites along with the formulation of schedules and specification documents relating to steel fabrication, reinforced concrete construction and timber detailing. Learners will use the techniques acquired to aptly produce line drawings for layout and fabrication purposes with annexed specifications and schedules where necessary. They need not have any prior experience in the field although a background in technical drawing is preferable.

Drawings form the backbone of any architectural project and are used in numerous ways during different phases of a project. Towards the latter stages of conceptualisation, drawings are required to show methods of construction and final dimensions for fabrication or setting out. Annotations are also used to make reference to workmanship and/or materials with the intention that the drawings may then be used autonomously as a basis for construction.

Learners will learn how to choose appropriate layouts for their drawings, choice of scales and proportions to be used, correct choice of line widths, graphic symbols and annotations.

Learners will also comprehend the importance of checking completed drawings and documents for accuracy in both graphical representation and specification. Drawings annexed to contracts are often legally binding and a poorly detailed or wrongly annotated drawing will usually become apparent in the resulting project.

Learning Outcomes

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

1. *Demonstrate a good knowledge of equipment and techniques used to produce graphical information documents.*
2. *Evaluate and explain information contained in graphical drawings, details, schedules and specifications.*
3. *Produce graphical drawings, details, schedules and specifications by means of manual drafting techniques.*
4. *Identify and utilise manual techniques used to produce stone masonry elements such as arches and portals.*

Sustainable Construction

Unit level (MQF): 4

Credits: 6

Unit Description

The aim of this unit is to enable learners to understand the impact of building construction activities on natural environment. Learners will find out about how the natural environment can be protected against these activities using the sustainable construction techniques.

The construction industry poses a major potential pollution threat to our environment and this unit will provide a fundamental understanding of how the activities of the construction sector impact on the natural environment. The techniques, processes and procedures used to protect the natural environment are investigated and the advantages of adopting a sustainable approach to construction work are explored in the contexts of energy, materials and waste.

Learning Outcomes

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

1. *Know the important features of the natural environment that need to be protected.*
2. *Understand how the activities of the construction and built environment sector impact on the natural environment.*
3. *Understand how the natural environment can be protected against the activities of the construction and built environment sector.*
4. *Understand sustainable construction techniques that are fit for purpose.*

Tendering and Estimating in Construction

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will allow learners to demonstrate their knowledge and understanding of estimating and tendering within the construction industry. It has been devised to help learners to demonstrate an ability to apply basic estimating and tendering concepts to the construction industry, including basic information required to produce a tender, different types of tender documentation and calculation of unit rates, through to producing a tender for a specific construction trade or element. It is a unit with considerable practical content.

The unit is relevant to learners wishing to develop their knowledge of estimating and tendering concepts and principles. On completion of the Unit learners will understand the principles that underpin construction and civil engineering projects, with knowledge of the personnel, procedures and documentation involved in the tendering and estimating process. This Unit will provide the Learner with an understanding of tender documentation and the scrutiny required, the gaining of further information (including site visits), the measurement process, bills of quantities, building up rates (including the importance of software) and the conversion of an estimate to a tender. The learner will also be able to apply, analyse and evaluate the effects and implications upon the tendering process of the differing range of project types and tender documentation. The learner will be able to produce a basic tender for a small construction project, making use of available data and possibly software packages, developing the understanding, knowledge and skills required to produce them.

Finally, learners should have the underpinning knowledge and understanding of the construction industry, construction technology and of measurement/quantification of building and civil engineering works. In addition, an appreciation of currently used contract conditions would be beneficial.

Learning Outcomes

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

1. *Describe the basic information required to produce a tender.*
2. *Explain how to use different types of tender documentation.*
3. *Calculate Unit Rates for an element or trade section of a bill of quantities.*
4. *Produce a tender for a specific construction trade or element.*

Electrical Theory and Installation Technology

Unit level (MQF): 4

Credits: 6

Unit Description

This unit has been designed to enable learners to understand the relationship between electrical scientific principles and the competencies required of an operative working within an electrical environment. The aim of the unit is to give the learner an understanding of the electrical principles, installation methods and terminology used within the HVAC industry.

The learner will begin with obtaining core knowledge of the mathematical principles required to work in an electrical engineering environment. The learner will be given the opportunity to apply the mathematical principals learned to problem solving situations within electrical engineering. The learner will obtain knowledge of the scientific principles of electrical engineering, this will include the units used in electrical engineering, electron flow theory and the relationship between power, work, force and energy. The learner will gain an understanding of the relationship between magnetism and electricity and from this gain an understanding and core knowledge of electricity production and electrical motors. The learner will examine and gain knowledge of AC theory including the sine wave generation for both single phase and three phase systems, the complexities of inductance, capacitance and impedance. The learner will learn to identify electrical components including but not limited to fuse types, circuit breakers, RCDs and RCBOs. The learner will gain a knowledge and understanding of the wiring systems used within electrical installations and will examine the different types of distribution boards and discrimination between safety devices.

Overall the learner will gain an in-depth knowledge and understanding of the theory needed to work in electrical environments in a HVAC industry. The learner will be given the opportunity to demonstrate the skills and ultimately prove competence in an electrical environment using hands-on tasks built to assess the learner's ability.

Learning Outcomes

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

1. *Apply mathematical principles which are appropriate to electrical installation, maintenance and design work and electrical safety principles.*
2. *Describe and apply standard units of measurement used in electrical installation, maintenance and design work.*

3. *Explain basic mechanics and the relationship between force, work, energy and power.*
4. *Describe the relationship between resistance, resistivity, voltage, current and power*
5. *and the fundamental principles which underpin the relationship between magnetism and electricity.*
6. *Explain electrical supply, distribution systems and earthing systems.*
7. *Explain how different electrical properties can effect electrical circuits, systems and equipment.*
8. *State the operating principles and applications of DC machines and AC motors.*
9. *Describe the operating principles of different electrical components and circuits.*
10. *Explain the principles and applications of electrical heating, domestic refrigeration wiring and thermo-electric systems.*
11. *Describe the types, applications and limitations of electronic components in electro-technical systems and equipment.*
12. *Commission and test a range of electrical installations.*

Electrical Principles in Building Services Engineering

Unit level (MQF): 4

Credits: 6

Unit Description

Knowing how electricity works is essential when designing, installing, testing and inspecting electrical installations. The unit deals with the fundamental principles of electricity which in turn will give students an understanding of the operation and behaviour of electrical components and circuits when various voltages are applied.

This is a theory based vocational unit divided into four general areas concerning electrical science and physics. The unit is mathematically based involving several formulae and calculations. The unit is relevant to those requiring knowledge of how electricity makes things work. On completion of the unit students will have gained an insight into the principles behind the background physics without which these systems could not operate.

This unit involves the use of mathematics and several formulae are required to aid problem solving. The learner should be familiar with basic maths, and how to use basic functions on a calculator. Some more advanced functions will be covered throughout the unit. An ability to apply and transpose mathematical formulae is a must for anyone studying this unit.

The unit can be studied as a standalone entity though it will help later when designing electrical installations and control systems whilst keeping in mind relevant legislation and codes of practice.

Learning Outcomes

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

1. *Determine the values of electrical quantities using appropriate formula and measuring instrumentation.*
2. *Explain the principles of electricity and its applications.*
3. *Design and draw simple single-phase and three-phase a.c. circuits.*
4. *Explain the operating principles and practical applications of transformers and rotating machines.*

Electrical Installation Standards and Components in Building Services Engineering

Unit level (MQF): 4

Credits: 6

Unit Description

This is a theory based unit divided into five general areas concerned with electrical installations within buildings. As building services engineers involved in the design and installation of the electrical and other building services such as HVAC a knowledge of the operational principles of the various components, materials and installation methods used electrical services in buildings is a must.

This unit is intended for those with responsibility for aspects of the design and installation of electrical systems within building services. The unit presents an excellent insight into the practicalities of design, safety considerations, selection and erection of systems and components without too much detail into the background principles and physics.

On completion of the unit learners will be able to make informed judgements on the advantages and dis-advantages of various wiring techniques and safety strategies depending on the intended use of the installation with consideration given to the environmental conditions within which the installation has to operate.

Learning Outcomes

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

1. *Apply requirements regarding legislation applicable to electrical installations.*
2. *Select electrical equipment with due consideration given to the intended use and environmental conditions.*
3. *Choose electrical safety systems with due consideration of their advantages and disadvantages.*
4. *Apply knowledge gained in this unit to the requirements and design of final circuits.*

Programmable Logic Controllers and BMS

Unit level (MQF): 4

Credits: 6

Unit Description

This unit has been designed to enable learners to develop the skills and competencies required to work in the HVAC industry. In this unit the learners will be introduced to Semi-conductor materials and the science associated with the electronics industry. Learners will then examine electronic components used in small scale circuits to larger components used in power electronics. Learners will be equipped with the knowledge and skills that will enable them to design and build their own electronic circuits.

The unit will also focus on Logic, a fundamental requirement before working with programmable logic controllers. In studying logic learners will cover number bases from binary to hexadecimal. Furthermore, the learner will introduce to logic gates, logic ladder diagrams and Boolean algebra.

Using the knowledge gained from the logic learning outcome the unit will now focus on transducer and sensors used within the industry. The learner will be introduced to the huge variety of transducers used to measure temperature to fluid flow amongst others. The learner will also be reacquainted with system feedback and analogue and digital systems. Lastly in this part the learner will be tasked with developing electrical and electronic circuits containing transducers.

Learners will now examine the role played by programmable logic controllers in industry. Programmable controller construction will be examined and the main parts will be studied more closely. Learners will be introduced to the working principles of programmable logic controllers and the differing programming techniques commonly used.

Finally, the learner will examine building management systems and the role they play within the HVAC industry. The learner will be shown the common layout of BMS systems and common controls, components and techniques used for building control. Lastly, the learner will be given the opportunity to have an in-depth look at BMS control circuits and ladder diagrams

Learning Outcomes

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

1. *Demonstrate an understanding of electronic principles and semi-conductor materials.*
2. *Demonstrate an understanding of electronic components and power electronics.*
3. *Demonstrate an understanding of logic.*
4. *Demonstrate an understanding of process control and transducers.*
5. *Demonstrate a working knowledge of programmable logic controllers.*
6. *Demonstrate a working knowledge of HVAC controls and BMS.*

Health, Safety and Welfare for Construction and the Built Environment

Unit level (MQF): 4

Credits: 6

Unit Description

This unit enables learners to know the responsibilities of employers and employees to take measures against risks and hazards in their work environment. They will learn the legal requirements imposed by the current rules and regulations. Learners will gain knowledge of how to undertake risk assessments, record accidents in the accident book and follow the reporting procedures. High standards of health, safety and welfare should be maintained during all stages of a construction project within the legal frame work. The health, safety and welfare should be the prime concerns of employers, employees, visitors and the general public visiting the site.

Learners will explore the importance, techniques and procedures of planning for health and safety at construction sites during handling of materials, tools and machineries. They will investigate dangerous occurrences, common accidents and how to report an accident. They will become familiar with the enforcement of rules, breaches of health and safety and know the prosecution, costs and fines.

They will explore risk assessment methods, control measures in construction and precautions to be taken to avoid accidents. They will identify all sorts of hazards at work place. Risk assessments will be produced in a format that can be understood by everyone so that it can be complied and reviewed. They will become familiar with the legal requirements and safe systems of work. Learners will know the components of health and safety management systems, importance of training, information, instruction and supervision, along with techniques to avoid actual accidents taking place at site and near miss accidents.

This course also provides a base for higher education.

Learning Outcomes

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

1. *Describe the responsibilities of employers and employees under current health, safety and welfare legislation.*
2. *Explain risk assessment methods and techniques using appropriate principles and Formats.*
3. *Explain how to implement the control measures to reduce risk and how to meet legal requirements.*
4. *Identify the procedures of accident recording and reporting.*

Science & Measurement within the HVACR Industry

Unit level (MQF): 4

Credits: 6

Unit Description

This unit provides the student with an introduction to basic scientific principles and instruments used within the HVAC Industry. The SI system of units is primarily used but Imperial units will be discussed and used/converted where necessary e.g. manufacturer data for equipment selection and evaluation etc.

The student will be introduced to the concepts of pressure, temperature and heat. These are the fundamental scientific principles used within HVAC design. The application of these principles to heat transfer, gas compression and expansion processes and other basic processes found within the HVAC Industry will be evaluated.

The student will then apply scientific principles to fluid flow. Basic continuity equations, CIBSE and ASHRAE fresh air requirements, air change rates, air flow and distribution duct work will be investigated and designed. Grilles, registers and diffusers will be sized and selected for both ventilation and air conditioning systems. Basic duct/pipe sizing will be carried out by the student along with investigation into the fan/pump laws. These will be applied to system designs to enable the student to construct fan and system characteristic curves and select fluid moving equipment e.g. fan selection.

The student will be introduced to the properties of air and the application of the psychrometric chart. Fundamental air conditioning processes will be evaluated and analysed using both tables and the psychrometric chart. Basic heating and cooling loads will be calculated by the student.

The Mollier diagram and the basic vapour compression refrigeration cycle will be investigated and applied to a range of systems, plant and equipment. The student will plot P-h charts, read from the charts and provide information on system performance in terms of COP, evaporator load etc.

Finally, the student will be introduced to a range of measuring equipment used within the HVAC Industry. Equipment for measuring pressure, temperature and fluid flow will be analysed in terms of basic operating principles, operating range and limitations and typical applications.

Learning Outcomes

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

1. *Understand fundamental science concepts used within the HVAC Industry.*
2. *Determine ductwork and terminal device designs to satisfy the ventilation and air conditioning needs of non-complex commercial and industrial buildings.*
3. *Analyse and quantify the principles of psychrometry as applied in the HVAC Industry.*
4. *Describe the operating principles of vapour compression refrigeration systems and apply Mollier charts to size plant and equipment.*
5. *Describe the application of instrumentation used within the HVAC Industry.*

Ventilation and Air Conditioning Technology

Unit level (MQF): 4

Credits: 6

Unit Description

This unit provides the student with the core knowledge and understanding of the different technologies used in ventilation systems and the components necessary to ensure systems operate as designed.

Students will be introduced to the working principles of ventilation systems including reasons for ventilation in buildings, air change requirements for buildings, types of ventilation systems, sources of heat recovery for ventilation systems, effects of wind on ventilation systems and the effects that disrupting ventilation systems could have on a building.

This unit will also describe ductwork systems and components used in ventilation system installation including different types of ductwork, types of ductwork material, ductwork fittings used within systems, the working principles of ductwork components used within systems, preferred location for ductwork components within ventilation systems, the working principles of heat transfer components, insulation requirements for ductwork, bracketing methods required for ductwork, types of fans used ventilation systems. The unit also provides the learner with core knowledge and understanding to be able to install ventilation systems.

The unit will also introduce students to the effects of ventilation equipment on comfort conditions within buildings, the implications of building uses on comfort condition requirements, the effects of changes in system performance on comfort conditions, how heat gains effect the comfort conditions within the building, how test equipment is used to establish comfort conditions, the calculation of air change rates within a room, the suitability of AC and Ventilation equipment for different spaces and the comfort conditions within different spaces.

Learning Outcomes

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

1. *Identify, describe and select ventilation and air conditioning requirements for buildings, recommend strategies, select design conditions and estimate cooling loads.*
2. *Describe the operational features and characteristics of ventilation and air conditioning, equipment, plant and materials and how these features contribute to their application and usage.*
3. *Design ventilation and simple single zone air conditioning installations for specific applications.*
4. *Size, select, specify, install and commission ventilation and air conditioning systems, ductwork, plant and equipment.*

Mathematics for Mechanical and Construction Engineering

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will allow learners to develop the mathematical skills required to solve practical construction problems. Learners will gain a knowledge and understanding of algebraic techniques that form the basis for solving many construction problems. Learners will develop their existing knowledge of area, perimeter and volume and be able to apply these techniques when solving problems. Trigonometry and geometry techniques and skills will be developed so that learners are able to apply this to help solve practical construction problems. Learners will also develop graphical and statistical techniques in order to problem solve.

The Unit is relevant to learners wishing to further develop their practical construction problem solving skills. On completion of the Unit learners will be able to choose the correct technique and apply this to solve practical construction problems and understand what each technique is used for, as well as developing the understanding, knowledge and skills required to successfully use these techniques.

Learning Outcomes

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

1. *Use mathematical techniques and methods to manipulate and/or solve formulae, equations and algebraic expressions.*
2. *Select and apply mathematical techniques correctly to solve practical construction problems.*
3. *Select and apply geometric and trigonometric techniques to correctly solve mathematical construction problems.*
4. *Select and apply graphical and statistical techniques correctly to solve practical construction problems.*

Science and Materials for Construction and the Built Environment

Unit level (MQF): 4

Credits: 6

Unit Description

The aim of this unit is to enable learners to gain knowledge of the nature and properties of building materials. They will learn the chemical composition of materials and understand performance criteria applicable to construction materials, and the techniques used to produce such materials. Learners will be able to know the relationship between stress and strain, and testing required to determine the nature and quality of the building materials. They will also gain an understanding of how materials fail.

Buildings provide shelter and create a comfortable space in which to live or work. Thermal comfort, visual comfort and aural comfort within the built environment are important parameters for the occupants of the building. Learners will know the methods to achieve human comfort. The occupants of a building require a comfortable internal environment and the understanding what is acceptable to different end users who undertake a variety of tasks and activities is an essential requirement of good design and performance of the building. Learners will know the mechanism of heat transfer, propagation of sound within the buildings and lighting design for various tasks in the building spaces.

Learning Outcomes

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

1. *Describe the nature and properties of building materials and coatings.*
2. *Explain testing methods for index properties of building materials.*
3. *Demonstrate the importance of standards in materials and construction.*
4. *Explain the basic factors that affect human comfort in a built environment.*

Plumbing Technology in Building Services Engineering

Unit level (MQF): 4

Credits: 6

Unit Description

The unit will provide underpinning knowledge to develop an understanding of the above ground drainage systems, gas installations and provision of cold water. Learners will develop skills to design hot and cold water systems.

Learners will appreciate that the supply of water is not only the most essential utility serving a building but also the disposal of waste water from it. The focus is on the importance of energy-efficiency to cope with the possible water shortages which requires sophisticated and efficient plumbing installations.

Learners will develop a clear understanding that the role of the plumbing engineer is to provide water distribution and disposal, and energy-efficient central heating systems to meet the requirements of the user and conforming to current regulations governing the water industry.

The unit gives learners an appreciation of water supply systems and the ways in which water is distributed around a building in order to provide supplies suitable for drinking, cooking and washing, to provide supplies of hot water for thermal comfort, and to assist in the safe and efficient disposal of waste water. Learners will develop skills to design hot and cold water systems.

The unit also provides learners with a basic introduction to natural gas systems, and an opportunity to apply appropriate regulations in scenarios relating the design and installation of gas systems for domestic buildings.

Learning Outcomes

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

1. *Investigate sources, required standard and distribution of cold water.*
2. *Design hot and cold water systems for domestic and non-domestic buildings.*
3. *Design above-ground drainage system for a low-rise building.*
4. *Design a natural gas installation for a low-rise building.*

Project Management in Construction and the Built Environment

Unit level (MQF): 4

Credits: 6

Unit Description

The unit focuses on developing project management skills and will enable learners to apply these skills in planning, organising and controlling resources effectively throughout the project in order to achieve a timely and satisfactorily outcome for the client and to ensure a financial profit.

The learners will gain underpinning knowledge about resources of labour, plant, materials and management which must be employed efficiently to ensure a satisfactory conclusion to a project. The areas covered include the logistical organisation of the site, ordering procedures, materials movement and handling, plant selection and usage, construction activities, the management and effective use of site labour, co-ordination of sub-contractors, the allocation of appropriate durations and resources for the construction work and the continuous monitoring of site progress and costs.

Learners will also develop an understanding of the management functions of planning and the techniques that are available both off and on site to effectively plan the deployment of resources needed successfully to complete a project. They will develop an insight into the importance of planning and resource control to the overall construction process.

Learners will be able to identify the human and physical resources needed for a typical low-rise domestic or commercial building, to produce a simple programme and to explain the associated resourcing, monitoring and controls. Learners will also develop an understanding that site planning is to be done in a way which ensures sustainability resulting in least impact upon the natural environment.

Learning Outcomes

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

1. *Explain the interaction between project management and construction teams.*
2. *Plan the resources required to complete a construction project*
3. *Organise the production stage of a construction project*
4. *Produce project documentation to be used by construction teams.*

Refrigeration Technology

Unit level (MQF): 4

Credits: 6

Unit Description

This unit will introduce the student to the basics of the vapour compression refrigeration cycle. The student will be provided with both theoretical and practical aspects of refrigeration.

The thermodynamic principles behind the vapour compression refrigeration cycle will be examined and the student will be competent in assessing and converting between the various units that are used within the refrigeration and air conditioning industries e.g. mainly SI units but also IP units which are still used in other countries and may be included in textbooks, manufacturers' details etc.

The Mollier diagram (P-h chart) will be evaluated and used as a means of analysing proposed new systems along with existing refrigeration plant during commissioning and as part of the fault finding methods and service and maintenance processes. The basic P-h chart refrigeration cycle will be expanded to include multi-stage compound refrigeration plant along with cascade systems frequently found in very low temperature refrigeration systems.

The student will examine all the classifications, designs, options and performance and fault conditions for the compressors, condensers, expansion devices and evaporators used in vapour compression refrigeration systems. Additional components e.g. pressure switches, oil separators and other accessories used in RAC and HP systems will also be investigated and evaluated in terms of their use, application, performance, control settings and operational problems.

The student will also install plant, equipment or components to provide working systems. These systems will be strength and pressure tested, vacuumed and charged with suitable refrigerant before being fully commissioned by the student. This process should be carried out on a number of occasions on a range of refrigeration systems e.g. cold room, display cases, air conditioners and with different refrigerants e.g. R 134a, R 404A and others currently in use to allow the student to gain experience on a range of equipment. The student will also undertake fault finding and service and maintenance tasks on a range of plant and equipment.

Learning Outcomes

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

1. *Describe vapour compression refrigeration system fundamentals and apply pressure enthalpy charts for plant sizing and selection.*
2. *Describe the design and application of refrigeration components and systems including defrost requirements.*
3. *Plan and install refrigeration plant and equipment.*
4. *Undertake fault finding, service and maintenance of refrigeration plant and equipment.*