



MCAST

Malta College of Arts, Science & Technology

MQF Level 3

MCAST Diploma in Welding and Fabrication

CE3-A8-19

Course Description

This apprenticeship course comprises a balance of theoretical knowledge and extended practical training both off-the-job and on work placement.

The hands-on training is carried out in the Institute's workshops equipped to industry standards. The student will be expected to participate individually and in teams to fabricate welded products.

Practical handling of hand and power tools and the use of welding sets, with particular attention to health and safety considerations, are an integral part of the course.

Programme Learning Outcomes

At the end of the programme the students is able to

- 1. Carry out a risk assessment of the surrounding working environment before and after executing an assigned task*
- 2. Produce simple patterns, developments and templates to fabricate from thin steel plates*
- 3. Identify materials and compare their properties*
- 4. Carry out Oxy-Acetylene Gas Welding, Manual Metal Arc Welding and Metal Inert Gas Welding.*

Entry Requirements

MCAST Foundation Certificate

or

Certificate in Engineering Skills (C&G 1155)

or

2 SEC/O-Level passes/SSC&p (Level 3) passes

A full "Secondary School Certificate and Profile" (SSC&P) at Level 2 will be accepted in lieu of one (1) O-Level pass.

Other Entry Requirements

N/A

Current Approved Programme Structure

Unit Title	ECVET/ECTS
Health and Safety in the Engineering Workplace	6
Building Drawings & Setting Out	6
MMA Welding Technology and Practice	6
Fabrication Technology	6
TIG Welding Technology and Practice	6
Welding & Fabrication Practice	6
Mathematics	4
English	4
Maltese	4
Information Technology	4
Individual and Social Responsibility	4
Science	4
Total ECVET/ECTS	60

Health and Safety in the Engineering Workplace

Unit level (MQF): 3

Credits: 6

Unit Description

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

Learning Outcomes

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

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

Building Drawings and Setting Out

Unit level (MQF): 3

Credits: 6

Unit Description

This unit develops learners' knowledge and skills in using manual drawing equipment like drawing board, rulers pens etc. They will learn how to draw the geometrical elements like lines, angles, parallel and orthogonal line, angle translation, circle, tangent, triangle, rectangle, polygons, ellipse, hyperbola and parabola.

The learners will adopt basic geometrical constructions, orthographic projections and sections of geometrical solids. They will learn three-dimensional presentation of geometrical solids and technical objects. They will practice the development of surfaces and drawing the sections and intersection of solids.

The learners will adopt the technical drawing skills by drawing different mechanical elements: welds, rivets, bolts, nuts, springs, wedges, axles, shafts, pulleys, gears etc. They will use drawing scales, specific views, details, rotated views, and specific symbols and dimensioning. They have to master the use of drawing equipment and media and adopt technical standards and symbols.

The learners will be familiar with workshop design, specific elements, tolerances and roughness. They will learn specific symbols for different technical fields with the purpose of making or understanding sketches.

This unit will provide learners with knowledge and skills which will enable them to understand the building construction drawings in orthographic projections or working sketches, understand the space dimension and positional settings in the selected area, and compare the built environment with elements of the structure as shown in the drawings.

In the construction industry, different drawings are used for presenting the building, crafts-work, installations, details, sections etc. The learners have to be familiar with these presentations in order to understand and participate in engineering communication.

The use of standard modern equipment and techniques is emphasised. Learners should also gain the basic understanding of computer aided drawing. They will learn how to adjust computer settings, adopt basic commands, draw the basic geometrical elements and comprehend the modelling principle. The learners will learn how to prepare themselves for upgrading the knowledge using literature and Internet.

Learning Outcomes

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

1. *Draw geometrical structures.*
2. *Recognise and interpret projections, sections and three dimensional drawings.*
3. *Produce simple drawings of mechanical elements.*
4. *Produce workshop drawings and sketches.*

Fabrication Technology

Unit level (MQF): 3

Credits: 6

Unit Description

This unit is designed to provide learners with the knowledge of fabrication of simple metal elements and structures. They will learn about the building of metal structures by cutting, bending, and assembling processes.

Learners will learn about the cutting processes by sawing, shearing, or chiselling in manual and powered variants. They will learn about torching with hand-held torches and via numerical control (CNC) cutters. Furthermore, they will become familiar with bending done by hammering (manual or powered) or via press brakes and similar tools. And finally, learners will also learn about assembling by welding, binding with adhesives, riveting and threaded fasteners.

Learners will be familiar with steel, aluminium and copper and their properties. They will learn about different material identification and how to compare its properties. Learners will also learn about the starting materials for fabrication: structural steel and sheet metal, along with the welding wire, flux, and fasteners that will join the cut pieces. They will learn about plate material, thin sheets materials, pipes, circular forms, U bends, and right-angle bends.

Learners will learn to organize simple joining procedures and individually perform joining works taking into account safety regulations. They will learn how to read typical workshop drawing and transfer it into practice.

In addition, learners will learn about different techniques of pipe joining, types of joints and joints preparation. They will learn capillary and compression fitting, pressure and vacuum gauges, removing gases, spring supports, anchors and stops, cathodic protection, flanges, blinds and spacers.

The unit will acquaint them with basic properties of welding joints, stresses and strains in welding joints as well as faults and their rectification.

Learners will also learn how to produce templates, how to make use of standard parts and tools, and how to produce and install simple parts of structures and pipe runs. Finally, learners will become aware of basic reasons for metal corrosion, its prevention and protection.

Learning Outcomes

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

1. *Describe the range of common methods used in fabrication engineering.*
2. *Select metals for a given application.*
3. *Determine the tolerances and bending allowance for fabricated forms.*

Welding and Fabrication Practice

Unit level (MQF): 3

Credits: 6

Unit Description

This unit is designed to enable learners to organise the workplace in accordance to operation's plan of fabrication.

Learners will gain basic skills in cutting of metal elements by sawing, shearing, abrasive cutting and cutting by torches. They will practice metal bending by hammering and press brakes. They will practice using drilling tools, files and other fabrication tools, nibblers, guillotines, power punch. Learners will also learn steelwork assembling by welding, binding with adhesives, and riveting and threaded fasteners. They will use nuts and bolts, washers, spanners and drifts in bolted connections.

Learners will learn about access platforms, decking, walkways, stairways, ladders, railings, support-saddles, brackets, cleats, and frameworks and will acquaint themselves with gates, guards, barriers, fencing and cages.

Learners should also improve their welding skills and learn how to deal with practical fabrication tasks. Furthermore, they will learn how to ensure that welding processes are carried out in all positions using single and double V-shape joints.

The unit will also provide learners with the knowledge of dealing with practical situations to realign joints and control the welding gap if increased. Learners will also learn how to make use of metal inert gas welding after adopting its principles and techniques.

In this unit, learners will also be taught how to deliver the knowledge of oxy-acetylene gas welding and cutting techniques and procedures, how to use and handle flame cutting torches, about factors affecting product results and basics of bending and straightening.

Finally, preparation and use of equipment, tools and materials will be delivered through production of prefabricated steelwork.

Learning Outcomes

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

1. *Prepare equipment and tools for working out a steelwork.*
2. *Use equipment safely for fabricating steelwork.*
3. *Produce fabricated steelwork.*

MMA Welding Technology and Practice

Unit level (MQF): 3

Credits: 6

Unit Description

This unit is designed to provide learners with knowledge and basic skills in MMA welding through a combination of theory, practical learning and workshop experience. Learners will learn how MMA welding devices and equipment function and how to prepare basic material, adjust the electric arc function and prepare the work place for safe and correct welding. This unit will raise awareness on the hazards in the process of welding and the importance of protection. Learners will learn how to use a variety of personal protective clothing and equipment. They will familiarise with electrical insulation, welding lead, fire and burns, arc-radiation, visible light, infra-red and ultraviolet light and electrical shock.

Learners will prepare the joint to be welded, learn how to produce a T-joint in horizontal and vertical position in two and three runs, and visually check the joint and its measurements. Learners will also learn how to prepare the square butt joint, the butt weld I-shape joint, how to weld joint on both sides and how to control check the joint. In addition, they will understand how and what to prepare for making a V-shape welded joint in the horizontal and vertical position.

Learners will have the opportunity to compare MMA with metal inert gas and Tungsten gas welding. They will learn about heat distribution, distortion and weld defects and other types of welding faults and errors and how to avoid them. They will gain knowledge about welding quality testing.

Learning Outcomes

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

1. *Identify hazards associated with MMA welding.*
2. *Prepare and use equipment and materials for MMA welding whilst applying appropriate terminology.*
3. *Produce welded joints and cuts using MMA welding process.*
4. *Check the weld quality produced by MMA welding.*

TIG Welding Technology and Practice

Unit level (MQF): 3

Credits: 6

Unit Description

This unit is designed to provide learners with knowledge and professional welding terminology, welding principles and techniques related to TIG welding. The learners will understand the risks of welding process, the effects of welding processes and health hazards associated with different types of welding. They will adopt the standard symbols in drawings for welded elements.

Learners will learn about function of a TIG welding machine. They will deal with the arc voltage, welding current, shielding gases and their influence.

Learners will gain knowledge about welding joints, elements, shapes and dimensions. They will learn about the function of the electrical arc, additional welding materials, and the transfer of melted material within the welded joint.

Learners will also have the opportunity to compare manual metal arc, metal inert gas and basics in Tungsten gas welding.

The unit will explain the types of welding faults and errors, technological, chemical and human factors as well as principles of avoiding such faults in TIG welding. Learners will understand the heat distribution, distortion control and weld defects.

Learning Outcomes

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

1. *Identify hazards associated with TIG welding.*
2. *Prepare and use equipment and materials for TIG welding and apply appropriate terminology.*
3. *Produce welding joints and cuts using TIG welding process.*
4. *Check the weld quality produced by TIG welding.*