

Level 1 Certificate in Engineering (2850-80)

June 2016 Version 1.2



Qualification at a glance

Subject area	Engineering
City & Guilds number	2850
Age group approved	All
Entry requirements	None
Assessment	Online multiple-choice Assignment
Approval	Required
Support materials	Centre handbook Assessment pack Smartscreen
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds number	Accreditation number
Level 1 Certificate in Engineering (IVQ)	2850-80	600/0879/9

Version and date	Change detail	Section
1.1 April 2014	Amend range for units 102, 108 and 112.	Units



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1 Introduction

This document tells you what you need to do to deliver the qualification:

Area	Description
Who is the qualification for?	This certificate is aimed at learners who: <ul style="list-style-type: none">• intend to follow an Apprenticeship or Advanced Modern Apprenticeship Programme• wish for career progression within engineering• wish to develop the skills learnt from other qualifications.
What does the qualification cover?	It allows learners to learn, develop and practise the basic introductory skills required for employment and/or career progression in the engineering sector.
What opportunities for progression are there?	It allows learners to progress into employment or to the following City & Guilds qualifications: <ul style="list-style-type: none">• 2850 - Level 2 in Engineering (IVQ) (all pathways).
This qualification replaces:	1115-01 Level 1 IVQ Certificate in Engineering Skills.

2 Structure

To achieve the **Level 1 Certificate in Engineering IVQ (2850-80)**, learners must achieve **21** credits:

- **7** credits from the mandatory units and,
- a minimum of **14** credits from the optional units available.

Unit accreditation number	City & Guilds unit number	Unit title	Credit value	GLH
Mandatory				
Y/503/0141	101	Working in engineering	7	60
Optional				
D/503/0142	102	Carrying out basic fitting techniques	7	60
H/503/0143	103	Carrying out basic milling techniques	7	60
K/503/0144	104	Carrying out basic turning techniques	7	60
A/503/0147	105	Carrying out mechanical assembly	7	60
F/503/0151	106	Carrying out electronics assembly	7	60
L/503/0153	107	Carrying out electrical assembly	7	60
R/503/0154	108	Working with sheet metals	7	60
H/503/0157	109	Carrying out manual arc welding techniques	7	60
Y/503/0169	110	Carrying out MIG welding processes	7	60
L/503/0170	111	Carrying out TIG welding processes	7	60
R/503/0171	112	Carrying out OXY-Acetylene welding processes	7	60
M/503/0162	113	Carrying out surface finishing techniques	7	60
A/503/0164	114	Carrying out mechanical maintenance	7	60
F/503/0165	115	Communicating using Computer Aided Design (CAD) systems	7	60
L/503/0167	116	Producing engineering drawings	7	60



3 Centre requirements

Approval

Centres wishing to offer City & Guilds qualifications must be approved:

- new centres must apply for centre and qualification approval. Please refer to the *Centre Manual – Delivering International Qualifications* for further information. Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.
- existing City & Guilds' centres will need to get specific qualification approval to run these awards and to submit a QAP form.

City & Guilds reserves the right to suspend an approved centre, or withdraw its approval from an approved centre to conduct City & Guilds' qualifications for reasons of debt, malpractice or for any reason that maybe detrimental to the maintenance of authentic, reliable and valid qualifications or that may prejudice the name of City & Guilds.

Resource requirements

Centre staffing

Staff delivering this qualification must be able to demonstrate that they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the areas for which they are delivering training and/or have experience of providing training. This knowledge must be at least to the same level as the training being delivered
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Centre staff may undertake more than one role, eg tutor and assessor or internal verifier, but cannot internally verify their own assessments.

Physical Resources

Centres wishing to use this qualification must review this handbook and ensure that they have the staff and access to sufficient equipment in the centre or workplace so that learners have the opportunity to cover all of the activities of the qualification. It is acceptable for a centre to use specifically designated areas within a centre if the learner does not have a work placement. Where facilities do not exist for realistic practical work, it is strongly recommended that centres develop links with local organisations to provide opportunities for hands on experience.

Internal quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Full information is provided in the *Centre Manual – Delivering International Qualifications*.

Centres are responsible for internal quality assurance, and City & Guilds is responsible for external quality assurance.

International standards and rigorous quality assurance are maintained by the use of:

- City & Guilds externally set and externally marked examinations for the mandatory unit
- City & Guilds activities, delivered and assessed by the centre according to externally set evidence requirements
- internal (centre) quality assurance
- City & Guilds external verification.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following internal roles are undertaken:

- Assessment Manager
- Tutor/Assessor
- Internal Verifier Co-ordinator (for larger centres)
- Internal Verifier
- Examinations Secretary
- Invigilator

Full details and guidance on the internal and external quality assurance requirements, procedures and roles, are provided in *Centre Manual – Delivering International Qualifications* together with full details of the tasks, activities and responsibilities of quality assurance staff.

In order to fully support learners, centres are required to retain original copies of learners' assessment and internal verification records for **three** years after certification.

The following is a summary of the key roles involved in the successful implementation and assessment of the qualification.

The role of the Internal Verifier (IV) is to ensure that:

- they liaise with City & Guilds personnel
- there are adequate resources, both staff and materials
- the work of all personnel contributing to the delivery and assessment of the programme is sampled by a range of methods which should include sampling the observation checklist, learner training plans and multiple choice quiz responses
- records of all sampling activities are monitored and maintained
- where several members of staff are involved in the delivery/assessment of the qualification, that there is a consistent interpretation of the requirements through standardisation activities and that these are documented
- all staff carrying out delivery and assessment are familiar with and understand the qualification requirements
- an appropriate referral policy is in place
- an appropriate appeals procedure is in place
- learner evidence is clearly organised and accessible to the Internal Verifier and Qualification Consultant
- relevant records and proformas are completed, maintained and retained for the purposes of internal and external verification along with the Record of Course Delivery Form.

The role of the Tutor/Assessor is to:

- plan, manage, deliver and assess the qualification using the City and Guilds materials provided
- ensure availability of technical support for ICT equipment
- ensure that each learner is aware of the assessment requirements throughout their programme of learning
- provide guidance and support to learners on the assessment and evidence requirements for the qualification
- ensure that the assessment and evidence requirements have been met by the learner
- observe learners' delivered sessions
- facilitate the multiple choice quiz and mark learner responses
- complete relevant records and proformas.

All staff should participate in appropriate Continuous Professional Development (CPD), to keep up to date with the delivery of the qualification and their role.

External quality assurance

External quality assurance for the qualifications will be provided by the usual City & Guilds external verification process and reported on using relevant documentation to provide a risk analysis of individual centre assessment and verification practice.

Continuing professional development (CPD)

Centres must support their staff to ensure that they have current knowledge of the occupational area, that delivery, mentoring, training, assessment and verification is in line with best practice, and that it takes account of any national or legislative developments. All teaching and assessment for this qualification must take place in the English language and centres must support their staff in this area.

Learner entry requirements

No specific prior qualifications, learning or experience are required for learners undertaking the qualification. However, centres will need to make an initial assessment of each learner to ensure that the level of the qualification is appropriate. The nature of both the learning and assessment required for the qualification is such that learners will need basic literacy and numeracy skills: i.e. the ability to read and interpret written tasks and to write answers in a legible and understandable form in the English language. Learners will also need to be able to organise written information clearly and coherently, although they will not be assessed for spelling or grammatical accuracy unless this is part of the assessment criteria.

There are no restrictions on entry for this award. City & Guilds recommend that learners should not enter for a qualification of the same level and the same content as that of a qualification they already hold.

Age restrictions

There is no age restriction for this qualification unless this is a legal requirement of the process or the environment.



4 Delivering the qualification

Initial assessment and induction

Centres will need to make an initial assessment of each learner prior to the start of their programme to ensure they are entered for an appropriate type and level of qualification.

The initial assessment should identify:

- any specific training needs the learner has, and the support and guidance they may require when working towards their qualification. This is sometimes referred to as diagnostic testing.
- any units the learner has already completed, or credit they have accumulated which is relevant to the qualification they are about to begin.

City & Guilds recommends that centres provide an induction programme to ensure the learner fully understands:

- the requirements of the qualification they will work towards
- their responsibilities as a learner
- the responsibilities of the centre.

It may be helpful to record the information on a learning contract.

All teaching and assessment for this qualification must take place in the English language.

Support materials

The following resources are available for this qualification:

Description	How to access
Assignment guide for centres	www.cityandguilds.com
Assignments (102 to 116)	www.cityandguilds.com (password protected)
SmartScreen	www.smartscreen.co.uk

Recording documents

Learners and centres may decide to use a paper-based or electronic method of recording evidence.

City & Guilds endorses several ePortfolio systems, including our own, **Learning Assistant**, an easy-to-use and secure online tool to support and evidence learners' progress towards achieving qualifications. Further details are available at: www.learningassistant.com.



5 Assessment

Unit 101 – Working in engineering is assessed by an online multiple-choice assessment. All other units are assessed by an assignment which contains practical and knowledge tasks.

Assignments (one per unit) assess practical activities. City & Guilds provides an assignment for assessors; this contains all the information required.

As assignments are designed to sample practical activities, it is essential that the centres ensure that learners cover the content of the whole unit. Assessment components are graded (Pass, Merit, Distinction). A pass is the achievement level required for the knowledge and understanding in an IVQ and generally represents the ability to follow instructions and procedures. Merit and distinction represent increasing levels of ability to adapt to changing circumstances and to independently resolve problems.

Summary of assessment methods

For this qualification, learners will be required to complete the following assessments:

- **one** online multiple-choice assessment for the mandatory unit
- **one** assignment for each chosen optional unit which contains practical and knowledge tasks.

Information on online assessments can be found at -
<http://cgcom/Provide-Training/Delivery-Success/e-volve>

City & Guilds provides the following assessments:

Unit	Title	Assessment method	Where to obtain assessment materials
101	Working in engineering	Online multiple-choice assessment	http://cgcom/Provide-Training/Delivery-Success/e-volve
102	Carrying out basic fitting techniques	Assignment 2850-102 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com

Unit	Title	Assessment method	Where to obtain assessment materials
103	Carrying out basic milling techniques	Assignment 2850-103 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
104	Carrying out basic turning techniques	Assignment 2850-104 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
105	Carrying out mechanical assembly	Assignment 2850-105 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
106	Carrying out electronics assembly	Assignment 2850-106 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
107	Carrying out electrical assembly	Assignment 2850-107 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com

Unit	Title	Assessment method	Where to obtain assessment materials
108	Working with sheet metals	Assignment 2850-108 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
109	Carrying out manual arc welding techniques	Assignment 2850-109 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
110	Carrying out MIG welding processes	Assignment 2850-110 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
111	Carrying out TIG welding processes	Assignment 2850-111 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
112	Carrying out OXY-Acetylene welding processes	Assignment 2850-112 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com

Unit	Title	Assessment method	Where to obtain assessment materials
113	Carrying out surface finishing techniques	Assignment 2850-113 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
114	Carrying out mechanical maintenance	Assignment 2850-114 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
115	Communicating using Computer Aided Design (CAD) systems	Assignment 2850-115 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com
116	Producing engineering drawings	Assignment 2850-116 The assessment covers the practical activities for all outcomes and will also sample underpinning knowledge to verify coverage of the unit. City & Guilds devised assignment, internally marked, externally verified.	www.cityandguilds.com

Time constraints

The following time constraints must be applied to the assessment of this qualification:

- each assignment has specific time constraints; please refer to the individual assignments. Centre staff should guide learners to ensure excessive evidence gathering is avoided. Centres finding that assignments are taking longer, should contact the Qualification Consultant for guidance
- all assignments must be completed and assessed within the learner's period of registration. Centres should advise learners of any internal timescales for the completion and marking of individual assignments.

Assessment strategy

Test specifications

The test specification for the online multiple-choice assessment is below:

Test 1: 2850-101 Working in engineering

Duration: 60 minutes

Outcome	Number of questions	%
1. Know safe working practices	15	37.5
2. Know the engineering environment	5	12.5
3. Understand the importance of maintaining working relationships	5	12.5
4. Know the sectors within engineering	3	7.5
5. Know key engineering materials	6	15
6. Know basic engineering information technology requirements	6	15
Total	40	100

Recognition of prior learning (RPL)

Recognition of Prior Learning (RPL) recognises the contribution a person's previous experience could contribute to a qualification.

RPL is allowed and is not sector specific.



6 Units

Availability of units

The units in this qualification are written in a standard format and comprise the following:

- City & Guilds reference number
- title
- Unit Reference Number (URN)
- level
- credit value
- Guided Learning Hours (GLH)
- endorsement by a sector or other appropriate body
- unit aim
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- notes for guidance.

URN:	Y/503/0141
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit will encourage learners to find out about working in engineering. It covers the basic skills and knowledge needed to enter engineering or manufacturing sectors. This will cover the need to recognise and use safe working practices, consideration of the environment and working effectively as a part of a team. It includes the basic materials that engineers use in their everyday work as well as the information technology that is used.
Assessment:	This unit will be assessed by an online multiple-choice assessment.

Learning outcome
The learner will: 1. Know safe working practices
Assessment criteria
The learner can: 1.1 state the basic safety legislation that applies in a workshop 1.2 state the employers and employees responsibility towards safety 1.3 state health and safety emergency procedures 1.4 state essential operator and bystander safety requirements 1.5 Identify health and safety signs that are used in an engineering/manufacturing workshop 1.6 state first aid procedures 1.7 state the procedures to be followed in the event of the sounding of an emergency alarm 1.8 define the fire triangle model 1.9 name types of fire extinguishers and state their application 1.10 state sources of health and safety information 1.11 state how to act responsibly in the workshop 1.12 state the importance of good housekeeping methods 1.13 identify potential hazards in the workshop 1.14 state the steps for dealing with health and safety issues .

Range

Basic safety legislation: Health and Safety at Work etc Act, Control of Substances Hazardous to Health Regulations, Personal Protective Equipment (PPE) at Work Regulations.

Employers and employees responsibility: Health and Safety at Work etc Act, Control of Substances Hazardous to Health Regulations, Personal Protective Equipment (PPE) at Work Regulations.

Emergency procedures: fire alarm, fire drill.

Safety requirements: Personal Protective Equipment (PPE), screening.

Health and safety signs: warning, information, mandatory, prohibition, fire.

First aid: location of facilities, requirements of qualified first aiders.

Sounding of an emergency alarm: evacuation, escape routes, assembly points.

Fire extinguishers: water, foam, powder, CO₂ gas, fire blankets.

Health and safety information: sources of information - booklets/leaflets, posters, supervisors/managers, trade unions, Internet.

Act responsibly: walking not running, proper behaviour, correct dress, follow instructions.

Good housekeeping: tidy work areas, removal of waste, storage of materials, tools and equipment, maintaining access and egress: walkways, emergency exits, fire doors.

Potential hazards: working at heights, slippery surfaces or spillages, uneven surfaces, waste material, flammable materials, faulty or missing machine guards, faulty, material handling or transportation, noise.

Health and safety issues: reporting, lines of reporting, responsibilities, follow up actions.

Additional guidance

Fire triangle model: fuel, oxygen, source of ignition.

Learning outcome

The learner will:

2. Know the engineering environment

Assessment criteria

The learner can:

- 2.1 state the benefits of different sources of **energy and resources**
- 2.2 state the impact on the environment from different methods of **waste disposal**
- 2.3 state the importance of working with colleagues to improve work practices
- 2.4 state the benefits gained from **working in an environmentally responsible manner.**

Range
<p>Energy and resources:</p> <ul style="list-style-type: none"> energy: carbon fuels (coal, gas, oil, diesel, petrol), electricity, water, wind, compressed air, steam, nuclear, solar resources: human, water, materials, equipment, time. <p>Waste disposal: recycling, landfill, incineration.</p> <p>Working in an environmentally responsible manner: environmental impact, preservation of resources, cost, energy savings, efficiency.</p>

Learning outcome
<p>The learner will:</p> <p>3. Understand the importance of maintaining working relationships</p>
Assessment criteria
<p>The learner can:</p> <p>3.1 state the roles and responsibilities within an organisation structure chart for a workplace</p> <p>3.2 state the communication systems used in the workplace</p> <p>3.3 describe how to seek assistance to clarify instructions</p> <p>3.4 describe when to approach a supervisor, trainer or colleague when experiencing difficulties with a task</p> <p>3.5 state expectations with regard to conduct in the workplace</p> <p>3.6 state the importance of maintaining good customer relationships.</p>

Range
<p>Communication systems: verbal, written, drawings, electronic, signs, charts.</p> <p>How to seek assistance: approach a supervisor, trainer or colleague.</p> <p>When to approach: when needing clarification of instructions, when experiencing difficulties with a task.</p> <p>Conduct in the workplace: walking not running, proper behaviour, correct dress, follow instructions.</p>

Learning outcome
<p>The learner will:</p> <p>4. Know the sectors within engineering</p>
Assessment criteria
<p>The learner can:</p> <p>4.1 state the different sectors of engineering</p> <p>4.2 name products and services associated with the different engineering sectors.</p>

Range
Sectors of engineering: maintenance/installation, manufacture/processing mechanical, electrical, electronic, chemical, energy generation and distribution, automotive engineering, aerospace, nuclear engineering, medical engineering, civil engineering, marine engineering, telecommunications.

Learning outcome
The learner will: 5. Know key engineering materials
Assessment criteria
The learner can: 5.1 classify engineering materials 5.2 Identify forms of supply of materials 5.3 Identify materials by their physical properties 5.4 state the applications of key engineering materials.

Range
Classify engineering materials: metals (ferrous, non-ferrous), plastics, ceramics, composites, wood, rubber. Forms of supply: bar and section, sheet, wire, plate, castings and mouldings, forgings, extrusions, tube/pipe. Materials: colour, density, simple workshop tests – eg magnetism, spark tests. Applications: metals (ferrous, non-ferrous), plastics, ceramics, composites, wood, rubber.

Learning outcome
The learner will: 6. Know basic engineering information technology requirements
Assessment criteria
The learner can: 6.1 identify the hardware requirements of a computer system 6.2 state how to check that equipment is safe for use and correctly set up 6.3 state the health and safety requirements relating to the use of workstations and VDU equipment 6.4 define the need for safe file storage 6.5 state the importance of making and keeping back-up copies 6.6 state the need for good housekeeping .

Range
Hardware requirements: CPU, monitor, keyboard, mouse, printer, scanner
Check: visual off-load checks
Health and safety requirements: lighting, seating, sitting and positioning of equipment, dangers of trailing leads, safe and tidy work area, screen filters
Good housekeeping: organisation of files into folders, closing down equipment correctly.

Additional guidance
Storage: may include - paper, storage media: hard disk drive, CD ROM, DVD ROM, USB removable storage, the Internet

Unit 102

Carrying out basic fitting techniques

URN:	D/503/0142
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit will introduce learners to the safe use of hand tools and fitting activities that are required in the engineering and manufacturing sectors. It covers the basic skills and knowledge needed to produce components for assembly using appropriate tools, materials and checking techniques to achieve the required sizes and specifications, whilst complying with health and safety legislation and regulations.
Assessment	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for fitting activities
Assessment criteria
The learner can: 1.1 state the key health and safety requirements that apply to fitting 1.2 read and interpret basic engineering drawings/sketches 1.3 produce a sequence of operations 1.4 identify and check marking out equipment 1.5 identify types of work and tool holding devices 1.6 use methods of marking out 1.7 use work datums .

Range
Health and safety requirements: signs, emergency stop procedures, Personal Protective Equipment (PPE) applicable to fitting, employers' and employees' duties, barrier cream, manual handling, handling sharp tools, entanglement with revolving parts, safe methods of removal of swarf (continuous chip), coolant (soluble oil, compounds), use of guards (fixed, adjustable, interlocking), safety signs.

<p>Engineering drawings/sketches: isometric, oblique, first angle projection, third angle projection.</p> <p>Marking out equipment: rules, scribe, scribing block, engineer's square, dividers, dot and centre punches, odd-leg callipers.</p> <p>Work and tool holding devices: bench vice, machine vice, hand vice, direct clamping, vee blocks.</p> <p>Marking out: straight and parallel lines, angles, arcs and circles</p> <p>Work datum: face, centre, corner, edge.</p>
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<p>Learning outcome</p> <p>The learner will:</p> <p>2. Be able to use simple fitting techniques to produce components</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>2.1 use hand tools safely to produce simple components</p> <p>2.2 produce simple forms using fitting techniques</p> <p>2.3 select drilling machines and prepare for drilling operation</p> <p>2.4 state how spindle speeds for specific diameters are obtained from charts and graphs</p> <p>2.5 produce internal and external threads</p> <p>2.6 operate the drilling machine safely</p> <p>2.7 check components are within limits</p> <p>2.8 restore the work area using the correct procedures for the disposal of waste.</p>

<p>Range</p> <p>Hand tools: files (sizes, forms, cuts, applications), chisels (types, applications), saws (types, size of blades), hammers and mallets.</p> <p>Forms: flat faces, parallel faces, square faces, steps/shoulders, angled faces, drilled holes, radii.</p> <p>Drilling machines: types, applications, bits (parallel, taper shank), reamers.</p> <p>Internal and external threads: stocks and dies, taps and tap wrenches.</p> <p>Correct procedure for disposal of waste to include: ferrous metals, non-ferrous metals, cloths, paper, coolant.</p>

<p>Additional guidance</p> <p>Spindle speeds: revolutions per minute.</p> <p>Restore the work area: tools and equipment returned to stores, swarf removal, clean machines and work area, method of holding taps and dies.</p>
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Learning outcome
The learner will: 3. Be able to check components for correct size
Assessment criteria
The learner can: 3.1 use measuring equipment to check components are within the set tolerances 3.2 state the accuracy of the measuring equipment 3.3 record measurements taken against size requirements.

Range
Tolerances: ± 0.5 mm / $\pm 2^\circ$, fits (clearance, interference). Measuring equipment: rule, outside callipers, digital vernier callipers/protractor/height gauge, engineers' square.

Unit 103

Carrying out basic milling techniques

URN:	H/503/0143
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process in setting and operating a milling machine, following safe working practices and checking simple components for size. The learner will be able select the required Personal Protective Equipment (PPE) and state the requirements for safe operation of the equipment. They will be able to select the appropriate speeds and tools to achieve the desired outcome and recognise and use the appropriate items of measuring equipment to achieve the desired outcome.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for milling activities
Assessment criteria
The learner can: 1.1 state key health and safety requirements that apply to milling 1.2 identify individual machine parts , their location and state their function 1.3 identify types of cutting tools and state their function 1.4 identify the method of mounting cutters , their position and state the benefits of each 1.5 identify types of work and tool holding devices and state their function 1.6 use work datums .

<p>Range</p> <p>Health and safety requirements: emergency stop procedures, Personal Protective Equipment (PPE) applicable to milling, employers' and employees' duties, barrier cream, lifting heavy vices, handling sharp cutting tools, entanglement with revolving parts, safe methods of removal of swarf (continuous chip), coolant (soluble oil, compounds), use of guards (fixed, adjustable, interlocking).</p> <p>Machine parts: vertical, horizontal and universal milling machines.</p> <p>Types of cutting tools: side and face cutters, slab/cylindrical cutters, slotting cutters, slitting saws, form cutters, end mills, slot drills.</p> <p>Mounting cutters: arbour, chucks (auto lock, jacob's), pull collets.</p> <p>Work and tool holding devices: machine vice (fixed jaw, swivel and universal), direct clamping, vee blocks.</p> <p>Work datums: face, centre, corner, edge.</p>
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<p>Learning outcome</p> <p>The learner will:</p> <p>2. Be able to use a milling machine to produce simple components</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>2.1 apply methods of tool setting for milling</p> <p>2.2 secure work for milling</p> <p>2.3 indicate how spindle speeds for specific diameters are obtained from charts and graphs</p> <p>2.4 name types of material</p> <p>2.5 operate the mill safely to shape material to form simple components within dimensional tolerances</p> <p>2.6 identify measuring equipment</p> <p>2.7 operate equipment safely</p> <p>2.8 restore the work area using the correct procedures for the disposal of waste.</p>

<p>Range</p> <p>Material: high speed steel for cutting tools, material being cut (bright mild steel, aluminium alloy, brass).</p> <p>Shape: flat faces, parallel faces, square faces, steps/shoulders, open-ended slots, angled faces, drilled holes.</p> <p>Measuring equipment: rule, outside callipers, digital vernier callipers/protractor, engineer's square.</p> <p>Correct procedure for disposal of waste to include: ferrous metals, non-ferrous metals, cloths, paper, coolant.</p> <p>Safely: up cut milling, guards.</p>

<p>Additional guidance</p> <p>Spindle speeds: revolutions per minute.</p> <p>Restore the work area: tools and equipment returned to stores, swarf removal, clean machine and work area.</p>
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Learning outcome

The learner will:

3. Be able to check milled components for correct size

Assessment criteria

The learner can:

- 3.1 use measuring equipment to check components are within the set **tolerances**
- 3.2 state the **accuracy** of the measuring equipment
- 3.3 record measurements taken against size requirements.

Range

Tolerances: ± 0.25 mm / $\pm 1^\circ$, fits (clearance, interference).

Accuracy: rule, outside callipers, vernier callipers/digital vernier callipers, engineer's square, external micrometer.

Unit 104

Carrying out basic turning techniques

URN:	K/503/0144
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process in setting and operating a centre lathe, following safe working practices and checking simple components for size. The learner will be able select the required Personal Protective Equipment (PPE) and state the requirements for safe operation of the equipment. They will be able to select the appropriate speeds and tools to achieve the desired outcome and be able to recognise and use the appropriate items of measuring equipment to achieve the desired outcome.
Assessment	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare centre lathe for turning operations
Assessment criteria
The learner can: 1.1 state the key health and safety requirements that apply to turning 1.2 identify individual lathe parts and their location 1.3 state the function of lathe parts 1.4 identify types of lathe tool, drill, tap and die 1.5 identify type of work and tool holding devices 1.6 identify different types of self centring chucks and state how they are mounted and their function.

<p>Range</p> <p>Health and safety requirements: emergency stop procedures, Personal Protective Equipment (PPE) applicable to turning, employers' and employees' duties, barrier cream, lifting heavy chucks onto the lathe without damaging the bed, handling sharp cutting tools, entanglement with revolving parts, safe methods of removal of swarf (continuous chip), coolant (soluble oil, compounds), use of guards.</p> <p>Lathe parts: headstock (all geared, spindle, speed selection), tailstock (barrel, Morse taper), bed, carriage (saddle, cross slide, compound slide, tool post (quick change)), apron (hand feed wheel), stop and start, coolant system (pump, tank, control valve).</p> <p>Function of lathe parts: tailstock, saddle, cross slide, compound slide, tool post, apron, determination of spindle speeds (use of: graph, charts).</p> <p>Types of lathe tool, drill, tap and die: tools (facing, knife, undercut, knurling, form (chamfer)), drills (centre, jobber (parallel shank), taps (taper, intermediate (second), plug), dies (slip), thread metric.</p> <p>Work and tool holding devices: three jaw self centring chuck, revolving centre, quick change tool post, Jacobs chuck, catch plate, carrier, running centre.</p>
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<p>Learning outcome</p> <p>The learner will:</p> <p>2. Be able to use the lathe to produce simple components</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>2.1 use methods of setting cutting tools on centre</p> <p>2.2 secure work in three jaw self centring chuck</p> <p>2.3 indicate how spindle speeds for specific diameters are obtained from charts and graphs</p> <p>2.4 identify types of material</p> <p>2.5 operate the lathe safely to shape material to form simple components within dimensional tolerances</p> <p>2.6 identify measuring equipment</p> <p>2.7 operate equipment safely</p> <p>2.8 restore the work area using the correct procedures for the disposal of waste.</p>

<p>Range</p> <p>Setting cutting tools: overhang, method of centring (tailstock centre, gauge, facing, rule between work and tool).</p> <p>Material: high speed steel for cutting tools, material being cut (bright mild steel, aluminium alloy, brass).</p> <p>Shape: face ends, centre drill, generate concentric diameters, drill and tap holes, generate and form surfaces, undercut, die threads.</p> <p>Measuring equipment: rules, callipers, outside, inside, digital vernier.</p> <p>Correct procedure for disposal of waste: ferrous metals, non-ferrous metals, cloths, paper, coolant.</p>

Additional guidance

Spindle speeds: revolutions per minute.

Restore the work area: tools and equipment returned to stores, clean machine and work area, remove and dispose of swarf and coolant correctly.

Learning outcome

The learner will:

3. Be able to check turned components for correct size

Assessment criteria

The learner can:

3.1 use measuring equipment to check components are within the set **tolerances**

3.2 state the accuracy of the **measuring equipment**

3.3 record measurements taken against size requirements.

Range

Tolerances: ± 0.25 mm.

Measuring equipment: rule, outside callipers, digital vernier callipers.

Unit 105

Carrying out mechanical assembly

URN:	A/503/0147
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit will introduce learners to mechanical assemblies that are required in the engineering and manufacturing sectors. It will cover the skills and knowledge needed to carry out simple sub and final assemblies. Learners will be able to identify, select and check appropriate tools and interpret simple assembly drawings. It also covers compliance with relevant health and safety regulations.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to plan and prepare for mechanical assembly
Assessment criteria
The learner can: 1.1 prepare the work area prior to assembly operations 1.2 use Personal Protective Equipment (PPE) appropriate to the various stages of the coating process 1.3 use safe procedures to prevent injury to skin 1.4 state the need to comply with manual handling regulations 1.5 identify and interpret information on drawings 1.6 identify types, sizes and shapes of tools/equipment used for assembling mechanical components 1.7 refer to charts for information 1.8 state the procedures for preparing the work area.

Range
Information: drawings (orthographic, pictorial, sketching, assembly, exploded).

Tools/equipment: spanners (open ended, ring, socket), allen keys, screwdrivers, pliers, grips, hammers (ball peen, cross and straight peen), mallets (copper, hide, plastic), lifting equipment (levers, wedges, jacks, pulley blocks, trucks and skids).

Charts: seals and gaskets, lubrication and screw threads, etc.

Learning outcome

The learner will:

2. Be able to plan and prepare for mechanical assembly

Assessment criteria

The learner can:

- 2.1 plan the sequence of operations
- 2.2 remove protective packaging and clean component parts before assembly
- 2.3 state the general **rules for assembly**
- 2.4 carry out component **checks** for assembly
- 2.5 state type, size, operation and application of **digital measuring instruments**
- 2.6 state types and **effects of forces** generated in assembly
- 2.7 identify **types of fit** and state their function
- 2.8 identify methods of **sealing joints**
- 2.9 identify methods of producing **non-permanent joints**
- 2.10 identify different types of **locking devices** and state their function
- 2.11 assemble component parts
- 2.12 check that the final assembly meets the **specification**
- 2.13 **restore the work area** using the correct procedures for the **disposal of waste**.

Range

Rules for assembly: cleanliness of component parts, tools and equipment, planning the sequence of operations before starting to assemble, drawings/specifications must be followed, use of appropriate tools, periodic checking with specifications.

Checks: lengths, angles, hole sizes, threads.

Digital measuring instruments: digital metric depth, inside and outside micrometer, digital metric vernier caliper and height gauge, metric feeler gauges, metric thread gauges, engineer's square.

Effects of forces: effects of over-tightening, shear load on pins, tensile and compressive loads on component parts.

Types of fit: clearance, interference.

Sealing joints: tape, compounds.

Non-permanent joints: nuts, bolts, studs, screws, pins and keys.

Locking devices: lock nuts, fibre nuts, castle nuts, and split pins, spring and serrated washers.

Specification: rotating parts are free, nuts and bolts are tight, freedom from leaks.

Disposal of waste: cloths, paper/card, chemicals, oils.

Additional guidance

Restore the work area: tools and equipment returned to stores, clean machine and work area.

Unit 106

Carrying out electronics assembly

URN:	F/503/0151
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	The unit is concerned with the processes and equipment essential to building and testing electronic circuits and includes the use of tools and equipment.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for building electronic circuits
Assessment criteria
The learner can: 1.1 collect, read and interpret information 1.2 plan and prepare for electronic activities 1.3 state how to identify basic electronic components and list their values.

Range
Interpret information: circuit, block, layout and schematic diagrams, data sheets. Plan and prepare: appropriate tools and components from data sheets, catalogues. Electronic components: resistors, diodes, capacitors, inductors, transistors, light emitting diodes, switches and relays, fuses and circuit breakers.

Learning outcome
The learner will: 2. Be able to build electronic circuits
Assessment criteria
The learner can: 2.1 carry out preparatory work to assemble electronic circuits 2.2 prepare a list of components and tools required 2.3 check the availability of all tools and test equipment 2.4 assemble and build electronic circuits 2.5 test electronic circuits 2.6 prove functionality of built assembly 2.7 restore the work area using the correct procedures for the disposal of waste .

Range
<p>Preparatory work: safety checks, establish work area and circuit to be assembled, diagrams, manufacturers catalogues, data sheets, Protective Personal Equipment (PPE), prevention of damage, anti-static devices, isolating transformers and Residual-Current Devices RCDs.</p> <p>Components: Components as per designated circuit. Tools: pliers, long nose pliers, drills. Extraction and insertion tools: cable strippers, screwdrivers, soldering iron, desoldering wick, heatsink.</p> <p>Assemble and build: Electronic circuits of a build and energise type. Bridge rectifier circuits, transistor switching circuits with light controls, etc. Simple motorspeed/light dimmer control.</p> <p>Test electronic circuits: Multimeters, oscilloscopes, signal generators, signal injectors.</p> <p>Disposal of waste: Identify materials requiring special disposal methods eg chemicals, sprays, flux.</p>

Additional guidance
<p>Check availability: of components and source from alternatives if required. Safety checks on tools and components; damaged components and tools; electrical safety checks.</p> <p>Functionality: prove functionality and operation.</p> <p>Restore the work area: tools and equipment returned to stores, clean machine and work area.</p>

Unit 107

Carrying out electrical assembly

URN:	L/503/0153
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	The unit provides the basic knowledge required for learners to be able to read and interpret data from diagrams and data sheets. It will enable learners to identify basic electrical components and their use
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for building electrical circuits
Assessment criteria
The learner can: 1.1 identify electrical components from information sources 1.2 plan and prepare for electrical assembly.

Range
Information sources: manufacturers catalogues, data sheets, specifications, circuit, wiring, block and schematic diagrams. Plan and prepare: work plans, risk assessment, electrical components/accessories for domestic/commercial and industrial installation types, electricity at work regulations, fixed wiring as per BS 7671 , flexible cords, fixings or solid and hollow surfaces, fuses, circuit breakers, control gear, containment systems, conduit, trunking, tray, basket, radial and ring final circuits, principles of earthing and bonding, circuit diagrams for one and two way lighting circuits, radial and ring final circuits. <ul style="list-style-type: none">BS 7671 – available from http://electrical.theiet.org/ for the latest edition/amendments.

Learning outcome
The learner will: 2. Be able to build electrical circuits
Assessment criteria
The learner can: 2.1 prepare a list of required tools 2.2 prepare a requisition of required cables, accessories and fittings 2.3 carry out safety checks on tools and work area 2.4 build a series of electrical circuits 2.5 restore the work area using the correct procedures for the disposal of waste .

Range
Tools: screwdrivers, pliers, side cutters, spanners, hammers, conduit dies, battery and mains drills, rivet tools, drill bits, hacksaws, tape measures, squares. Requisition: to include, cables, accessories, fixings and fittings. Safety checks: carry out visual inspections to ensure that hand and power tools are safe to use, for signs of damage, check area is safe. Electrical circuits: <ul style="list-style-type: none"> • mark out circuits • construct lighting and power circuits using a range of cables and containment systems, conduit, trunking and PVC flat multicore cables • connect components. Disposal of waste: identify items to be recycled and returned to store and those for disposal.

Additional guidance
Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.

Learning outcome
The learner will: 3. Be able to check completed circuits
Assessment criteria
The learner can: 3.1 carry out checks to ensure that the completed circuit meets appropriate regulations and operational requirements 3.2 prove installation dead by approved methods.

Range
Checks: visual inspection, dead tests, continuity of protective conductors, ring final circuit, insulation resistance, polarity, functional tests.

Unit 108

Working with sheet metals

URN:	R/503/0154
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the processes and technology associated with working with sheet metal to make simple assemblies. It covers a range of cutting, forming and joining techniques that are used in sheet metal working. Learners will be able to identify appropriate tools and methods of working for the desired result. The health and safety requirements common to the use of this process are also covered.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare sheet metal work equipment, tools and materials
Assessment criteria
The learner can: 1.1 state the health and safety measures in the workplace that relate to sheet metal fabrication 1.2 state the fire hazards associated with hot working 1.3 state the hazards from electricity 1.4 use simple methods of marking out 1.5 select Personal Protective Equipment (PPE) 1.6 use sheet metalwork cutting equipment to produce simple shapes 1.7 use sheet metalwork cutting tools to produce simple shapes 1.8 use safe working practices 1.9 identify health and safety hazards.

Range
<p>Health and safety measures: Personal Protective Equipment (PPE) (application to sheet metal working processes, employers' duties, employees' duties, function of items of PPE).</p> <p>Fire hazards: sources of combustion, burns, hot metal (identification of hazard ('HOT' and date and time), use of tools tongs for moving and manipulation, use of PPE).</p> <p>Electricity: shock, fire, burns, methods of avoiding shock hazards.</p> <p>Marking out: use of datum line, edge, centre point.</p> <p>Cutting equipment: drills, rotary shears, nibblers (shear type, punch type), guillotines (treadle, mechanical, back stops, front stops), fly press, portable angle grinders/sanders.</p> <p>Cutting tools: hand shears (straight, left hand, right hand), bench shears (hand lever), tin man's hand-level punch.</p>

Learning outcome
<p>The learner will:</p> <p>2. Be able to use equipment and tools for metal work forming operations</p>
Assessment criteria
<p>The learner can:</p> <p>2.1 use sheet metalwork fabrication forming tools</p> <p>2.2 use sheet metalwork fabrication forming equipment</p> <p>2.3 use techniques to produce simple forms</p> <p>2.4 restore the work area using the correct procedures for the disposal of waste.</p>

Range
<p>Forming tools: hammers (types), planishing hammers, mallets (types), wooden blocks, range of bench stakes.</p> <p>Forming equipment: jennys (stiffening techniques, swaging, beading), rolling machines (pyramid type, pinch type, slip rolls, hand-operated), folding machines (box and pan, universal swing-beam), fly press (tooling, dies, forming tools).</p> <p>Simple forms: square, rectangular, cylindrical, boxed.</p>

Additional guidance
<p>Restore the work area: tools and equipment returned to stores, clean machine and work area.</p>

Learning outcome
The learner will: 3. Be able to produce fabrications using sheet metalwork assembly techniques
Assessment criteria
The learner can: 3.1 use simple methods of fabrication assembly 3.2 assemble simple non self-secured joints 3.3 assemble simple self-secured joints 3.4 use mechanical joining methods 3.5 use soft soldering techniques 3.6 use the resistance spot welding process 3.7 state the need for good housekeeping in the workplace 3.8 use equipment safely 3.9 produce sheet metalwork assembly 3.10 restore the work area using the correct procedures for the disposal of waste.

Range
Fabrication assembly: holding methods, clamping. Non self-secured joints: lap, corner, butt, tee, flanged butt, lock seem. Self-secured joints: grooved seam, panned down. Mechanical joining methods: hollow/solid riveting, threaded fastenings. Soft soldering: preparing the joint, cleaning the joint, types of soft solder, types of fluxes, types of soldering iron, heat sources (electrical, flame). Spot welding: fixed, static, portable.

Additional guidance
Restore the work area: tools and equipment returned to stores, clean machine and work area, remove waste materials and reuse/recycle correctly.

Unit 109

Carrying out manual arc welding techniques

URN:	H/503/0157
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process technology associated with Manual Metal Arc (MMA) welding at low carbon steel. It covers a range of joints and simple welding positions used in industry that reflect the level of the qualification. The learner will be able to select the appropriate tools and working methods to achieve the desired outcome. The learner will be able to state the risks involved in MMA welding and how to mitigate them.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare manual metal arc welding equipment and tools for safe use
Assessment criteria
The learner can: 1.1 state the health and safety measures in the workplace that relate to the welding process 1.2 state the methods of avoiding and removing welding fumes 1.3 state the methods of avoiding hazards associated with the process 1.4 state hazards commonly encountered in the welding environment 1.5 select Personal Protective Equipment (PPE) for manual metal arc (MMA) welding 1.6 follow safe working practices.

Range
<p>Health and safety measures: Personal Protective Equipment (PPE) (application to welding process, employers' duties, employees' duties, function of items of (PPE) (headshield, filter lens, cover lens, gauntlets, protective footwear, eye protection, flame retardant overalls)).</p> <p>Welding fumes: use of extraction, natural ventilation (eg on-site), air-fed headshields, respirator.</p> <p>Hazards: fire (sources of combustion, burns), electric shock (shock hazards, welding lead, welding return, welding earth, insulation), arc radiation (PPE, screening), hot metal/slag (identification of hazard ('HOT' and date and time), use of tools tongs for moving and manipulation, use of PPE).</p>

Learning outcome
<p>The learner will:</p> <p>2. Know how to use equipment safely for manual metal arc welding low carbon steel</p>
Assessment criteria
<p>The learner can:</p> <p>2.1 identify manual metal arc (MMA) welding equipment and state its function</p> <p>2.2 state the safe use of equipment used for preparing and finishing materials and welded joints</p> <p>2.3 state common types of consumable electrodes</p> <p>2.4 state the types of welding current</p> <p>2.5 identify electrode sizes</p> <p>2.6 relate welding current for flat and horizontal/vertical welding to electrode sizes</p> <p>2.7 define welding practices</p> <p>2.8 identify the types of joint</p> <p>2.9 define the welding positions as they relate to current standards</p> <p>2.10 state the appropriate assembly and distortion control methods</p> <p>2.11 state the post welding cleaning activities</p> <p>2.12 state the need for good housekeeping in the workplace.</p>

Range
<p>Welding equipment: alternating current (ac), direct current (dc), welding leads (welding, return, earth), electrode holders, return clamps.</p> <p>Equipment: angle grinders, linishers, files, chipping hammer, wire brushes, hammer and chisel.</p> <p>Electrodes: rutile, basic, cellulosic.</p> <p>Welding current: alternating (ac), direct (dc) (electrode positive, electrode negative).</p> <p>Electrode sizes: \varnothing2.5 mm, \varnothing3.2 mm, \varnothing4.0 mm.</p> <p>Welding practices: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p>

<p>Types of joint: butt, lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Assembly and distortion control methods: clamping, alignment jigs, run on/off plates, tack welds.</p> <p>Cleaning activities: slag removal, spatter removal, wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p> <p>Housekeeping: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.</p>

<p>Learning outcome</p> <p>The learner will:</p> <p>3. Be able to produce welded joints safely using manual metal arc welding.</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>3.1 use equipment for a welding operation safely</p> <p>3.2 produce sufficient tack welded joints to enable welding</p> <p>3.3 produce fillet welded joints in 3 to 6 mm thick, low carbon steel safely in welding positions</p> <p>3.4 use low carbon steel for a welding operation</p> <p>3.5 use welding consumables safely</p> <p>3.6 carry out weld cleaning and checking safely</p> <p>3.7 restore work area using the correct procedure for the disposal of waste.</p>

<p>Range</p> <p>Joints: lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Welding operation: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Weld cleaning and checking: slag removal, spatter removal, wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>
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<p>Additional guidance</p> <p>Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.</p>

Unit 110

Carrying out MIG welding processes

URN:	Y/503/0169
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process technology associated with Metal Inert Gas (MIG) welding at low carbon steel. It covers a range of joints and simple welding positions used in industry that reflect the level of the qualification. The learner will be able to select the appropriate tools and working methods to achieve the desired outcome. The learner will be able to state the risks involved in MIG welding and how to mitigate them.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Know how to prepare MIG welding equipment and tools for safe use
Assessment criteria
The learner can: 1.1 state the health and safety measures in the workplace that relate to the welding process 1.2 state the methods of avoiding and removing welding fumes 1.3 state the methods of avoiding hazards associated with the process 1.4 identify hazards commonly encountered in the welding environment 1.5 define safe working practices.

Range
<p>Health and safety measures: Personal Protective Equipment (PPE) (application to welding process, employers' duties, employees' duties, function of items of PPE (headshield, filter lens, cover lens, gauntlets, protective footwear, eye protection, flame retardant overalls)).</p> <p>Welding fumes: use of extraction, natural ventilation (eg on-site), air-fed headshields, respirator.</p> <p>Hazards: fire (sources of combustion, burns), electric shock (shock hazards, welding lead, welding return, welding earth, insulation), arc radiation (visible light, infra-red, ultra-violet), arc-eye, glare, methods of avoiding (PPE, screening), hot metal (identification of hazard ('HOT' and date and time), use of tools tongs for moving and manipulation).</p>

Learning outcome
<p>The learner will:</p> <p>2. Know how to use equipment safely for MIG welding low carbon steel</p>
Assessment criteria
<p>The learner can:</p> <p>2.1 identify MIG welding equipment</p> <p>2.2 state the function of welding equipment</p> <p>2.3 state the safe use of equipment used for preparing and finishing materials and welded joints</p> <p>2.4 identify common types of shielding gases</p> <p>2.5 state the type of welding current and polarity</p> <p>2.6 identify electrode sizes</p> <p>2.7 relate process variables to flat and horizontal/vertical welding of joints</p> <p>2.8 define welding practices</p> <p>2.9 identify the types of joint</p> <p>2.10 state the welding positions as they relate to current standards</p> <p>2.11 name the appropriate assembly and distortion control methods</p> <p>2.12 state the post welding cleaning activities</p> <p>2.13 state the need for good housekeeping in the workplace.</p>

Range
<p>Welding equipment: alternating current (ac), direct current (dc), welding leads (welding, return, earth), electrode holders, return clamps.</p> <p>Equipment: angle grinders, linishers, files, wire brushes, hammer and chisel.</p> <p>Shielding gases: argon/oxygen/carbon dioxide mixtures, carbon dioxide.</p> <p>Welding current: direct (dc) Electrode positive.</p> <p>Electrode sizes: ø0.8mm, ø1.0 mm.</p>

<p>Variables: voltage, wire feed speed, gas flow rate, inductance.</p> <p>Welding practices: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Types of joint: butt, lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Assembly and distortion control methods: clamping, alignment jigs, run on/off plates, tack welds.</p> <p>Cleaning activities: spatter removal, wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>

<p>Learning outcome</p> <p>The learner will:</p> <p>3. Be able to produce welded joints safely using MIG welding</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>3.1 use Personal Protective Equipment (PPE) effectively for MIG welding</p> <p>3.2 use equipment for a welding operation safely</p> <p>3.3 produce sufficient tack welded joints to enable welding</p> <p>3.4 produce fillet welded joints in 3 to 6 mm thick low carbon steel safely in simple welding positions</p> <p>3.5 use low carbon steel for a welding operation</p> <p>3.6 use welding consumables safely</p> <p>3.7 carry out weld cleaning and checking safely</p> <p>3.8 restore work area using the correct procedure for the disposal of waste .</p>

<p>Range</p> <p>Joints: lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Welding operation: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Weld cleaning and checking: spatter removal, wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>
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<p>Additional guidance</p> <p>Restore work area leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.</p>
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Unit 111

Carrying out TIG welding processes

URN:	L/503/0170
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process technology associated with Tungsten Inert Gas (TIG) welding at low carbon steel. It covers a range of joints and simple welding positions used in industry that reflect the level of the qualification. The learner will be able to select the appropriate tools and working methods to achieve the desired outcome. The learner will be able to state the risks involved in TIG welding and how to mitigate them.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Know how to prepare TIG welding equipment and tools for safe use
Assessment criteria
The learner can: 1.1 state the health and safety measures in the workplace that relate to the welding process 1.2 state the methods of avoiding and removing welding fumes 1.3 state the methods of avoiding hazards associated with the process 1.4 identify hazards commonly encountered in the welding environment 1.5 define safe working practices.

Range
<p>Health and safety measures: Personal Protective Equipment (PPE) (application to welding process, employers' duties, employees' duties, function of items of PPE (headshield, filter lens, cover lens, gauntlets, protective footwear, eye protection, flame retardant overalls)).</p> <p>Welding fumes: use of extraction, natural ventilation (eg on-site), air-fed headshields, respirator.</p> <p>Hazards: fire (sources of combustion, burns), electric shock (shock hazards, welding lead, welding return, welding earth, insulation), arc radiation (visible light, infra-red, ultra-violet), arc-eye, glare, methods of avoiding (PPE, screening), hot metal (identification of hazard ('HOT' and date and time), use of tools tongs for moving and manipulation).</p>

Learning outcome
<p>The learner will:</p> <p>2. Be able to use equipment safely for TIG welding low carbon steel</p>
Assessment criteria
<p>The learner can:</p> <p>2.1 identify TIG welding equipment</p> <p>2.2 state the function of welding equipment</p> <p>2.3 state the safe use of equipment used for preparing and finishing materials and welded joints</p> <p>2.4 identify common shielding gas</p> <p>2.5 state the type of welding current and polarity</p> <p>2.6 identify electrode sizes</p> <p>2.7 state tungsten electrode types</p> <p>2.8 identify filler wire sizes</p> <p>2.9 relate process variables to flat and horizontal/vertical welding of joints</p> <p>2.10 state welding practices</p> <p>2.11 identify the types of joint</p> <p>2.12 name the welding positions as they relate to current standards</p> <p>2.13 state the appropriate assembly and distortion control methods</p> <p>2.14 list the post welding cleaning activities</p> <p>2.15 state the need for good housekeeping in the workplace.</p>

Range
<p>Welding equipment: alternating current (ac), direct current (dc), welding leads (welding, return, earth), electrode holders, return clamps</p> <p>Equipment: angle grinders, linishers, files, wire brushes, hammer and chisel, shielding gas: argon</p> <p>Welding current and polarity: direct (dc) electrode negative</p> <p>Electrode sizes: \varnothing1.6 mm, \varnothing2.4 mm</p> <p>Electrode types: thoriated, ceriated, lanthanated</p> <p>Filler wire sizes: \varnothing1.6 mm, \varnothing2.4 mm</p>

<p>Variables: welding current, gas flow rate</p> <p>Welding practices: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving</p> <p>Types of joint: butt, lap, tee, corner</p> <p>Welding positions: flat, horizontal/vertical</p> <p>Assembly and distortion control methods: clamping, alignment jigs, run on/off plates, tack welds</p> <p>Cleaning activities: wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>
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<p>Learning outcome</p> <p>The learner will:</p> <p>3. Be able to produce simple welded joints safely using TIG welding</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>3.1 use Personal Protective Equipment (PPE) effectively for TIG welding</p> <p>3.2 use equipment for a welding operation safely</p> <p>3.3 produce sufficient tack welded joints to enable welding</p> <p>3.4 produce fillet welded joints in 1.5 to 3 mm thick low carbon steel safely in simple welding positions</p> <p>3.5 use low carbon steel for a welding operation</p> <p>3.6 use welding consumables safely</p> <p>3.7 carry out weld cleaning and checking safely</p> <p>3.8 restore work area using the correct procedures for the disposal of waste.</p>

<p>Range</p> <p>Joints: lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Welding operation: arc striking, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Weld cleaning and checking: wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>

<p>Additional guidance</p> <p>Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.</p>

Unit 112

Carrying out oxy-acetylene welding processes

URN:	R/503/0171
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the underlying process technology associated with oxy-acetylene (gas) welding at low carbon steel. It covers a range of joints and simple welding positions used in industry that reflect the level of the qualification. The learner will be able to select the appropriate tools and working methods to achieve the desired outcome. The learner will be able to state the risks involved in oxy-acetylene welding and how to mitigate them.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Know how to prepare oxy-acetylene welding equipment and tools for safe use
Assessment criteria
The learner can: 1.1 state the health and safety measures in the workplace that relate to the welding process 1.2 state the methods of avoiding and removing welding fumes 1.3 state the methods of avoiding hazards associated with the process 1.4 state the safe start-up and shutdown procedures 1.5 state the procedure for dealing with a backfire 1.6 list the procedure for dealing with a flashback 1.7 state hazards commonly encountered in the welding environment 1.8 define safe working practices

Range
<p>Health and safety measures: Personal Protective Equipment (PPE) (application to welding process, employers' duties, employees' duties, function of items of PPE (goggles, filter lens, cover lens, gloves, protective footwear, eye protection, flame retardant overalls, leather apron).</p> <p>Welding fumes: use of extraction, natural ventilation (eg on-site), respirator.</p> <p>Hazards: fire (sources of combustion, burns), glare, methods of avoiding (PPE, screening), hot metal (identification of hazard ('HOT' and date and time), use of tools tongs for moving and manipulation, use of PPE), hazards from compressed gas cylinders (safe storage conditions, safe handling/moving, safe use).</p>

Learning outcome
<p>The learner will:</p> <p>2. Know how to use equipment safely for oxy-acetylene welding low carbon steel</p>
Assessment criteria
<p>The learner can:</p> <p>2.1 identify oxy-acetylene welding equipment</p> <p>2.2 state the function of welding equipment</p> <p>2.3 state the safe use of equipment used for preparing and finishing materials and welded joints</p> <p>2.4 identify filler rod sizes</p> <p>2.5 relate process variables to flat and horizontal/vertical welding of joints</p> <p>2.6 identify the neutral flame condition</p> <p>2.7 identify the gases used</p> <p>2.8 identify welding practices</p> <p>2.9 identify the types of joint</p> <p>2.10 state how the welding positions relate to current standards</p> <p>2.11 name the appropriate assembly and distortion control methods</p> <p>2.12 list the post welding cleaning activities</p> <p>2.13 state the need for good housekeeping in the workplace.</p>

Range
<p>Welding equipment: cylinders, pressure regulators, flashback arrestors, hoses, hose check-valves, hose connectors, blowpipe/torch, nozzles.</p> <p>Function: cylinders (oxygen, acetylene, colour coding), pressure regulators, flashback arrestors, hoses, hose check-valves, blowpipe/torch, economisers, nozzles (sizes), use of left hand and right hand threaded connections (identification).</p> <p>Equipment: angle grinders, linishers, files, chipping hammer, wire brushes, hammer and chisel.</p> <p>Filler rod sizes: Ø1.6mm, Ø2.4 mm.</p>

<p>Process variables: gas pressures, nozzle sizes, welding technique (leftward).</p> <p>Neutral flame: inner cone, outer envelope, hottest point of the flame, other conditions (oxidising, reducing/carburising).</p> <p>Gases: types (oxygen, acetylene, cylinder colour, hose colour, hazards) associated with its use and how to avoid them.</p> <p>Welding practices: flame ignition and setting, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Types of joint: butt, lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Assembly and distortion control methods: clamping, alignment jigs, run on/off plates, tack welds, longitudinal contraction, transverse contraction, angular, longitudinal angular distortion and buckling.</p> <p>Cleaning activities: wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>

<p>Learning outcome</p> <p>The learner will:</p> <p>3. Be able to produce welded joints safely using oxy-acetylene welding</p>
<p>Assessment criteria</p> <p>The learner can:</p> <p>3.1 use Personal Protective Equipment (PPE) effectively for oxy-acetylene welding</p> <p>3.2 use equipment for a welding operation safely</p> <p>3.3 produce sufficient tack welded joints to enable welding</p> <p>3.4 produce fillet welded joints in 1.0 to 3.0 mm thick low carbon steel safely in welding positions</p> <p>3.5 use low carbon steel for a welding operation</p> <p>3.6 use welding consumables safely</p> <p>3.7 carry out weld cleaning and checking safely</p> <p>3.8 restore the work area using the correct procedures for the disposal of waste.</p>

<p>Range</p> <p>Joints: lap, tee, corner.</p> <p>Welding positions: flat, horizontal/vertical.</p> <p>Welding operation: flame ignition and setting, crater filling at the end of a weld, stop/restart, stringer beading, weaving.</p> <p>Weld cleaning and checking: wiring brushing, removal of excess weld metal where required, checking welds for signs of defects.</p>

<p>Additional Guidance</p> <p>Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.</p>

Unit 113

Carrying out surface finishing techniques

URN:	M/503/0162
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit will introduce learners to basic surface finishing operations. It will cover the skills and knowledge needed to prepare for and carry out simple surface finishing activities. The learner will be able to identify the surface finishing techniques required and their application to simple tasks. All relevant health and safety considerations are covered.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for surface finishing
Assessment criteria
The learner can: 1.1 define the employees' responsibility for Health & Safety 1.2 state the hazards associated with the coating/treatment process 1.3 use Personal Protective Equipment (PPE) appropriate to the various stages of the coating process 1.4 use safe procedures to prevent injury to skin 1.5 identify surface coating/treatment processes and their applications 1.6 identify consumables required for surface coating/treatment processes 1.7 state the factors influencing the selection of a specific surface coating/ treatment process 1.8 identify standard and specialist equipment and consumables required when performing surface preparation operations 1.9 prepare the work area prior to the surface finishing operation 1.10 prepare equipment and consumables for surface finishing operation 1.11 prepare material for simple surface finishing operation 1.12 apply health and safety procedures and practices.

Range

Hazards: fumes, particles, spillages.

Coating/treatment process: liquid coatings (painting), mechanical treatments (polishing, finishing).

Consumables: cleaning agents, paints, abrasives.

Selection: type of material, component size, process availability, cost, work environment.

Preparation: steaming, degreasing, grinding and sanding, brushing.

Learning outcome

The learner will:

2. Be able to apply surface coatings

Assessment criteria

The learner can:

2.1 state the **reasons for the application** of the coating/treatment

2.2 state the **factors affecting coating applications**

2.3 select consumables to apply to **surface coatings/treatments**

2.4 apply the surface coating treatment

2.5 **restore work area** using the correct procedures for the disposal of waste.

Range

Reasons for the application: protective, decorative, wear resistance, insulation, type of material.

Factors affecting coating applications: temperature, humidity, viscosity, time.

Surface coatings/treatments: either liquid coatings (painting) or mechanical treatments (polishing or finishing).

Additional guidance

Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.

Unit 114

Carrying out mechanical maintenance

URN:	A/503/0164
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with the routine inspection, lubrication, servicing and maintenance of simple mechanical devices and systems, using the most appropriate tools and equipment in a safe manner. It further deals with dismantling and rebuilding of simple devices and systems, including the replacement of 'lived' items.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to plan and prepare for maintaining simple mechanical devices/systems
Assessment criteria
The learner can: 1.1 gather and interpret information dealing with maintenance, lubrication, assembly and dismantling of devices and systems 1.2 list the stages in a typical service/maintenance schedule 1.3 identify wear and/or damage .

Range
Information: drawings (orthographic, pictorial, sketching, assembly, exploded), charts, tables, maintenance manuals, technical specifications, manufacturers' instructions.
Service/maintenance schedule: permit to work, isolation procedure, locking off procedure, sequence of dismantling and assembly, lubrication requirements, lubrication requirements, tools and equipment, spare/replacement components, 'on-line' reporting requirements (signing off).
Identify wear and/or damage: bearings and shafts, linkages, drive belts, couplings, clutches, brakes, gearboxes, seals and gaskets.

Learning outcome
The learner will: 2. Be able to carry out simple servicing/maintenance in accordance with information from fault-finding
Assessment criteria
The learner can: 2.1 select Personal Protective Equipment (PPE) to be used when undertaking dismantling and assembly operations 2.2 list the sequence to be used to dismantle a device or system 2.3 state the procedure for removing covers 2.4 state levels of cleanliness necessary when undertaking dismantling operations 2.5 use cleaning techniques 2.6 state the need for proof marking during dismantling to aid re-assembly 2.7 state the appropriate storage requirements for removed parts 2.8 use hand tools to dismantle mechanical devices/systems 2.9 separate components by removing mechanical fastenings 2.10 remove components 2.11 remove and fit seals, gaskets and packing 2.12 use release agents for dismantling corroded parts 2.13 conduct visual checks on dismantled components 2.14 state the need to check fastening devices for damage 2.15 check dimensions and clearances of components 2.16 identify the components to discard and replace 2.17 set out components in a logical sequence in preparation for re-assembly 2.18 state the need for packing and shims 2.19 state how to fit seals and gaskets 2.20 state how to locate and secure parts 2.21 check moving parts 2.22 tighten fastenings in the correct sequence to the correct torque 2.23 apply lubricant to moving parts 2.24 restore work area using the correct procedures for the disposal of waste.

Range
PPE: anti-splinter spectacles, skin protection agents, flame proof overalls. Covers: inspection covers, casings, guards. Cleaning: dust (blow, vacuum), dirt (brush, vacuum), grease (degreasing agents, solvents, steam). Hand tools: spanners, socket sets, pin punches, drifts and wedges, grips and pliers, extractors. Mechanical fastenings: nuts and bolts, studs and screws, clips, pins, rivets. Components: bearing extractors, hub pullers, mandrel presses. Fastening devices: studs, bolts and screws, pins and dowels, keys, bearings and shafts, gears, couplings, circlips, seals and gaskets, springs, washers (flat, tab, spring, taper).

Dimensions and clearances: digital metric inside and outside micrometer, digital metric vernier caliper and height gauge, metric feeler gauges, digital metric dial test indicator.

Discard and replace: high tensile bolts and load indicating washers, nylon insert nuts, locking devices, split pins, seals and gaskets.

Locate and secure parts: keys, pins and dowels, screws, nuts and bolts, circlips, mechanical locking devices, castellated nuts.

Lubricant: methods of application, types of lubricants: oil, grease, wax, graphite.

Moving parts: sliding, reciprocating, rotating.

Additional guidance

Restore work area: leave the work area free of unused consumables, clean the work area, put tools and equipment into safe storage, identify and record finished work.

Learning outcome

The learner will:

3. Know how to check that the device/system conforms to the schedule

Assessment criteria

The learner can:

- 3.1 state the need to maintain **maintenance logs**
- 3.2 state the need to check the completed system/device complies with the **specification**
- 3.3 state the importance of making visual checks
- 3.4 state the mechanisms and faults that can be identified by **visual, tactile or audible checks**
- 3.5 state typical **common faults** that occur with specific devices or systems
- 3.6 state methods for 'signing-off' serviced/maintained systems.

Range

Maintenance logs: service administration information (date, name, findings, notes, etc), confirm the serviced/maintained device/system meets the required specification, record the results to confirm achievement of the required operating performance.

Specification: dimensions and tolerances, movement, capacities, appearance, lubrication.

Visual, tactile or audible checks: metal fractures or pitting, loose or damaged mechanical fastenings, broken drive belts and/or chains, leaking seals, excessive movement/clearance, excessive temperature of bearings, brakes or drives, unfamiliar noises.

Common faults: wear and abrasion, overheating, vibration, out of balance, fractures, corrosion, leakages.

Unit 115

Communicating using CAD systems

URN:	F/503/0165
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit is concerned with forms of communication that an entrant to the field of engineering will need to be familiar with, for progression into the industry. This unit aims to develop the communication skills of learners' through the study of topics which include writing, speaking, sketching, CAD, interpreting engineering information, and the use of a range of ICT methods for obtaining, processing and presenting information in oral and written forms.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to prepare for communication
Assessment criteria
The learner can: 1.1 state the types of engineering drawing 1.2 apply the basic information contained within a title block 1.3 state additional information that may be supplied 1.4 identify and use systems of projection 1.5 state types of line and their application 1.6 define standard abbreviations 1.7 list sources of engineering data .

Range
Types of engineering drawing: general layout, detail/component, assembly. Title block: name of draughtsperson, date drawn, projection symbol, scale, title, drawing number, unit of measurement, lettering.

Additional information: general tolerance, material specifications, surface texture, issue number and revisions, warning notices (if in doubt ask, do not scale, not to scale).

Systems of projection: orthographic (first angle, third angle), pictorial (isometric, oblique), views (sectional, hatching).

Types of line: continuous thick, continuous thin, continuous thin irregular, dashed thin, chain thin, dimension (projection lines, dimension lines, leader lines) dimension types (linear - chain, base line - angular).

Abbreviations: across flats, centre line, chamfer, countersunk, diameter, drawing, hexagon head, material, radius, square, thread, undercut.

Engineering data: data sheets, handbooks, reference tables, charts, manufacturers manuals.

Learning outcome

The learner will:

2. Be able to use CAD software for engineering purposes

Assessment criteria

The learner can:

- 2.1 use CAD system **menus and commands** to amend features of CAD templates
- 2.2 use CAD software to produce and output simple basic circuit and detail **drawings**
- 2.3 use CAD software to create and output a simple basic **isometric** drawing or view.

Range

Menus and commands: layers, templates, straight lines, curved lines, circles, ellipses, hatching, dimensioning, text; editing, modification commands (trim, extend, fillet, chamfer, etc), viewing/navigation features (pan, zoom, etc).

Drawings: inserting commonly used symbols, orthographic drawings for 2D output.

Isometric: drawings for 2D output.

Learning outcome

The learner will:

3. Be able to use communication software for engineering purposes

Assessment criteria

The learner can:

- 3.1 create a **spreadsheet** to produce a bill of materials from a given assembly
- 3.2 create a chart or graph using a spreadsheet
- 3.3 send and receive email messages
- 3.4 create **folders** and manage files
- 3.5 operate computer / display **equipment** in compliance with current health and safety legislation.

Range

Spreadsheet: tables, costing, charts, graphs.

Folders: files are sorted and backed-up saved into appropriate folders and storage media.

Equipment: health and safety legislation relating to the use of VDU equipment and work station environment, understand the user's responsibilities under the Data Protection Act, software copyright, Computer Misuse Act, procedures for starting up and closing down systems and software, procedure to output hard copies of files.

Unit 116

Producing engineering drawings

URN:	L/503/0167
Level:	1
Credit value:	7
GLH:	60
Endorsement by a sector or regulatory body:	This unit is endorsed by SEMTA.
Aim:	This unit introduces learners to methods of drawing and communication that are required in the engineering and manufacturing sectors. It covers the fundamental skills and knowledge needed to prepare and produce engineering drawings, in both orthographic and pictorial form.
Assessment:	This unit will be assessed by an assignment which contains practical and knowledge tasks.

Learning outcome
The learner will: 1. Be able to identify standards for engineering drawings and pictorial views
Assessment criteria
The learner can: 1.1 state the sizes of 'A' series drawing sheets 1.2 state the types of engineering drawing 1.3 state the basic information contained within a title block 1.4 state additional information that may be supplied 1.5 identify and use systems of projection 1.6 state types of line and their application 1.7 define standard abbreviations 1.8 list sources of engineering data .

Range
Types of engineering drawing: general layout, detail/component, assembly. Title block: name of draughtsperson, date drawn, projection symbol, scale, title, drawing number, unit of measurement, lettering. Additional information: general tolerance, material specifications, surface texture, issue number and revisions, warning notices (if in doubt ask, do not scale, not to scale).

Systems of projection: orthographic (first angle, third angle), pictorial (isometric, oblique), views (sectional, hatching).

Types of line: continuous thick, continuous thin, continuous thin irregular, dashed thin, chain thin, dimension (projection lines, dimension lines, leader lines) dimension types (linear - chain, base line - angular).

Abbreviations: across flats, centre line, chamfer, countersunk, diameter, drawing, hexagon head, material, radius, square, thread, undercut.

Engineering data: data sheets, handbooks, reference tables, charts, manufacturers manuals.

Learning outcome

The learner will:

2. Be able to apply techniques to produce drawings and geometrical constructions

Assessment criteria

The learner can:

- 2.1 state the basic **instruments and equipment** that are used
- 2.2 set out a title block
- 2.3 apply **drawing scales**
- 2.4 set out **orthographic views** using construction lines and other line types
- 2.5 use methods of **geometrical construction**
- 2.6 use representation of **common features**
- 2.7 state the need for tolerances
- 2.8 state the need for **sectional views**.

Range

Instruments and equipment: pencils (grades), board (parallel motion), rule, set squares (45°, 30/60°, adjustable), compasses (spring bow), protractor, eraser.

Drawing scales: smaller than full size, larger than full size.

Orthographic views: first angle, third angle.

Geometrical construction: bisect a line, construct lines parallel to each other and perpendicular, divide an line into equal parts, construct triangles (equilateral, isosceles), construct an ellipse, construct regular polygons (square, hexagon, octagon).

Common features: threads (external, internal), knurls (diamond, straight), square.

Sectional views: elevations and plan, cutting plain line, hatching, parts not hatched (bolts, nuts and washers, pins, keys and keyways, shafts, webs, gussets, spokes).



Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to <http://www.cityandguilds.com/Provide-Training/Centre-Support>.

Our Quality Assurance Requirements encompasses all of the relevant requirements of key regulatory documents

- Regulatory Arrangements for the Qualifications and Credit Framework (2008)

and sets out the criteria that centres should adhere to pre and post centre and qualification approval.

The **homepage** section of the City & Guilds website also contains useful information such on such things as:

- **Walled Garden:** how to register and certificate learners on line
- **Events:** dates and information on the latest Centre events
- **Online assessment:** how to register for e-assessments.

Centre manual – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:

- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of learners
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Management systems
- Maintaining records
- Assessment
- Internal and External quality assurance
- Frequently asked questions.

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Useful contacts

International learners and centres

General qualification information

Please contact your regional office.

Details can be found at

www.cityandguilds.com or
alternatively

E: **intcg@cityandguilds.com**

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