Qualification Specification for:

OCN NI Level 2 Diploma in Engineering

- **Qualification No: 610/2947/6**

Qualification Regulation Information

OCN NI Level 2 Diploma in Engineering
Qualification Number: 610/2947/6

Operational start date: 15 July 2023
Operational end date: 14 July 2028
Certification end date: 14 July 2030

Qualification operational start and end dates indicate the lifecycle of a regulated qualification. The operational end date is the last date by which learners can be registered on a qualification and the certification end date is the last date by which learners can claim their certificate.

All OCN NI regulated qualifications are published to the Register of Regulated Qualifications (**http://register.ofqual.gov.uk/**). This site shows the qualifications and awarding organisations regulated by CCEA Regulation and Ofqual.

OCN NI Contact Details

Open College Network Northern Ireland (OCN NI)
Sirius House
10 Heron Road
Belfast
BT3 9LE

Phone: 028 90463990
Web: **www.ocnni.org.uk**

Foreword

This document explains OCN NI's requirements for the delivery and assessment of the following regulated qualification:

→ **OCN NI Level 2 Diploma in Engineering**

This specification sets out:

- Qualification features
- Centre requirements for delivering and assessing the qualification
- The structure and content of the qualification
- Unit details
- Assessment requirements for the qualification
- OCN NI's quality assurance arrangements for the qualification
- Administration

OCN NI will notify centres in writing of any major changes to this specification. We will also publish changes on our website at **www.ocnni.org.uk**

This specification is provided online, so the version available on our website is the most up to date publication. It is important to note that copies of the specification that have been downloaded and printed may be different from this authoritative online version.

Contents

About Regulation

OCN NI

Open College Network Northern Ireland (OCN NI) is a regulated Awarding Organisation based in Northern Ireland. OCN NI is regulated by CCEA Regulation to develop and award professional and technical (vocational) qualifications from Entry Level up to and including Level 5 across all sector areas. In addition, OCN NI is regulated by Ofqual to award similar qualification types in England.

The Regulated Qualifications Framework: an overview

The Regulated Qualifications Framework (RQF) was introduced on 1st October 2015: the RQF provides a single framework for all regulated qualifications.

Qualification Level

The level indicates the difficulty and complexity of the knowledge and skills associated with any qualification. There are eight levels (Levels 1-8) supported by three 'entry' levels (Entry 1-3).

Qualification Size

Size refers to the estimated total amount of time it could typically take to study and be assessed for a qualification. Size is expressed in terms of Total Qualification Time (TQT), and the part of that time typically spent being taught or supervised, rather than studying alone, is known as Guided Learning Hours (GLH).

Qualification Summary

Sector Subject Area

4.1 Engineering

This qualification has been mapped to National Occupational Standards including the following:

SEMPEO268 - General maintenance engineering applications - National Occupational Standards (ukstandards.org.uk)

SEMPEO267 - General electrical and electronic engineering applications - National Occupational Standards (ukstandards.org.uk)

SEMPEO266 - General fabrication and welding applications - National Occupational Standards (ukstandards.org.uk)

SEMPEO261 - Producing CAD models (drawings) using a CAD system - National Occupational Standards (ukstandards.org.uk)

SEMPEO255 - Carrying out hand forging of engineering materials - National Occupational Standards (ukstandards.org.uk)

Qualification Aim

The aim of the OCN NI Level 2 Diploma in Engineering is to enable learners to gain the skills and knowledge to undertake a broad range of engineering roles and/or progress to further engineering qualifications.

Qualification Objectives

The objectives of the OCN NI Level 2 Diploma in Engineering are to enable learners to gain skills and knowledge to include the following:

- health and safety in an engineering and manufacturing environment
- mathematics and science for engineering
- practical engineering project
- engineering skills in a broad range of areas

Grading

Grading for this qualification is pass/fail.

Qualification Target Group

The qualification is targeted at individuals who are interested in developing skills and knowledge in a broad range of engineering areas.

Progression Opportunities

The OCN NI Level 2 Diploma in Engineering qualification enables progression to further learning in this area or into employment.

Entry Requirements

Learners must be at least 16 years of age.

Qualification Support

A Qualification Support pack is available for OCN NI centres within the login area of the OCN NI website (https://www.ocnni.org.uk/my-account/), which includes additional support for teachers, eg planning and assessment templates, guides to best practice, etc.

Delivery Languages

This qualification is available in English only at this time. If you wish to offer the qualification in Welsh or Irish (Gaeilge) then please contact OCN NI who will review demand and provide as appropriate.

Centre Requirements for Delivering the Qualification

Centre Recognition and Qualification Approval

New and existing OCN NI recognised centres must apply for and be granted approval to deliver the qualification prior to the commencement of delivery.

Centre Staffing

Centres are required to have the following roles in place as a minimum, although a member of staff may hold more than one role*:

- Centre contact
- Programme Co-ordinator
- Tutor
- Assessor
- Internal Verifier

*Note: A person cannot be an internal verifier for their own assessments.

Tutors

Tutors delivering the qualification should be occupationally competent, qualified to at least one level higher than the qualification, and have a minimum of three years' relevant experience in the engineering industry.

Assessors

The qualification is assessed within the centre and is subject to OCN NI's quality assurance processes. Units are achieved through internally set, internally assessed, and internally verified evidence.

Assessors must:

- be occupationally competent to at least one level higher than the qualification and have a minimum of three years' relevant experience in the engineering industry
- have direct or related relevant experience in assessment
- assess all assessment tasks and activities

Internal Verification

OCN NI qualifications must be scrutinised through the centre's internal quality assurance processes as part of the recognised centre agreement with OCN NI. The centre must appoint an experienced and trained centre internal verifier whose responsibility is to act as the internal quality monitor for the verification of the delivery and assessment of the qualifications.

The centre must agree a working model for internal verification with OCN NI prior to delivery of the qualifications.

Internal Verifiers must:

- have at least three years' occupational experience in the areas they are internally verifying
- attend OCN NI's internal verifier training if not already completed

Internal verifiers are required to:

- support tutors and assessors
- sample assessments according to the centre's sampling strategy
- ensure tasks are appropriate to the level being assessed
- maintain up-to-date records supporting the verification of assessment and learner achievement

Structure and Content

OCN NI Level 2 Diploma in Engineering Skills

To achieve the OCN NI Level 2 Diploma in Engineering learners must successfully complete 60 credits with 20 credits from the five mandatory units and the remaining 40 credits from any of the optional units.

Total Qualification Time (TQT) for this qualification: 600 hours
Guided Learning Hours (GLH) for this qualification: 480 hours

Note: Barred units (only one of the units below will count towards qualification achievement):

- → Producing Computer Aided Design Models - H/650/9669
- → Computer Aided Design - H/650/7660
- → Producing Electrical and Electronic Engineering Drawings Using CAD - A/650/7659

Unit Reference Number	OCN Code	Unit Title	Credit Value	GLH	Level
Mandatory units					
R/650/7647	CBG236	Health and Safety in an Engineering and Manufacturing Environment	4	32	Two
M/650/7655	CBG237	Mathematics for Engineering	4	32	Two
R/650/7656	CBG238	Understand the Principles of Science Used within Engineering	4	32	Two
T/650/7657	CBG239	Engineering Materials	4	32	Two
Y/650/7658	CBG240	Practical Engineering Project	4	32	Two
Optional units					
A/650/7659	CBG241	Producing Electrical and Electronic Engineering Drawings Using CAD	10	80	Two
H/650/7660	CBG242	Computer Aided Design	10	80	Two
J/650/7661	CBG243	Hand Fitting	10	80	Two

Unit Reference Number	OCN Code	Unit Title	Credit Value	GLH	Level
K/650/7662	CBG244	Preparing and Using Lathes for Turning Operations	10	80	Two
L/650/7663	CBG245	Producing Plate Work Components and Assemblies	10	80	Two
M/650/7664	CBG246	Preparing and Using Manual Metal Arc Welding Equipment	10	80	Two
R/650/7665	CBG247	Using Semi-Automatic Metal Inert Gas, Metal Active Gas and Flux Cored Arc-Welding Equipment	10	80	Two
T/650/7666	CBG248	Forming and Installing Cable Enclosures	10	80	Two
Y/650/7667	CBG249	Wiring and Testing Electrical Circuits and Equipment	10	80	Two
A/650/7668	CBG250	Robotic Systems for Engineering	10	80	Two
D/650/7669	CBG251	Preparing and Using Manual TIG Welding Equipment	10	80	Two
J/650/7670	CBG252	Producing Sheet Metal Components and Assemblies	10	80	Two
K/650/7671	CBG253	Assembling and Testing Electronic Circuits	10	80	Two
L/650/7672	CBG254	Preparing and Using Milling Machines	10	80	Two
M/650/7673	CBG255	Wiring and Testing Programmable Controllers	10	80	Two
K/650/7680	CBG256	Fluid Power Systems	10	80	Two
L/650/7681	CBG257	Installing Aircraft Mechanical Fasteners	10	80	Two

Unit Reference Number	OCN Code	Unit Title	Credit Value	GLH	Level
M/650/7682	CBG258	Producing Aircraft Detail Assemblies	10	80	Two
R/650/7683	CBG259	Aircraft Detail Fitting	10	80	Two
T/650/7684	CBG260	Industrial Coatings Application	10	80	Two
K/651/0261	CBG538	Preparing and Using Computerised Numerical Control Mills for Milling Operations	10	80	Two
H/650/9669	CBG539	Producing Computer Aided Design Models	10	80	Two
L/650/9670	CBG540	Producing Components using Rapid Prototyping and Additive Manufacturing	10	80	Two
L/651/0262	CBG541	Producing Composite Mouldings Using Wet Lay-up Techniques	10	80	Two

Unit Details

Title	Health and Safety in an Engineering and Manufacturing Environment
Level	Two
Credit Value	4
Guided Learning Hours (GLH)	32
OCN NI Unit Code	CBG236
Unit Reference No	R/650/7647
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand health and safety regulations, policies and procedures and how to work safely in a manufacturing and engineering environment.	
Learning Outcomes	**Assessment Criteria**
1. Understand regulations, polices, procedures and roles and responsibilities relating to health and safety in engineering and manufacturing.	1.1. Describe key aspects of health and safety regulations, policies and procedures applicable to engineering and manufacturing. 1.2. Summarise employer and employee responsibilities in relation to workplace health and safety. 1.3. Define the roles and responsibilities for health and safety personnel applicable to engineering and manufacturing.
2. Understand safe working practices in an engineering and manufacturing environment.	2.1. Identify safe working practices that must be adhered to in the workplace. 2.2. Identify different types and classifications of health and safety signs that are used in engineering and manufacturing environments. 2.3. Summarise the purpose and use of different types of personal protective equipment (PPE) to minimise risk. 2.4. Describe how to carry out a risk assessment in an engineering and manufacturing environment including identification of potential hazards. 2.5. Describe the following in relation to health and safety in engineering and manufacturing environments: a) methods of fire prevention and control b) how to ensure hazardous areas are safe prior to work commencing c) emergency procedures to be followed in response to different incidents d) procedures to be followed when carrying out manual handling activities safely

Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Mathematics for Engineering
Level	Two
Credit Value	4
Guided Learning Hours (GLH)	32
OCN NI Unit Code	CBG237
Unit Reference No	M/650/7655
Learn Direct Code	XA1

Unit purpose and aim(s): This unit will enable the learner to apply basic mathematics to solve engineering problems.

Learning Outcomes	Assessment Criteria
1. Be able to use basic arithmetic, algebraic and graphical methods to solve engineering problems.	1.1. Use basic arithmetic methods to solve engineering problems including: a) addition, subtraction, multiplication and division of whole and decimal numbers b) fractions, ratios and percentages c) powers and roots d) standard form and scientific notation e) approximations, significant figures and decimal places 1.2. Use algebraic methods to transpose two simple formulae. 1.3. Use graphical methods to plot and analyse linear and non-linear relationships for given engineering data.
2. Be able to use and apply trigonometric functions.	2.1. Apply the following to solve basic mathematical problems involving right-angled triangles: a) Pythagoras' theorem b) sine, cosine, tangent functions
3. Be able to measure and calculate the area and volume of objects and apply trigonometric functions.	3.1. Determine the area of at least three of the following regular shapes: a) squares b) rectangles c) triangles d) circles e) compound shapes 3.2. Determine the volume of at least three of the following regular solid bodies: a) cylinders b) cones c) right rectangular prisms d) compound solid bodies

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Understand the Principles of Science Used within Engineering
Level	Two
Credit Value	4
Guided Learning Hours (GLH)	32
OCN NI Unit Code	CBG238
Unit Reference No	R/650/7656
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to apply scientific principles to solve engineering problems.	

Learning Outcomes	Assessment Criteria
1. Be able to apply concepts and principles relating to electrical science.	1.1. Summarise what is meant by the following electrical terms including units of measurement: a) voltage b) current c) resistance d) electro-motive force e) electrical power 1.2. Summarise what is meant by electrical terms: a) direct current b) alternating current c) electrostatic discharge d) conductors e) insulators f) earthing 1.3. Identify electrical and electronic components of using industry forms of classifications of components. 1.4. Summarise what is meant by the following terms relating to magnetic fields including units of measurement: a) magnetic fields b) magnetic flux c) flux density 1.5. Determine the following for both series and parallel circuits: a) total resistance b) potential difference between two given points c) current at given points
2. Be able to apply concepts and principles relating to mechanical science.	2.1. Summarise what is meant by following terms relating to static and dynamic systems including units of measurement: a) mass b) weight c) force d) moment of a force e) density f) relative density g) displacement h) velocity i) acceleration j) work

	2.2. Use appropriate physical laws to calculate from given data: a) the resultant and equilibrant of a system of concurrent coplanar forces from given data b) uniform acceleration and deceleration retardation of a body c) pressure at a given depth in a fluid

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Engineering Materials
Level	Two
Credit Value	4
Guided Learning Hours (GLH)	32
OCN NI Unit Code	CBG239
Unit Reference No	T/650/7657
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand common engineering materials, their properties and use for different engineering applications. The learner will also understand how sustainability impacts on engineering and use of materials.	

Learning Outcomes	Assessment Criteria
1. Understand the properties of engineering materials.	1.1. Describe the properties that are used to define the behaviour of common engineering materials. 1.2. Determine the properties of given materials commonly used in engineering applications from each of the following categories: a) ferrous metal b) non-ferrous metal c) organic d) thermoplastic e) thermosetting polymer f) smart material
2. Know how engineering materials are identified.	2.1. Identify material symbols and abbreviations used on given engineering documentation. 2.2. Describe the forms of supply available for different engineering materials.
3. Understand the importance of using sustainable materials within engineering manufacture.	3.1. Describe why sustainability is important in engineering and how engineering companies can be encouraged to become more sustainable and environmentally aware. 3.2. Describe the importance of recycling within engineering. 3.3. Describe what is meant by the term materials economy in relation to engineering.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log

Title	Practical Engineering Project
Level	Two
Credit Value	4
Guided Learning Hours (GLH)	32
OCN NI Unit Code	CBG240
Unit Reference No	Y/650/7658
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to be able to undertake a timebound engineering project demonstrating appropriate industry skills and knowledge.	

Learning Outcomes	Assessment Criteria
1. Be able to research and select approaches to provide a solution to an engineering challenge.	1.1. Research a minimum of two approaches to provide solutions to a given engineering challenge taking into account the following: a) types of material to be used b) material costs c) health and safety d) engineering techniques and skills required 1.2. Use a decision-making matrix to select with justification a preferred approach from those identified in AC 1.1 taking into account: a) costs b) difficulty of execution c) timeframe d) resources required
2. Be able to present a solution to an engineering challenge.	2.1. Present findings of research undertaken above using an appropriate medium to a given audience to include: a) explanation of why each approach was considered b) justification for approach selected
3. Be able to design and manufacture a solution to an engineering challenge.	3.1. Design a solution specification based on selection of approach in AC 1.2. 3.2. Select the appropriate tools and equipment to implement the solution developed in AC 3.1. 3.3. Carry out a risk assessment. 3.4. Select and use personal protective equipment correctly where appropriate. 3.5. Manufacture the solution in the timeframe identified in AC 1.2.
4. Be able to evaluate a solution to an engineering challenge and present findings.	4.1. Evaluate the solution manufactured in AC 3.5 including how it addresses the specification and identifying possible areas for improvement. 4.2. Present findings of evaluation undertaken in AC 4.1 using an appropriate medium to a given audience responding to technical and other questions as required.

Delivery Guidance

This unit must be delivered last and may either simulate an 'on the job' activity or be completed on site. Representatives from industry are encouraged to attend this presentation

Sizes and materials are to be determined by the individual centre to maximise the appropriate training to deem the candidate competent.

The use of extension activities is at the discretion of the centre and will have no impact on the overall achievement.		
Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log

Title	Producing Electrical and Electronic Engineering Drawings Using CAD
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG241
Unit Reference No	A/650/7659
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to set up and operate a computer aided drawing (CAD) system to produce detailed drawings of electrical or electronic engineering systems.	
Learning Outcomes	**Assessment Criteria**
1. Be able to use sources of data and design features to produce electrical and electronic engineering drawings.	1.1. Use at least three of the following to obtain the necessary data to inform the production of electrical and electronic engineering drawings: a) drawing brief b) drawing change or modification request c) manuals d) calculations e) sketches f) specifications g) electrical regulations h) standards i) existing drawings and designs j) other available data k) standard reference documents l) notes from meetings or discussions 1.2. Incorporate at least four of the following design features to inform the production of electrical and electronic engineering drawings: a) function b) operating voltages c) ergonomics d) operating environment e) cost f) lifetime of the product g) tolerances h) interfaces i) aesthetics j) physical space and dimensions of circuit k) power supplies l) safety m) component orientation n) connectors and test point access o) types of components available to be used p) method of installation q) position of circuit components r) type of cable to be used s) connections between components t) type of circuit; digital, analogue, hybrid u) technology of circuit design including single sided, double sided, multi-layer, flexi-rigid v) meets signal integrity parameters

	w) meets specified operating conditions x) assembly or manufacturing schedule constraints
2. Be able to produce electrical and electronic engineering drawings.	2.1. Evaluate data and information obtained above to inform the production of electrical and electronic engineering drawings in terms of: a) completeness and accuracy b) determination of potential problems arising and how they may be addressed. 2.2. Produce three of the following types of electrical or electronic engineering drawings informed by evaluations carried out in AC 2.1: a) circuit diagrams b) general assembly drawings c) installation and / or commissioning d) wiring diagrams e) panel assembly f) manufacture of cable looms g) block diagrams h) cable and routing i) fault diagnostics j) schematics k) circuit board assembly l) system drawings m) circuit board layout n) modifications to equipment or systems
3. Be able to produce engineering drawings complying with British Standards (BS) and International Organisation for Standardisation (ISO) and other standards.	3.1. Produce electrical or electronic drawings which include at least ten of the following features: a) straight lines b) curved or contour lines c) dimensions d) circles or ellipses e) angled lines f) hidden detail g) text h) parts lists i) insertion of standard electrical or electronic components j) test points k) type and size of cables l) colour and component coding m) connection/termination details n) parts lists o) electrical/electronic symbols and abbreviations p) fault diagnosis 3.2. Produce an electrical or electronic drawing which complies with BS and ISO standards and procedures to include at least seven of the features identified in AC 3.1

	3.3. Produce an engineering drawing which complies with one of the following: a) organisational guidelines b) statutory regulations and codes of practice c) CAD software standards d) other international standards

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Computer Aided Design
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG242
Unit Reference No	H/650/7660
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to set up and operate a computer aided drawing (CAD) system to produce detailed mechanical engineering drawings.	

Learning Outcomes	Assessment Criteria
1. Be able to interpret information and produce drawings using a drawing template.	1.1. Illustrate how to set up drawing template parameters including: a) layers of drawings b) scale c) paper size d) colour setup e) line types f) dimension system g) text styles 1.2. Interpret information in order produce drawings, using two of the following methods of projection: a) first angle orthographic projections b) isometric/oblique projections c) third angle orthographic projections 1.3. Illustrate how to set up a viewing screen to show multiple views of a drawing to assist with development of a drawing including isometric front and side elevations. 1.4. Produce at least two of the following: a) detail drawings b) general arrangement drawings c) sub-assembly drawings d) installation drawings
2. Be able to produce mechanical drawings which comply with British Standards (BS) and International Organization for Standardization (ISO).	2.1. Illustrate the application and use of drawing tools to produce drawing features including: a) straight lines b) curves and circles c) adding dimensions and text d) layers of drawings 2.2. Produce mechanical drawings which comply with BS and ISO standards and procedures to include at least ten of the following features: a) straight lines b) dimensions c) angled lines d) text e) insertion of standard components f) symbols and abbreviations g) curved/contour lines h) circles or ellipses i) geometrical tolerancing j) hidden detail k) sectional detail l) parts lists m) other specific detail

Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Hand Fitting
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG243
Unit Reference No	J/650/7661
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce components using hand fitting techniques.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for hand fitting activities in a manufacturing environment.	1.1. Describe the health and safety issues and requirements associated with carrying out hand fitting activities in a manufacturing environment. 1.2. Describe how to prepare and plan for hand fitting activities. 1.3. Carry out a risk assessment for a given hand fitting activity in a manufacturing environment.
2. Be able to carry out engineering processes to manufacture products safely.	2.1. Describe the process and demonstrate how to mark out different material forms to given tolerances, to include at least two of the following: a) square or rectangular bar stock, sheet material or machined components b) circular or cylindrical bar stock, tubes, turned components or flat disks c) sections including angles channel, tee section, joists or extrusions d) irregular shaped castings, forgings or odd shape components 2.2. Describe the process and demonstrate how to cut and shape at least two different types of material to given tolerances for the following: a) low carbon or mild steel b) high carbon steel c) cast iron d) stainless steel e) aluminium or aluminium alloys f) brass or brass alloys g) plastic, nylon or synthetic materials h) composite 2.3. Describe and demonstrate the techniques used to carry out the following engineering activities safely to manufacture products to given tolerances: a) filing b) hand sawing c) drilling d) threads external e) threads internal 2.4 Describe and demonstrate the techniques used to carry out at least one of the following engineering activities safely to manufacture products: a) power sawing b) offhand grinding c) scraping

	d) chiseling e) lapping
3. Be able to carry out quality checks on manufactured products.	3.1. Carry out quality checks on products manufactured in AC 2.2, 2.3, and 2.4 to ensure products meet requirements in relation: a) linear dimensions b) flatness c) squareness d) angles e) profiles f) hole position g) hole size/fit h) depths i) thread size and fit j) surface finish

Additional Assessment Guidance

Re: AC 2.1 - (Description and demonstration should include how to prepare the materials in readiness for the marking out activities, including holding and measuring to prescribed tolerances).

Prescribed Tolerances:

Produce components to the following standards, as applicable to the process:
- Components to be free from false tool cuts, burrs and sharp edges
- General dimensional tolerance +/- 0.25mm
- Flatness and squareness 0.05mm per 25mm
- Angles within +/- 1 degree
- Screw threads to BS Medium fit
- Reamed and bored holes within H8
- Surface finish 63 µin or 1.6 µm

Re: AC 2.2 - (Explanation should include how to use tools Safely and efficiently while cutting and shaping).

Re: AC 3.1 - At least one of the components produced must be of a significant nature and require all of the techniques listed in learning outcome 2.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Preparing and Using Lathes for Turning Operations
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG244
Unit Reference No	K/650/7662
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to prepare and use lathes for turning operations.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for turning activities.	1.1. Summarise the key aspects of health and safety requirements for turning activities. 1.2. Plan turning activities prior to manufacturing. 1.3. Carry out a risk assessment for a given turning activity.
2. Be able to set up and use lathes and associated accessories and tools.	2.1. Summarise the main features of a given lathe and accessories including: a) saddle b) capstan/turret head c) compound slide d) tailstock e) taper turning attachments f) profile attachments g) fixed and travelling steadies 2.2. Describe how to position and secure workholding devices to a machine spindle, and associated checks including: a) ensuring that all seating/location faces are clean and undamaged b) location marks are lined up with those on the machine spindle where appropriate c) bolts, cam locks or other securing devices are tightened securely 2.3. Machine two components for each of the following types of material: a) ferrous b) non ferrous c) non metallic 2.4. Describe how to mount and secure cutting tools in tool holding devices and the importance of ensuring correct centre height and overhang is kept to a minimum including: a) front or rear tools posts b) mounting drills in chucks c) use of morse taper sockets 2.5. Mount, secure and machine components using two of the following work-holding devices: a) three-jaw chucks with hard jaws b) three-jaw chucks with soft jaws c) four-jaw chucks d) collet chucks

	2.6. Mount, secure and machine components using at least one of the following: a) drive plate and centres b) magnetic or pneumatic devices c) fixtures d) fixed steadies or traveling steadies e) faceplates f) special purpose work-holding devices 2.7. Mount and use at least eight of the following types of tools: a) turning b) knurling c) recessing/grooving d) twist/core drills e) thread forming tools f) facing g) parting off h) chamfering i) reamers j) dies k) boring l) forming m) centre drills n) taps
3. Be able to produce machined components using different operations and carry out checks for accuracy.	3.1. Produce machined components which combine different operations and have features that include the following: a) flat faces b) stepped diameters c) drilled holes d) chamfers e) parallel diameters f) tapered diameters g) reamed holes h) grooves/undercuts i) bored holes 3.2. including at least four more of the following: a) internal threads (taps) b) external threads (dies) c) eccentric diameters d) knurls or special finishes e) profile forms f) parting off g) external threads (screw cutting using formed tooling) h) internal threads (screw cutting using formed tooling) 3.3. Carry out the following checks for accuracy on the components produced in AC 3.1: a) external diameters b) bore/hole size/fit c) surface finish d) parallelism e) angle/taper f) linear dimensions (such as lengths, depths) g) grooves/undercuts (such as position, width, depth) 3.4. including at least two of the following checks for accuracy: a) internal diameters

	b) concentricity c) eccentricity d) ovality e) thread fit 3.5. Describe factors that influence the selection of cutting feeds, speeds and the depth of cut that can be taken. 3.6. Describe the following in relation to machining components: a) techniques of taking trial cuts b) checking dimensional accuracy c) application of roughing and finishing cuts, and the effect on tool life, surface finish and dimensional accuracy.
4. Be able to use different measuring equipment to carry out quality inspection ensuring the quality and accuracy of components produced.	4.1. Use the following measuring equipment during machining and checking activities: a) external micrometers b) dial test indicators (DTI) c) vernier/digital/dial callipers d) surface finish equipment (such as comparison plates, machines) 4.2. including at least six of the following: a) rules b) bore/hole gauges c) internal micrometers d) thread gauges (such as ring, plug, profile) e) depth micrometers f) plug gauges g) depth verniers h) radius/profile gauges i) slip gauges j) protractors k) coordinate measuring machine (CMM) 4.3. Produce components to the following quality and accuracy standards, as applicable to the operation: a) components to be free from false tool cuts, burrs, and sharp edges b) general dimensional tolerance +/- 0.15mm or +/- 0.006” c) have one or more specific dimensional tolerances within +/- 0.05mm or +/- 0.002” d) screw threads British Standard (BS) medium fit e) reamed / bored holes within H8 f) surface finish 63 µin or 1.6µm g) angles within +/- 0.5 degree 4.4. Describe how to check that measuring equipment is within current calibration dates and instruments are correctly zeroed; measuring internal and external dimensions including: a) lengths, diameters, depths, slots, hole positions, angles, profiles b) geometric features including flatness, squareness, parallelism, concentricity, ovality c) checking surface finish by using comparison blocks or instruments

Additional Assessment Guidance
Re: AC 3.1 - at least one of the machined components produced, must be of a significant nature, and have a minimum of six of the features identified in AC 3.1. **Re: AC 3.3** – factors to be considered may include type of material, type of tool used, size of material, operations being performed, work-holding method/security of workpiece, condition of machine, finish and tolerance required.

Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Plate Work Components and Assemblies
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG245
Unit Reference No	L/650/7663
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce platework components and assemblies.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan, prepare and carry out a risk assessment for plate work activities.	1.1. Describe the health and safety issues and requirements associated with carrying out plate work activities in a manufacturing environment. 1.2. Describe how to prepare and plan for plate work activities. 1.3. Carry out a risk assessment for a given plate work activity.
2. Be able to mark out materials.	2.1. Describe how to select and establish a suitable datum including: a) importance of ensuring that marking out is undertaken from the selected datum b) possible effects of working from a different datum. 2.2. Use the following marking out tools: a) scriber b) punch c) rule and /or tape d) straight edge e) square f) protractor g) dividers or trammels h) chalk, blueing or paint to mark out the following: a) datum and centre lines b) square/rectangular profiles c) angles d) circles e) curved profiles f) hole centres g) cutting and bending detail on flat plates and one of the following materials: a) pipe or tube b) solid bar c) rolled section d) non-ferrous material
3. Be able to carry out cutting and forming processes using industrial fabrication equipment.	3.1. Describe how to set up and use two of the following types of forming equipment and techniques: a) hand or powered bending machine b) hand or powered rolling machine c) press d) heating techniques 3.2. Describe the tools and techniques that may be used for cutting and shaping heavy plate and section materials.

	3.3. Describe the selection and fitting of abrasive cutting discs including: a) cutting disc identification markings b) identifying the correct type of disc for the type of material being cut c) statutory regulations regarding the fitting and use of abrasive discs 3.4. Describe different shearing machine cutting methods and techniques including: a) cutting to marking out b) using machine back-stops c) setting plates at an angle to the machine slides 3.5. Cut materials safely using both guillotines and drills and at least two of following: a) abrasive discs b) cropping machines c) machine saws 3.6. Perform cutting operations safely to produce components that have the following features: a) parallel sides b) sides square to each other c) holes linearly pitched 3.7. and have at least two of the following features: a) angled sides b) bevelled edges or weld preps c) curves d) holes radially pitched 3.8. Perform forming operations safely to produce components that have the following features: a) bends at 90° and other angles b) cylinders 3.9. and have at least two of the following features: a) set plate ends b) box square and rectangular sections c) curved plates d) pipe sections e) cones f) segments of a cylindrical tank g) curved section or sector of an otherwise flat plate h) counter-curved sections i) flattening or straightening plate
4. Be able to assemble, secure and produce platework components.	4.1. Describe different methods of securing the assembled components including: a) mechanical fastening devices such as nuts and bolts, rivets, screws, special fasteners b) tack welding methods and techniques 4.2. Describe inspection techniques that can be applied to confirm platework components are in line with specification and within acceptable limits including checking: a) shape including straightness b) dimensions

	4.3. Assemble and secure plate work components in their correct positions and using at least two of the following methods: a) temporary tack welding b) hot or cold riveting c) adhesive bonding d) mechanically fastened 4.4. Produce platework components that meet all the following criteria: a) all dimensions are within +/- 3.0mm or +/- 0.125” b) finished components meet the required shape and geometry c) completed components are free from excessive tooling marks, deformation, cracking, sharp edges, slivers or burrs d) all components are correctly assembled, and have secure and firm joints

Additional Assessment Guidance

Re: AC 3.2 - Machines may include guillotines, cropping machines, abrasive discs such as hand-held portable machines and bench type radiac cutting machines, drilling machines and machine saws.

Re: AC 4.4b - Components features shapes and geometry that depending on component are square, straight, angles free from twists.

Re: AC 4.4 - At least one of the platework components produced must be of a significant nature and contain components with a minimum of three of the cuttings features and three of the forming features listed in learning outcome 3.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner’s progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log

Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Preparing and Using Manual Metal Arc Welding Equipment
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG246
Unit Reference No	M/650/7664
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to prepare and use manual metal arc welding equipment.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan, prepare and carry out a risk assessment for manual metal arc welding activities.	1.1. Describe the health and safety issues and requirements associated with carrying out manual metal arc welding activities. 1.2. Plan and prepare for manual metal arc welding activities prior to welding. 1.3. Carry out a risk assessment for given manual metal arc welding activities.
2. Be able to safely set up manual metal arc welding equipment and select electrodes.	2.1. Describe and safely set up manual metal-arc welding and related equipment to include: a) alternating current (AC) equipment b) direct current (DC) equipment 2.2. Describe the following types of welding electrodes and their applications: a) rutile b) cellulosic c) basic d) other suitable electrodes 2.3. Select and safely set up appropriate welding electrodes for the welding of the following materials and material forms: one type of material from the following: a) carbon steel b) stainless steel c) aluminium 2.4. and one form of material from the following: a) plate b) sheet (less than 3mm) c) pipe-tube d) section e) other forms 2.5. Describe the terminology used for welding positions. 2.6. Set up equipment to weld joints in good access situations for at least two of the following British Standard (BS) European Standard (EN) International Organization for Standardization (ISO) 6947 positions: a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC)
3. Be able to safely weld different joints in different positions and check weld quality.	3.1. Describe the techniques of operating welding equipment to produce different joints in different joint positions.

	3.2. Describe methods used to control distortion including welding sequence and deposition technique. 3.3. Weld at least three of the following types of joints to given specifications safely each at least 150mm long, by single or multi-run as appropriate, using appropriate electrodes, with at least one stop and start included: a) fillet lap b) corner c) tee fillet d) butt 3.4. Weld joints to given specifications safely in good access situations in at least two of the following BS EN ISO 6947 positions : a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC) 3.5. Check the quality of the welded joints produced in AC 3.3 and 3.4 conforms to given specifications including: a) dimensional accuracy b) size and profile of weld c) number of runs d) alignment/squareness
4. Be able to produce welds and carry out non-destructive and destructive tests and identify different weld defects in line with quality standards.	4.1. Describe different procedures for visually examining welds for cracks, porosity and slag inclusions including: a) dye penetrant b) fluorescent penetrant c) magnetic particle testing 4.2. Carry out non-destructive testing of given welds, using at least one of the following: a) dye penetrant b) fluorescent penetrant c) magnetic particle 4.3. Describe different procedures for carrying out destructive tests on the welds including: a) macroscopic examination b) bend tests c) nick break tests 4.4. Carry out destructive tests on weld specimens using at least one of the following: a) macroscopic examination b) nick break test c) bend tests such as face, root or side, as appropriate 4.5. Identify the following defects in given welds: a) lack of continuity of the weld b) uneven and irregular ripple formation c) incorrect weld size or profile 4.6. and at least four of the following: a) undercutting b) internal cracks c) overlap d) surface cracks e) inclusions f) lack of fusion

	g) porosity h) lack of penetration 4.7. Produce welded joints at least 150mm long, using single or multi-run welds as appropriate, with at least one stop and start which meet all of the following (with reference to BS 4872 Part 1 Weld test requirements): a) welds meet the required dimensional accuracy b) fillet welds are equal in leg length and slightly convex in profile, with the size of the fillet equivalent to the thickness of the material welded c) the weld contour is linear, of uniform profile, free from excessive undulations, with regular and even ripple d) the welds are adequately fused, and there is minimal undercut, overlap and surface inclusions e) joins at stop/start positions merge smoothly, with no pronounced hump or crater in the weld surface f) tack welds are blended in to form part of the finished weld, without excessive hump g) corner joints have minimal burn through to the underside of the joint or, where appropriate, penetration is present to a maximum depth of 3mm for at least 75% of the joint h) the weld surface is free from cracks, and substantially free from porosity, shrinkage cavities and trapped slag i) the weld surface and adjacent parent metal is substantially free from arcing or chipping marks

Additional Assessment Guidance

Re AC 2.1 - Description should include basic principles of fusion welding, AC and DC power sources and power ranges.

Re AC3.1 - Description should include striking and initiating the arc, fine adjustment of parameters, correct manipulation and welding speed of electrode, blending in stops/starts and tack welds.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

	the learner's progression through the course	
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Using Semi-Automatic Metal Inert Gas, Metal Active Gas and Flux Cored Arc-Welding Equipment
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG247
Unit Reference No	R/650/7665
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to prepare and use semi-automatic Metal Inert Gas (MIG), Metal Active Gas (MAG) and flux cored arc-welding equipment.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan, prepare and carry out a risk assessment for welding activities.	1.1. Describe the health and safety issues and requirements associated with carrying out welding activities. 1.2. Plan and prepare for welding activities prior to welding. 1.3. Carry out a risk assessment for given welding activities.
2. Be able safely set up welding equipment and select appropriate consumables, gas and welding positions.	2.1. Describe how to safely set up the following types of welding equipment: a) MIG b) MAG c) Flux cored wire 2.2. Set up one of the following types of welding equipment safely: a) MIG b) MAG c) Flux cored wire 2.3. Describe consumables including gas appropriate to different materials and applications, to include one of the following wire types: a) solid b) cored 2.4. Select consumables for the welding of the following materials and material forms: one type of material from the following: a) carbon steel b) stainless steel c) aluminium and two forms of material from the following: a) plate b) sheet (less than 3mm) c) pipe/tube d) section e) other forms 2.5. Describe different types of shielding gas and reasons for use. 2.6. Use one of the following types of shielding gas: a) inert b) active 2.7. Describe the terminology used for welding positions. 2.8. Set up equipment to weld joints in good access situations for at least two of the

	following British Standard (BS) European Standard (EN) International Organization for Standardization (ISO) 6947 positions: a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC)
3. Be able to safely weld different joints in different positions and check weld quality.	3.1. Describe the techniques of operating welding equipment to produce a different joints in the various joint positions. 3.2. Describe methods used to control distortion including welding sequence and deposition technique. 3.3. Weld at least three of the following types of joints to given specifications safely each at least 150mm long, by single or multi –run as appropriate with at least one stop and start included: a) fillet lap b) corner c) tee fillet d) butt 3.4. Weld joints to given specifications safely in good access situations in at least two of the following BS EN ISO 6947 positions: a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC) 3.5. Check the quality of the welded joints produced in AC 3.3 and 3.4 conforms to given specifications including: a) dimensional accuracy b) size and profile of weld c) number of runs d) alignment/squareness
4. Be able to carry out non-destructive and destructive tests and identify different weld defects in line with quality standards.	4.1. Describe different procedures for visually examining welds for cracks, porosity and slag inclusions including: a) dye penetrant b) fluorescent penetrant c) magnetic particle testing 4.2. Carry out non-destructive testing of given welds, using at least one of the following: a) dye penetrant b) fluorescent penetrant c) magnetic particle 4.3. Describe different procedures for carrying out destructive tests on the welds including: a) macroscopic examination b) bend tests c) nick break tests 4.4. Carry out destructive tests on weld specimens using at least one of the following: a) macroscopic examination b) nick break test c) bend tests (such as face, root or side, as appropriate)

	4.5. Identify the following defects in given welds: a) lack of continuity of the weld b) uneven and irregular ripple formation c) incorrect weld size or profile and at least four of the following: a) undercutting b) internal cracks c) overlap d) surface cracks e) inclusions f) lack of fusion g) porosity h) lack of penetration 4.6. Produce welded joints at least 150mm long, using single or multi-run welds as appropriate, with at least one stop and start which meet all of the following (with reference to BS 4872 Part 1 Weld test requirements): a) welds meet the required dimensional accuracy b) fillet welds are equal in leg length and slightly convex in profile, with the size of the fillet equivalent to the thickness of the material welded c) the weld contour is linear, of uniform profile, free from excessive undulations, with regular and even ripple d) the welds are adequately fused, and there is minimal undercut, overlap and surface inclusions e) joins at stop/start positions merge smoothly, with no pronounced hump or crater in the weld surface f) tack welds are blended in to form part of the finished weld, without excessive hump g) corner joints have minimal burn through to the underside of the joint or, where appropriate, penetration is present to a maximum depth of 3mm for at least 75% of the joint h) the weld surface is free from cracks, and substantially free from porosity, shrinkage cavities and trapped slag i) the weld surface and adjacent parent metal is substantially free from arcing or chipping marks
Additional Assessment Guidance	
Re: AC 2.1 - Description should include the basic principles of fusion, power sources, the major parts of the welding equipment and their function **Re: AC 3.1** - Description should include fine adjustment of parameters; correct manipulation of the welding gun; blending in stops/starts and tack welds	

Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Forming and Installing Cable Enclosures
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG248
Unit Reference No	T/650/7666
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to install electrical cable enclosures.	

Learning Outcomes	Assessment Criteria
1. Understand health and safety in relation to forming and assembling cable enclosures and support systems.	1.1. Summarise the key aspects of the following in relation to forming and assembling cable enclosure and support systems a) health and safety legislation b) regulations c) safety practices and procedures
2. Be able to plan, prepare and carry out a risk assessment for the assembly of electrical cable enclosures.	2.1. Use a British Standard (BS) wiring diagram to identify cable enclosure layouts. 2.2. Prepare for assembly of electrical cable enclosures including: a) carrying out a risk assessment 2.3. Complete the following activities prior to installing electrical enclosures: a) a risk assessment b) interpret a control of substances hazardous to health (COSHH) assessment c) identify and use appropriate personal protective equipment (PPE)
3. Be able to form electrical cable enclosures.	3.1. Compare the advantages and disadvantages of the following electrical cable enclosures including the effects of ambient temperature: a) metallic and non-metallic trunking b) cable tray c) metallic and non-metallic conduit 3.2. Identify and use the correct tools for forming and installing electrical enclosures, working safely and following job instructions at all times. 3.3. Cut, form and construct cable enclosure components to the required size and shape taking into account couplers and bends and removing burrs and sharp edges. 3.4. Produce external threads on conduit holding the conduit securely to avoid damage when cutting and bending. 3.5. Form bends, up to, including and over 90°. 3.6. Make tee junctions in trunking and traywork. 3.7. Form offsets and bridge/saddle sets. 3.8. Assemble cable enclosures and traywork to include the following: a) inspection type bends and elbows b) horizontal runs and vertical drops c) couplings d) tee-pieces

4. Be able to secure and check electrical cable enclosure assemblies.	4.1. Outline the checks required to be undertaken for services within walls. 4.2. Secure electrical cable enclosures to given surfaces in accordance with BS wiring regulations. 4.3. Secure conduits ensuring saddles are spaced in accordance with BS wiring regulations. 4.4. Use a spirit-level and/or plumb bob to ensure horizontal and vertical runs are level and straight. 4.5. Check that all connections and mountings are secure.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Wiring and Testing Electrical Circuits and Equipment
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG249
Unit Reference No	Y/650/7667
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to plan, prepare, carry out and test the installation of wiring of electrical circuits and equipment.	
Learning Outcomes	**Assessment Criteria**
1. Understand the health and safety issues associated with the installation of electrical wiring systems and cable enclosures and supports.	1.1. Describe the key aspects of health and safety legislation, regulations and safety practices and procedures in relation to: a) forming and assembling cable enclosure and support systems b) installation and testing of electrical wiring systems 1.2. Describe how to identify that an individual has suffered an electric shock and actions to be taken.
2. Be able to plan, prepare and carry out a risk assessment for the wiring and testing of electrical equipment and circuits.	2.1. Interpret a British Standard (BS) wiring diagram to identify electrical components and circuits. 2.2. Identify the correct tools for wiring and testing electrical equipment and circuits. 2.3. Describe and demonstrate how to confirm the safe isolation of circuits before commencing work. 2.4. Check that tools are in good working order and appropriately insulated. 2.5. Check that testing equipment is calibrated and has been Portable Appliance Testing (PAT) tested. 2.6. Complete the following activities prior to installation of wiring: a) a risk assessment b) interpret a Control of Substances Hazardous to Health (COSHH) assessment c) select appropriate personal protective equipment (PPE)
3. Be able to install wiring of electrical circuits.	3.1. Describe typical uses of the different cable types for different applications. 3.2. Describe the importance of bonding and earthing to the installation and operation of safe electrical wiring systems. 3.3. Install wiring safely, using appropriate PPE and following job instructions to connect three circuits using three different cable types and at least five different components and: a) ensure wiring runs and equipment are installed level and in accordance with BS regulations b) determine required cable current ratings and selecting appropriate cables

	c) install cables appropriately without twisting 3.4. Carry out eight of the following cable termination activities: a) stripping cable sheaths without damage to conductor insulation b) removing cable insulation c) connecting accessories (such as plugs, sockets multi-way connectors) d) crimping (such as spade end, loops, tags and pins). e) soldering and de-soldering. f) terminating armoured cables g) attaching suitable cable identification. h) heat shrinking (devices and boots). i) earth bonding j) making mechanical/screwed/clamped connections k) terminating mineral insulated cables l) sealing/protecting cable connections m) securing wires and cables (such as clips, plastic strapping, lacing, harnessing) n) cable glands and grips
4. Be able to test and check the wiring of electrical systems.	4.1. Describe the function of and demonstrate the use of at least two of the following test instruments during the wiring and testing activities: a) multimeter b) insulation resistance tester c) polarity tester/indicator d) residual current device (RCD) tester e) earth-loop impedance tester f) other specific test equipment 4.2. Carry out checks, appropriate to the equipment and circuits being wired, to include at least three of the following: a) visual checks for signs of damage, incorrect termination, sound bonding/earthing connections b) movement checks to identify loose fittings and connections c) testing that equipment operates to the circuit specification d) using fault finding techniques such as half-split, input/output, unit substitution and testing at least three of the following: a) protective conductor resistance values b) insulation resistance values c) continuity d) voltage levels e) load current f) polarity g) resistance h) RCD disconnection time

Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Robotic Systems for Engineering
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG250
Unit Reference No	A/650/7668
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to develop programs for robotic systems to carry out engineering functions.	

Learning Outcomes	Assessment Criteria
1. Be aware of health and safety requirements associated with using a robotic system and carry out a risk assessment.	1.1. Describe the health and safety requirements associated with using a robotic system. 1.2. Carry out a risk assessment for given robotic system related activities.
2. Be able to develop programs for robotic systems.	2.1. Describe the information required and how to develop complete and accurate programs for a given robotic system. 2.2. Develop complete and accurate programs for robotic systems to undertake at least two engineering applications which may include: a) welding b) surface coating c) gluing/sealing d) machine loading/unloading e) assembly f) logistics movement/control g) packaging h) stud welding
3. Be able to prepare, load and prove programs for robotic systems and select and set up robot end effectors.	3.1. Describe the process used to prepare, load and prove robotic programs. 3.2. Describe how to produce effective and efficient programs to avoid unnecessary operations including the use of macro programs and canned cycles to reduce program size. 3.3. Prepare, load and prove programs using one of the following types of robot programming methods: a) positional commands (x,y,xz) b) teach pendant c) lead by the nose d) off-line programming e) other specific method 3.4. Select and set up one of the following types of robot end effectors for the engineering application of: a) welding guns b) spot welders c) spray guns d) grippers e) drills f) vacuum devices g) other specific tooling

4. Be able to develop programs to control robotic systems.	4.1. Develop programs to include the following as applicable to a given robot type and work specification: a) safe and start positions b) all necessary positional information c) types of motion (such as joint interpolated, linear, circular) d) preparatory commands and process management/auxiliary functions e) repetitive programs (sub-routines, canned cycles, labels) f) speed/acceleration parameters g) sensor information h) part programs downloaded from a computer (such as patch programs) i) use of workframes (such as tool, global, joint, user)
5. Know the methods to check work specifications have been completed safely, accurately and efficiently.	5.1. Describe methods that can be used to check completed programs perform safely, accurately and efficiently including: a) conducting trial runs b) using single block run c) dry run d) speed override controls 5.2. Describe how to check that the finished operations meet the work specification.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Preparing and Using Manual TIG Welding Equipment
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG251
Unit Reference No	D/650/7669
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to gain the skills and knowledge needed to prove the competences required to prepare and use manual TIG welding equipment.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan, prepare and carry out a risk assessment for manual TIG welding activities.	1.1. Describe the health and safety issues and requirements associated with carrying out manual TIG welding activities. 1.2. Plan and prepare for TIG activities prior to welding. 1.3. Carry out a risk assessment for given TIG welding activities.
2. Be able to safely set up manual TIG welding equipment and select consumables and gas.	2.1. Describe the principles of fusion, power sources, major component parts of manual TIG welding equipment and their function 2.2. Describe how to and safely set up manual TIG welding and related equipment 2.3. Describe and select welding consumables (including gas) appropriate to the material being welded and application for either AC or DC current types for the welding of the following materials and material forms: One type of material from the following: a) carbon steel b) stainless steel c) aluminium and two forms of material from the following: a) sheet (less than 3mm) b) pipe/tube c) plate d) section e) other forms 2.4. Describe the terminology used for welding positions 2.5. Set up equipment to weld joints in good access situations for at least two of the following British Standard (BS) European Standard (EN) International Organization for Standardization (ISO) 6947 positions: a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC)
3. Be able to safely weld different joints in different positions and check weld quality.	3.1. Describe the techniques of operating welding equipment to produce different joints in different joint positions. 3.2. Describe methods used to control distortion including welding sequence and deposition technique.

	3.3. Weld at least three of the following types of joints to given specifications safely each at least 150mm long, by single or multi-run as appropriate, with or without filler wire, with at least one stop and start included: a) fillet lap b) corner c) tee fillet d) butt 3.4. Weld joints to given specifications safely in good access situations in at least two of the following BS EN ISO 6947 positions: a) flat (PA) b) vertical upwards (PF) c) horizontal vertical (PB) d) vertical downwards (PG) e) horizontal (PC) 3.5. Check the quality of the welded joints produced in AC 3.3 and 3.4 conforms to given specifications including: a) dimensional accuracy b) size and profile of weld c) number of runs d) alignment/squareness
4. Be able to produce welds and carry out non-destructive and destructive tests and identify different weld defects in line with quality standards.	4.1. Describe different procedures for visually examining welds for cracks, porosity and slag inclusions including: a) dye penetrant b) fluorescent penetrant c) magnetic particle testing 4.2. Carry out non-destructive testing of given welds, using at least one of the following: a) dye penetrant b) fluorescent penetrant c) magnetic particle 4.3. Describe different procedures for carrying out destructive tests on the welds including: a) macroscopic examination b) bend tests c) nick break tests 4.4. Carry out destructive tests on weld specimens using at least one of the following: a) macroscopic examination b) nick break test c) bend tests such as face, root or side, as appropriate 4.5. Identify the following defects in given welds: a) lack of continuity of the weld b) uneven and irregular ripple formation c) incorrect weld size or profile and at least four of the following: a) undercutting b) internal cracks c) overlap d) surface cracks e) inclusions f) lack of fusion g) porosity h) lack of penetration

	4.6. Produce welded joints at least 150mm long, using single or multi-run welds as appropriate, with at least one stop and start which meet all of the following (with reference to BS 4872 Part 1 Weld test requirements): a) welds meet the required dimensional accuracy b) fillet welds are equal in leg length and slightly convex in profile, with the size of the fillet equivalent to the thickness of the material welded c) the weld contour is linear, of uniform profile, free from excessive undulations, with regular and even ripple d) the welds are adequately fused, and there is minimal undercut, overlap and surface inclusions e) joins at stop/start positions merge smoothly, with no pronounced hump or crater in the weld surface f) tack welds are blended in to form part of the finished weld, without excessive hump g) corner joints have minimal burn through to the underside of the joint or, where appropriate, penetration is present to a maximum depth of 3mm for at least 75% of the joint h) the weld surface is free from cracks, and substantially free from porosity, shrinkage cavities and trapped slag i) the weld surface and adjacent parent metal is substantially free from arcing or chipping marks

Additional Assessment Guidance

Re AC 3.1 - Description should include fine adjustment of parameters, correct manipulation of welding gun, blending in stops/starts and tack welds.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Sheet Metal Components and Assemblies
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG252
Unit Reference No	J/650/7670
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce sheet metal components and assemblies.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for sheet metal activities.	1.1. Describe the health and safety issues and requirements associated with carrying out sheet metal activities. 1.2. Plan and prepare for sheet metal activities. 1.3. Carry out a risk assessment for a given sheet metal activity.
2. Be able to safely mark out materials.	2.1. Mark out sheet metal up to 3 mm safely in at least two different materials from the following: a) hot rolled mild steel b) cold rolled mild steel c) coated mild steel (such as primed, tinned, galvanised) d) copper e) brass f) lead g) stainless steel h) titanium i) aluminium 2.2. Use marking out methods and techniques safely including direct marking using instruments and at least one of the following: a) use of templates b) tracing/transfer methods 2.3. Describe how to use and demonstrate the safe use of the following marking out equipment: a) scriber b) rule or tape c) square d) dividers or trammels e) punch f) straight edge g) protractor h) chalk, blueing or paint 2.4. Describe how to and demonstrate the safe marking out of materials to include the following features: a) datum and centre lines b) curved profiles c) square/rectangular profiles d) cutting and bending detail (including allowances) e) angles f) hole centering and outlining (such as circular or linear) g) circles

3. Be able to safely use hand tools and industrial equipment to cut sheet metal profiles.	3.1. Describe and demonstrate the safe use of tin snips and bench shears to cut and finish materials to marked out shape plus at least two of the following hand tools: a) hacksaw b) files c) hand power tools (such as drill nibbling, saw) d) pneumatic tools e) trepanning f) thermal device g) other specific tool 3.2. Describe and demonstrate the safe use of a guillotine to cut and finish materials to the marked out shape plus at least two of the following types of industrial equipment: a) pillar drill b) punch/cropping machine c) trepanning machine d) bench saw e) nibbling machine f) band saw 3.3. Carry out cutting operations to produce components with the following shapes: a) square or rectangular profiles b) angled profiles c) external curved profiles and at least two of the following: a) notches b) internal curved contours c) round holes d) square holes
4. Be able to safely use industrial forming equipment to produce sheet metal components.	4.1. Describe how to calculate allowances for the forming of sheet metal such as circumference, bend allowance and wired edges. 4.2. Describe and demonstrate the set up and safe use of the following types of industrial forming equipment and techniques: a) bending machine (hand or powered) b) rolling machine (hand or powered) and at least two of the following: a) hammers/panel beating equipment b) wheeling machine c) stakes and formers d) swaging machine e) presses f) shrinking techniques g) jenny/wiring machine h) stretching techniques 4.3. Carry out forming operations safely to produce components with the following shapes: a) bends/upstands b) tray/box sections c) folds/safe edges d) cylindrical sections and at least one of the following: a) wired edges b) cowlings and rounded covers c) swages

	d) square to round trunking e) curved panels f) lobster-back trunking g) ribbed components h) concertina ducting or trunking
5. Be able to safely assemble and produce sheet metal components in line with quality requirements.	5.1. Describe and demonstrate how to safely assemble sheet metal components, using at least two of the following methods: a) temporary tack welding b) adhesive bonding c) soldering or brazing d) flanged and mechanically fastened (such as bolts, screws) e) resistance spot welding f) self-securing joints (such as knocked up, paned down, swaged, joggled) g) riveting (such as hollow or solid) 5.2. Produce sheet metal components safely which meet all the following quality requirements: a) all dimensions are within +/- 2.0mm or +/- 0.079” b) finished components meet the required shape/geometry (square, straight, angles free from twists) c) completed components are free from excessive tooling marks, deformation, cracking, sharp edges, slivers or burrs all components are correctly assembled and have secure and firm joints d) all components are correctly assembled and have secure and firm joints

Additional Assessment Guidance

Re AC 5.1 and AC 5.2 - The learner should demonstrate how to combine different sheet metal cutting and forming operations for at least one of the jobs to produce a component of a significant nature, and must contain at least three of the cutting operations listed in AC 3.3 and at least three of the forming techniques listed in AC 4.3.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner’s progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Assembling and Testing Electronic Circuits
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG253
Unit Reference No	K/650/7671
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to assemble and test electronic circuits.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for the assembly and testing of electronic circuits.	1.1. Describe the health and safety issues and requirements associated with carrying out assembling and testing electronic circuits. 1.2. Plan and prepare assembly and testing activities prior to manufacturing. 1.3. Carry out a risk assessment for a given assembly or testing activity.
2. Be able to safely assemble an electronic circuit using different assembly techniques and tools.	2.1. Describe and demonstrate how to safely assemble one of the following electronic circuit types: a) single-sided b) thick film c) thin film d) flexible e) double-sided f) hybrid 2.2. Describe the principles of the following techniques and methods and demonstrate how to safely assemble electronic components on a circuit board using at least two of the following: a) manual soldering techniques b) surface mount techniques c) mechanical fixing methods 2.3. Assemble electronic circuits safely using at least four of the following tools: a) heat shunts/tweezers b) component forming devices c) mechanical fasteners (screwdriver, spanners) d) snipe or long nosed pliers e) wire strippers f) anti-static packaging, mats and straps g) sleeving pliers h) side or end cutters i) specialised assembly tools/equipment
3. Be able to safely assemble electronic circuits using different components and carry out visual checks on completed circuits.	3.1. Assemble electronic circuits safely to given specification, to include at least fifteen of the following types of components: a) fixed resistors b) variable resistors c) potentiometers d) encoders or resolvers e) transistors f) inverters or servo controllers g) thyristors h) edge connectors i) thermistors j) light dependent resistors (LDR)

	k) analogue or digital integrated circuits l) wiring pins/tags/wire links m) fixing spacers n) fixed capacitors o) variable capacitors p) insulators q) surface mount packages r) rectifiers s) small heat sinks t) electrolytic capacitors u) switches v) cables w) diodes x) Zener diodes y) light emitting diodes (LEDs) z) mini transformers aa) decoders bb) protection devices cc) cable connectors dd) regulators ee) relays ff) inductors gg) other specific electronic components 3.2. Describe the function of at least five of the following types of electronic circuits and demonstrate how to safely assemble them using electronic components: a) audio amplifiers b) filters c) regulated power supplies d) signal converters e) microprocessor based applications (such as PIC chips) f) logic function controls g) signal generators h) comparators i) display circuits j) counter/timers k) power amplifiers l) ADC and DAC hybrid circuits m) oscillators n) motor control o) sensor/actuator circuit (such as linear, rotational, temperature, photo-optic, flow, level, pressure) p) digital circuit (such as process control, microprocessor, logic devices, display devices) q) signal processing circuit (such as frequency modulating/demodulating, amplifiers, filters) r) alarms and protection circuits s) other specific circuit 3.3. Describe the importance of and carry out visual checks on the circuits assembled in AC 3.2 to confirm the following: a) soldered joints are clean, shiny, free from solder spikes, bridges, holes, excess solder and flux

	b) components are correctly mounted for best physical support, and are correctly orientated c) excess component leads have been trimmed off to the standard required d) circuit tracks are free from faults (such as lifting, breaks, bridges, hot spots) e) there are no obvious signs of damage, to components or to the substrate f) all required connectors, wire links, spacers and other ancillary items are in place
4. Be able to use testing equipment to carry out diagnostic checks in line with standards.	4.1. Describe the function of and use at least five of the following types of test equipment: a) multimeter b) signal generator c) oscilloscope d) signal tracer e) logic probe/clip f) stabilised power supplies g) logic analyser h) measuring bridges i) pulse sequencing analyser j) software diagnostic programs k) counter/timers l) data communications test set m) signature analysers n) bus exerciser/analyser o) protocol analyser 4.2. Describe how to and carry out at least six of the following checks, adjustments and fault rectification where appropriate to given circuits being assembled: a) logic states b) pulse width/rise time c) inductance d) dc voltage/current levels e) open/short circuit f) frequency modulation/demodulation g) ac voltage/current levels h) resistance i) amplification j) clock/timer switching k) capacitance l) signal noise/interference levels m) oscillations n) waveform analysis o) attenuation 4.3. Produce electronic circuits in accordance with one of the following: a) British Standards (BS) or International Standards Organisation (ISO) standards and procedures b) customer standards and requirements c) company standards and procedures other international standards

Additional Assessment Guidance
Re: Learning outcomes 3 and 4 - at least one of the electronic circuit assemblies produced and tested must be of a significant nature, and contain at least ten of the electronic components listed in AC 3.1
Assessment Guidance
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Preparing and Using Milling Machines
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG254
Unit Reference No	L/650/7672
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to prepare and use milling machines.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for milling activities.	1.1. Describe the health and safety issues and requirements associated with carrying out milling activities. 1.2. Plan and prepare for milling activities prior to manufacturing. 1.3. Carry out a risk assessment for a given milling activity.
2. Be able to safely set up components and use tools for the milling of different materials.	2.1. Describe the process and safely mount, secure and machine components made from two of the following types of material: a) ferrous b) non ferrous c) non metallic using two of the following work holding devices: a) fixed vice (must include setting/clocking up to ensure it is square) b) direct clamping to machine table c) magnetic or pneumatic devices d) swivel or universal vice e) angle plates f) chucks g) fixtures h) vee block and clamps i) indexing device j) other devices 2.2. Describe the function of, safely mount and use at least six of the following types of milling cutters/tools: a) face mills b) slot cutters c) twist/core drills d) slab/cylindrical cutters e) slitting saws f) reamers g) end mills h) vee cutters i) boring bars j) slot drills k) taps l) side and face cutters m) other form cutters
3. Be able to safely mill components using different operations and carry out checks for accuracy.	3.1. Describe how to and produce milled components safely combining different operations and have the following features: a) flat faces b) parallel faces c) open ended slots

	d) square faces e) steps/shoulders f) enclosed slots g) drilled holes and at least two more of the following: a) angular faces b) reamed holes c) bored holes d) indexed or rotated forms e) recesses f) tee slots g) profile forms (such as vee, concave, convex, gear forms, serrations, special forms) 3.2. Carry out checks for accuracy, to include: a) linear dimensions b) surface finish c) depths d) slots (such as position, width, depth) e) flatness f) angles (where appropriate) g) squareness h) hole size/fit (where appropriate)
4. Be able to use different measuring equipment to carry out quality inspections .	4.1. Describe and use the following measuring equipment during the machining and checking activities: a) rules b) squares c) external micrometers d) dial test indicators (DTI) e) vernier/digital/dial callipers f) surface finish equipment (such as comparison plates, machines) and at least three of the following: a) feeler gauges b) bore/hole gauges c) internal micrometers d) slip gauges e) depth micrometers f) radius/profile gauges g) depth verniers h) protractors i) coordinate measuring machine (CMM) 4.2. Produce components to the following quality and accuracy standards, as applicable to the operation: a) components to be free from false tool cuts, burrs, and sharp edges b) general dimensional tolerance +/- 0.15mm or +/- 0.006” c) there must be one or more specific dimensional tolerances within +/- 0.05mm or +/- 0.002” d) flatness and squareness within 0.125mm per 25mm or 0.005” per inch e) reamed / bored holes within H8 f) surface finish 63 µin or 1.6µm g) angles within +/- 1 degree

Additional Assessment Guidance
Re: AC 2.1 - Description should include the work holding devices and techniques used to ensure that the components are set up correctly and checked before milling such as ensuring all seating/location faces are clean and undamaged, ensuring that the device is suitably aligned using measuring instruments, as appropriate, and checking that all bolts or other securing devices are tightened securely **Re AC 3.1** - Description should include features and tools used and how tool speed and feed is calculated for each operation. **Re AC 3.1, 4.1 and 4.2** - At least one of the components produced must be of a significant nature and have at least five of the features listed in AC 3.1.

Assessment Guidance
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Wiring and Testing Programmable Controllers
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG255
Unit Reference No	M/650/7673
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to wire and test programmable controller-based systems.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for the wiring and testing of programmable controller-based systems.	1.1. Describe the health and safety issues and requirements associated with wiring and testing programmable controller-based systems. 1.2. Plan and prepare for wiring and testing activities prior to manufacturing. 1.3. Carry out a risk assessment for a given wiring and testing activity.
2. Be able to safely connect and test programmable controller systems using different equipment, components and connection methods.	2.1. Describe the function and operation of different types of programmable controllers. 2.2. Compare differences between the following types of connections: a) mechanical b) screwed/clamped c) soldered 2.3. Connect and test equipment safely for at least one of the following types of programmable controller systems: a) monitoring system b) combination system c) process/product control system d) diagnostic system e) other specific system 2.4. Connect up and test safely at least one of the following types of programmable controller equipment/components: a) rack mounted controller units b) modular controller units c) unitary controller units and at least five of the following: a) sensors (such as inductive, proximity, temperature, colour, optical) b) actuators (such as pneumatic or hydraulic) c) printers panels and sub-assemblies d) switches (such as emergency stop, limit, pressure) e) valves (such as pneumatic or hydraulic) f) electrical wires and cable connections g) safety interlocks h) signal transmission components/cables i) motor starters j) overload protection devices k) barcode scanners l) personal computer (PC) peripheral devices m) analogue to digital modules

	n) proportional integral derivative (PID) controller o) other devices 2.5. Use wiring and connection methods and techniques safely including: a) locating and securing equipment in the correct positions b) attaching suitable cable identification c) making mechanical/screwed/clamped connections d) routing and securing wires and cables e) stripping cable insulation/protection f) crimping (such as tags and pins) g) connecting all input and output devices h) soldering and de-soldering connections (where applicable) i) using heat shrinking devices or boots (where applicable) j) sealing and protecting cable connections (where applicable)
3. Be able to develop, prove and edit programmable logic controller (PLC) programs.	3.1. Compare three programming languages used in PLCs. 3.2. Develop programs applicable to given type of controller and programming software using one of the following: a) ladder and logic diagrams b) function block diagrams c) statement/instruction lists d) state logic e) structured text f) sequential function charts g) other specific programming language 3.3. Prove and edit a PLC program, using the following: a) edit facilities b) program full run and at least five from the following: a) single block/sub routine run b) program save/store facilities c) data input facilities d) search facilities e) program override controls f) graphic displays g) taking test measurements h) using monitoring mode i) using process simulation techniques (forcing contacts on/off) j) counter and timer settings
4. Be able to use testing equipment to carry out diagnostic checks in line with standards.	4.1. Use at least three of the following test instruments during wiring and testing activities: a) multimeter b) voltmeter/indicator c) programming devices (such as loader terminal, hand held programmer, personal computer) d) network testing equipment e) other specific test equipment

	Explain the function of two of the test instruments above including their range of options. 4.2. Carry out the following on completion of the programming activity: a) check and review program content b) edit programs using the correct procedure (where appropriate) c) check that the program is correctly titled and referenced d) ensure that programs are stored safely and correctly in the correct format e) create a separate backup copy of the program in case of file corruption 4.3. Use all of the following diagnostic techniques, tools and aids: a) visual checks (such as signs of damage, missing parts, wear/deterioration) b) movement checks (such as loose fittings and connections) c) fault finding techniques (such as input/output, half-split, unit substitution) d) diagnostic aids (such as manuals, flow charts, logic diagrams, troubleshooting guides) e) test instrumentation measurement (such as continuity, voltage, resistance, current) f) controller error warning lights/displays 4.4. Wire up and test programmable controllers, in accordance with two of the following standards: a) equipment manufacturer's specification/operation range b) British Standard (BS) S7671/ Institution of Engineering and Technology (IET) wiring regulations c) other BS and/or International Standards Organization (ISO) standards d) company standards and procedures

Additional Assessment Guidance		
At least one of the PLC systems must be of a significant nature and at least five of the types of equipment or components identified in AC 2.4.		
Assessment Guidance		
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Fluid Power Systems
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG256
Unit Reference No	K/650/7680
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how plan, prepare and carry out fluid power assembly activities.	

Learning Outcomes	Assessment Criteria
1. Be aware of health and safety issues and requirements and carry out a risk assessment for using fluid power systems.	1.1. Describe the health and safety issues and requirements associated with the use of fluid power systems. 1.2. Carry out a risk assessment for given fluid power systems activities.
2. Be able to plan, prepare and safely use fluid power techniques and methods to produce fluid power assemblies.	2.1. Compare the differences between two of the following types of fluid power systems: a) pneumatic b) hydraulic c) vacuum 2.2. Plan and prepare fluid power assembly using one of the following fluid power systems: a) pneumatics b) hydraulics c) vacuum 2.3. Describe the function of the following components : a) actuators b) pumps c) compressors d) reservoirs/storage devices e) motors f) lubricators 2.4. Produce fluid power assemblies safely comprising the following components: a) rigid pipework b) hoses c) valves d) cylinders/actuators and at least six of the following: a) pumps b) compressors c) accumulators d) reservoirs/storage devices e) motors f) lubricators g) pressure intensifiers h) regulators i) gauges/indicators j) switches k) sensors l) receivers m) filters n) bearings o) cables and wires p) gaskets and seals q) other specific components

	2.5. Use fluid power assembly methods and techniques safely including: a) checking components for serviceability b) positioning equipment/components c) aligning pipework and connections d) dressing and securing pipes and hoses e) setting, aligning and adjusting system components f) securing by using mechanical fixings g) applying screw fastener locking devices h) tightening fastenings to the required torque i) applying hose/cable clips and fasteners j) making de-energised checks before filling and/or pressurising the system
3. Be able to safely carry out the testing and fault finding of fluid power systems.	3.1. Carry out quality checks safely using appropriate equipment to confirm the following: a) the system is complete, as per specification b) dimensions are within specification requirements c) components are correctly positioned d) components are correctly aligned e) direction and flow indicators on components are correct f) components are securely held in place g) connections to components are tightened to the required torque h) pipework is free from ripple and creases i) electrical connections are correctly made (where applicable) 3.2. Describe the procedures for checking that test equipment is correctly calibrated. 3.3. Carry out the following checks safely to ensure the accuracy and quality of the tests carried out: a) test equipment is correctly calibrated b) test equipment used is appropriate for the tests being carried out c) test procedures used are as recommended in the appropriate specifications d) test readings are taken at the appropriate points, and where appropriate components are adjusted to give the required readings e) test equipment is operated within its specification range 3.4. Carry out leak tests and at least one of the following tests and adjustments safely as required on assembled fluid power systems: a) pressure line pressure tests b) return line pressure test c) flow d) speed e) sequence f) operational performance g) contamination

Additional Assessment Guidance
At least one of the fluid power assemblies produced above must be of a significant nature and contain at least six of the components identified in AC 2.4.
Assessment Guidance
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Installing Aircraft Mechanical Fasteners
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG257
Unit Reference No	L/650/7681
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to install aircraft mechanical fasteners.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment prior to installation of aircraft mechanical fasteners.	1.1. Describe the health and safety issues and requirements associated with the installation of aircraft mechanical fasteners. 1.2. Plan and prepare for installation of aircraft mechanical fasteners prior to manufacturing. 1.3. Carry out a risk assessment prior to installation of aircraft mechanical fasteners.
2. Be able to use appropriate equipment to safely install different aircraft mechanical fasteners.	2.1. Describe the function of and demonstrate the safe use of the following types of equipment: a) riveting guns (appropriate to rivet type) b) gripping pins and location dowels and at least two of the following: a) gauges (such as for intrusions) b) redline templates c) clamps d) drills and tools with attachments e) jigs 2.2. Describe three of the following aircraft mechanical fasteners and one use for each: a) hollow rivets b) solid rivets c) threaded fasteners d) quick release fasteners e) collared fasteners f) split pins g) pin clips h) wire locks i) anchor nuts j) Rivnuts k) NAPPY pins l) PIP/PIT pins m) other locking devices 2.3. Install different aircraft mechanical fasteners safely including: a) hollow rivets b) solid rivets c) threaded fasteners d) quick release fasteners and at least two of the following: a) collared fasteners b) split pins c) pin clips d) wire locks e) anchor nuts f) Rivnuts g) NAPPY pins

	h) PIP/PIT pins i) other locking devices
3. Be able to safely use installation methods and techniques on different connections.	3.1. Describe two of the following installation methods and techniques and a typical application for each: a) countersinking b) solid riveting (single and double handed) c) through-hole d) milling rivets e) wire locking f) blind riveting 3.2. Use all of the following installation methods and techniques safely: a) countersinking b) solid riveting (single and double handed) c) through-hole d) milling rivets e) wire locking f) blind riveting 3.3. Make three types of connection safely from the following: a) wet assembly b) panels c) structures d) dry assembly e) skins f) repairs
4. Be able to safely check and inspect the installation of aircraft mechanical fasteners using different measuring equipment.	4.1. Describe and use at least four of the following to carry out appropriate checks and inspections during, and on completion of installation activities: a) rules b) feeler gauges c) squares d) bore/hole gauges e) calipers f) radius/profile gauges g) protractors h) dial test indicators (DTI) i) micrometers j) torque wrenches/gauges k) Verniers l) rivet intrusion gauges m) slip gauges 4.2. Install aircraft mechanical fasteners to comply with the following requirements: a) all components are correctly assembled and aligned, in accordance with the specification b) overall dimensions are within specification tolerances c) assemblies meet appropriate geometric tolerances (such as square, straight, angles free from twists) d) where appropriate, pitches of rivets/fasteners meet specification requirements

	e) completed assemblies have secure and firm joints, and are clean and free from burrs/flash, deformation or cracking

Additional Assessment Guidance

At least one of the assemblies produced above must be of a significant nature and contain at least four of the mechanical fasteners identified in learning outcome 2.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Aircraft Detail Assemblies
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG258
Unit Reference No	M/650/7682
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce aircraft detail assemblies.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for producing aircraft detail assemblies.	1.1. Describe the health and safety issues and requirements associated with producing aircraft detail assemblies. 1.2. Plan and prepare for producing aircraft detail assemblies prior to manufacturing. 1.3. Carry out a risk assessment prior to producing aircraft detail assemblies.
2. Be able to safely produce detail assemblies using different assembly methods and techniques.	2.1. Produce aircraft detail assemblies safely, which include at least seven of the following components: a) skins b) frames c) trays d) jumper braids, bonding clips e) earthing straps f) stringers g) ribs h) angles i) cleats j) panels k) pipes, unions and joints l) aircraft general supplies m) tanks n) brackets o) other small specific assemblies 2.2. Describe and use all of the following assembly methods and techniques: a) drilling and riveting b) ensuring that correct part numbers are used c) applying sealants/adhesives d) electrical bonding of components e) ensuring that correct hand of components is used (left or right handed) f) positioning and aligning components for cosmetic appearance and skin lines g) securing components using mechanical fasteners and threaded devices h) applying bolt locking methods (such as split pins, wire locking, lock nuts, stiff nuts)
3. Be able to safely carry out quality and accuracy checks on assemblies to ensure they comply with standards.	3.1. Describe and carry out quality and accuracy checks safely including at least three of the following: a) cosmetic appearance b) freedom from damage

	c) electrical bonding and continuity d) accuracy of skin lines e) torque loading checks 3.2. Describe one consequence of not meeting specification tolerances. 3.3. Produce assemblies safely that comply with the following requirements: a) all components are correctly assembled and aligned, in accordance with specification b) overall dimensions are within specification tolerances c) assemblies meet appropriate geometric tolerances (such as square, straight, angles free from twists) d) where appropriate, pitches of rivets/fasteners meet specification requirements e) completed assemblies have secure and firm joints, and are clean and free from burrs/flash, deformation or cracking

Additional Assessment Guidance

At least one of the assemblies produced above must be of a significant nature and contain at least four of the components identified in assessment criteria 2.1.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Aircraft Detail Fitting
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG259
Unit Reference No	R/650/7683
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to carry out aircraft detail fitting activities.	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for aircraft detail fitting activities.	1.1. Describe the health and safety issues and requirements associated with carrying out aircraft detail fitting activities. 1.2. Plan and prepare for aircraft detail fitting activities prior to manufacturing. 1.3. Carry out a risk assessment for a given aircraft fitting activity.
2. Be able to mark out different materials.	2.1. Compare the differences between metallic and composite materials. 2.2. Describe and use marking out methods and techniques including direct marking using instruments and at least one of the following: a) use of templates b) tracing/transfer methods c) other specific method 2.3. Use the following marking out tools: a) marking tools b) squares c) vernier instruments d) rules/tapes e) protractors f) dividers/compass 2.4. Describe the characteristics of and mark out the following: a) datum/centre lines b) circles and radial profiles c) square/rectangular profiles d) linear hole positions and at least two of the following: a) angles/angular profiles b) allowances for bending c) radial hole positions d) simple pattern development
3. Be able to safely carry out cutting and forming processes using industrial equipment.	3.1. Describe how to use and cut materials using at least four of the following: a) saws (hand or mechanical) b) tin snips c) cropping machines d) guillotines e) drills and hole saws f) files g) bench knives h) nibblers i) abrasive discs

	3.2. Describe how to use and carry out cutting operations to produce components that combine operations and produce the following features: a) edges/faces that are square to each other b) curved or circular forms c) edges/faces that are parallel d) holes linearly pitched and at least two of the following: a) edges/faces that are angled b) external profiles c) internal profiles d) holes radially pitched 3.3. Bend and form materials using at least four of the following: a) bench folding machines b) hand tools c) box pan folding machines d) heating techniques e) pinch or pyramid rolling machines f) shrinking techniques g) presses h) stretching techniques 3.4. Describe how to use and carry out forming operations to produce components that combine operations and produce at least five of the following features: a) right angled bends b) curved profile c) angled bends d) cylindrical shape e) square flanges f) conical shape g) tray sections and channels h) dished profile i) curved/circular flanges
4. Be able to safely check and inspect detail fitting and components using different measuring equipment.	4.1. Describe the function of and use external micrometers and vernier calipers during detail fitting and checking activities and at least four of the following: a) rules b) feeler gauges c) squares d) bore/hole gauges e) calipers (external and internal) f) radius/profile gauges g) vernier protractors h) thread gauges i) micrometers (internal and external) j) dial test indicators (DTI) k) depth Verniers l) surface finish equipment (such as comparison plates, machines) m) slip gauges n) coordinate measuring machine (CMM) 4.2. Produce components to the following standards, as applicable to the process: a) components to be free from false tool cuts, burrs and sharp edges

	b) finished components meet the required shape/geometry (to the template profile) c) completed components are free from excessive tooling marks, deformation including from heat sources or cracking d) dimensional tolerance +/- 0.25mm or +/- 0.010” e) flatness and squareness 0.05mm per 25mm or 0.002″ per inch f) angles within +/- 0.5 degree g) screw threads to BS Medium fit h) reamed and bored holes within H8 i) surface finish 63 µin or 1.6 µm

Additional Assessment Guidance

Re AC 2.2, 2.3 and 2.4 - Marking out should be on both:

a) metallic materials relevant to the aerospace sector
b) composite materials relevant to the aerospace sector

These materials should include the at least three of the following forms and include a description of each form:

a) square/rectangular (such as bar stock, sheet material, machined components) circular/cylindrical (such as bar stock, tubes, turned components, flat discs, rolled cylinders/cones)
b) sections (such as angle, channel, tee section, joists, extrusions)
c) irregular shapes (such as castings, forgings, odd-shaped components)
d) detail assemblies

At least one of the aircraft detail fittings activities produced above must be of a significant nature and contain at least five features identified in assessment criteria 3.2.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner’s progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log

Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Industrial Coatings Application
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG260
Unit Reference No	T/650/7684
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand the application of industrial coatings.	

Learning Outcomes	Assessment Criteria
1. Understand health and safety and environmental issues relating to the application of industrial coatings.	1.1. Describe the health and safety and environmental issues and requirements associated with the application of industrial coatings.
2. Understand how to prepare surfaces safely for industrial coating application.	2.1. Compare different types of industrial coating materials, techniques and equipment used for surface preparation and coating application. 2.2. Describe the causes of typical surface preparation and coatings defects, how they can be avoided and rectified. 2.3. Describe the importance of completing quality documentation, reporting procedures and the need to maintain accurate records.
3. Be able to safely carry out industrial coating applications.	3.1. Prepare and maintain work areas in order to work safely and effectively including the safe use and secure storage of equipment and materials. 3.2. Prepare surfaces for industrial coating application including the preparation of steelwork to required standards 3.3. Carry out spray application to appropriate work standard including use of quality control measuring and test equipment, and instrumentation. 3.4. Identify surface preparation and coatings defects and rectify as required. 3.5. Ensure health and safety and environmental protection requirements are maintained when carrying out the application of industrial coatings.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion

Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Preparing and Using Computerised Numerical Control Mills for Milling Operations
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG538
Unit Reference No	K/651/0261
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to prepare and use Computerised Numerical Control (CNC) milling machines.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan and prepare for CNC milling activities and carry out a risk assessment.	1.1. Describe the key health and safety requirements for CNC milling activities. 1.2. Plan CNC milling activities prior to manufacturing. 1.3. Carry out a risk assessment for a given milling activity.
2. Be able to safely set up and use components and tools for CNC milling a range of materials.	2.1. Describe the differences between ferrous, non-ferrous and non-metallic materials. 2.2. Machine components made from two of the following types of materials: a) ferrous b) non-ferrous c) non-metallic 2.3. Mount, secure and machine components using two the following work-holding devices: a) machine vices b) fixtures c) chucks d) angle plate e) direct clamping to machine table f) pneumatic or magnetic table g) ancillary indexing devices 2.4. Select four of the following types of milling cutters and mount them to the appropriate tool holding device: a) face mills b) end mills c) twist/core drills d) boring tools e) reamers f) slot drills g) special profile cutters 2.5. Carry out the following activities to prepare the tooling for operation as applicable to the machine type: a) securing tools to the machine spindle or positioning tools in the correct position in the tool magazine/carousel b) checking that tools have specific tool number in relation to the operating program c) entering all relevant tool data to the operating program such as tool

	lengths, tool offsets, radius compensation d) pre-setting tooling using setting jigs/fixtures where appropriate e) setting tool datum f) saving changes to the program g) 2.5 Confirm that the machine and program operate safely and correctly, by checking **all** of the following: a) datums for each machine axis are set in relation to all equipment and tooling used b) all operations are carried out to the program co-ordinates c) tool change positions are safe and clear of the workpiece and machine equipment d) the correct tools are selected at the appropriate points in the program e) tool offsets are correctly entered into the machine controller f) tool cutter paths are executed safely and correctly g) auxiliary functions operate at the correct point in the program such as cutter start/stop, coolant flow h) programs have been saved in the appropriate format
3. Be able to safely CNC mill components using different operations and carry out checks for accuracy.	3.1. Produce machined components which combine different operations and have the following features: a) flat faces b) steps/shoulders c) open ended slots d) enclosed slots/recesses e) drilled holes linearly pitched **and three of the following features:** a) parallel faces b) square faces c) angular faces d) internal profiles e) external profiles f) drilled holes on pitched circles. g) bored holes h) reamed holes i) tapped holes. j) circular/curved profiles k) special forms such as concave or convex 3.2. Carry out checks for accuracy of the following: a) linear dimensions such as lengths and depths b) slots such as position, width and depth

	c) flatness d) surface finish **and four of the following:** a) squareness b) parallelism c) hole size/fit d) angles e) recesses f) thread fit 3.3. Describe and demonstrate how to shut down the equipment to a safe condition on completion of the machining activities.
4. Be able to carry out quality inspections to ensure the quality and accuracy of the components produced.	4.1. Use the following measuring equipment during the machining and checking activities: a) external micrometers b) dial test indicators (DTI) c) vernier/digital/dial calipers d) surface finish equipment such as comparison plates and machines **and four of the following:** a) rules b) internal micrometers c) depth micrometers d) depth Verniers e) slip gauges. f) bore/hole gauges. g) thread gauges h) plug gauges. i) radius/profile gauges j) Vernier protractors k) coordinate measuring machine (CMM) 4.2. Produce components to the following quality and accuracy standards, as applicable to the operation: a) components to be free from false tool cuts, burrs, and sharp edges b) general dimensional tolerance +/- 0.15mm or +/- 0.006” c) there must be one or more specific dimensional tolerances within +/- 0.05mm or +/- 0.002.” d) screw threads BS medium fit e) reamed / bored holes within H8 f) surface finish 63 µin or 1.6µm g) angles within +/- 0.5 degree
Additional Assessment Guidance	
Re: Learning Outcome 3 in order to demonstrate the ability to combine different CNC milling operations, at least one of the machined components produced must be of a significant nature, and must have a minimum of five of the features listed in assessment criteria 3.1	
Assessment Guidance	

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.		
Assessment Method	**Definition**	**Possible Content**
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Computer Aided Design Models
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG539
Unit Reference No	H/650/9669
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to set up and operate a computer aided design (CAD) system to produce CAD models.	

Learning Outcomes	Assessment Criteria
1. Be able to plan and prepare for CAD modelling.	1.1. Describe the health and safety requirements for using a CAD system. 1.2. Plan CAD modelling activities. 1.3. Use appropriate data and design sources to obtain required information to create CAD models.
2. Be able to produce CAD models using a CAD system.	2.1. Summarise the types of drawings that may be produced by the modelling software. 2.2. Explain why it is necessary to be able to recall previous issues of modified models. 2.3. Use three of the following to obtain the necessary data to produce the required model: a) model brief/request b) change order/modification request c) manuals d) calculations e) sketches f) specifications g) regulations h) sample component i) previous models/designs j) standards reference documents k) notes from meetings/discussions l) other available data 2.4. Demonstrate how to incorporate three of the following, as appropriate to the CAD model being produced: a) function b) quality c) manufacturing method d) ergonomics e) materials f) cost g) lifetime of the product h) tolerances i) clearance j) aesthetics k) physical space l) operating environment m) interfaces n) safety 2.5. Use one of the following tools to produce a CAD model: a) surface modelling b) solid modelling c) wire frame modelling **which includes the use of eight of the following from the part feature menu:**

	a) extrude b) revolve c) hide d) fillet e) shell f) solid model g) solid model h) wire frame i) rib j) cut/remove k) mirror l) radius m) rectangular pattern n) circular pattern o) other specific feature 2.6. Explain how to access, identify, and use different standard components and symbol libraries from a CAD platform database. 2.7. Modify parts in the assembly environment using constrained parts and assemblies with eight of the following features: a) straight lines b) dimensions c) angular surfaces d) text e) surface texture f) insertion of standard components g) symbols and abbreviations h) curved surfaces i) circles or ellipses j) material colour k) hidden detail l) hatching and shading m) parts lists n) other specific details
3. Be able to complete CAD models to expected standards and formats.	3.1. Summarise the key features of national, international, and organisational standards and conventions that are used for the models and drawings. 3.2. Summarise the different types of drawings that may be produced by CAD modelling software and the importance of data indicated on drawings including: a) datums b) surface finishes c) tolerances 3.3. Explain the importance of document control including ensuring that completed models are approved, labelled, and stored on a suitable storage medium. 3.4. Produce a CAD model for export to one of the following manufacturing systems: a) Computer Numerical Control (CNC) machine b) 3D printer c) other specific system 3.5. Produce CAD models which comply with two of the following: a) organisational guidelines b) statutory regulations and codes of practice

	c) CAD software standards d) British Standards (BS) and International Organization for Standardization (ISO) standards e) Other international standard 3.6. Save and store CAD models appropriately including: a) ensuring models have been checked to comply with organisational quality assurance procedures b) ensuring models are correctly titled, referenced, and annotated c) saving models to an appropriate storage medium (such as hard drive, DVD, external storage device) d) creating separate backup copies, and placing in safe storage e) registering and storing models in the appropriate organisational information system in line with organisational procedures f) recording and storing changes to models in the appropriate organisational information system in line with organisational procedures 3.7. Print hard copies of CAD models, with sufficient detail to facilitate manufacture.

Additional Assessment Guidance

RE Learning Outcome 3 at least one of the models/drawings produced must be of a significant nature. It must involve a minimum of five of the part features listed in assessment criteria AC 2.3 and must include a minimum of seven of the features listed in assessment criteria AC 2.5.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or	Record of observation Learner notes/written work Tutor notes/record Learner log/diary

	knowledge gained throughout the course	
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Components using Rapid Prototyping and Additive Manufacturing
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG540
Unit Reference No	L/650/9670
Learner Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce components using rapid prototyping and additive manufacturing.	
Learning Outcomes	**Assessment Criteria**
1. Be able to plan, prepare and carry out risk assessment for rapid prototyping and additive manufacturing activities.	1.1. Describe the health and safety issues and requirements associated with carrying out rapid prototyping and additive manufacturing activities. 1.2. Describe how to prepare and plan for rapid prototyping and additive manufacturing activities. 1.3. Carry out a risk assessment for a given rapid prototyping or additive manufacturing activity.
2. Be able to prepare a digital model file for rapid prototyping and additive manufacturing activities.	2.1. Describe the process of transforming Computer Aided Design (CAD) models through to a programming language for computer numerical control (CNC), including the importance of file type, units and resolution when producing a mesh file. 2.2. Describe the key factors of manufacture established at the point of computer code creation that relate directly to the types of additive manufacture being used including: a) speed b) temperature c) wall thickness d) infill density and type 2.3. Convert CAD files to applicable mesh model for slicing software at an appropriate resolution. 2.4. Transfer mesh model file to slicing software and slice model to given specifications to produce appropriate computer code. 2.5. Transfer computer code to additive manufacturing equipment using appropriate means.
3. Be able to safely set up for rapid prototyping and additive manufacturing activities.	3.1. Describe the key principles of rapid prototyping and additive manufacturing relevant to the machine being used. 3.2. Explain the different materials used to produce components by the rapid prototyping process including how the materials used will affect the operating conditions that can be applied relevant to the machine being used. 3.3. Summarise the key factors associated with material form relevant to the type of rapid prototyping and additive manufacturing process being utilised, and their importance including: a) dimensions

	b) shelf life c) control of water content 3.4. Carry out appropriate checks to ensure that equipment is in a safe and usable working condition including ensuring equipment is: a) undamaged b) clean c) and safety devices are in place and operational 3.5. Confirm sufficient quantities of relevant materials and available and load material into the additive manufacturing equipment. 3.6. Calibrate rapid prototyping and additive manufacturing equipment using appropriate techniques and equipment.
4. Be able to safely carry out rapid prototyping and additive manufacturing to produce components.	4.1. Describe Three different forms of Rapid Prototyping/Additive Manufacturing, explaining typical applications and advantages and disadvantages of each. 4.2. Summarise three potential problems and defects that can occur in components produced by rapid prototyping processes, including possible reasons these occur, and preventative actions to prevent them. 4.3. Describe the importance of leaving the machine in a safe condition on completion of the rapid prototyping and additive manufacturing activities including: a) correctly isolating b) closing or removing operating programs c) cleaning the machine d) removing and disposing of waste appropriately 4.4. Produce components using one of the following types of rapid prototyping and additive manufacturing equipment from appropriate material: a) stereo lithography apparatus (SLA) b) fused deposition modelling (FDM) c) selective laser sintering (SLS) d) direct metal laser sintering (DMLS) e) selective laser melting (SLM) f) 3D printing (thermojet) g) laminated object manufacturing (LOM) h) digital light process (DLP) i) other specific additive manufacturing equipment 4.5. Produce components made from one of the following materials: a) photo-polymer resin b) plastics c) wax d) metal e) laminated paper f) polyurethane 4.6. Demonstrate how to unload the components from rapid prototyping and additive manufacturing equipment, to include:

	a) removing the part from remaining raw material b) removing the part from supports (where applicable) c) pre-cleaning d) infiltrate (when required) e) packing to avoid damage f) storing g) completing all relevant documentation (such as material batch number, CAD file name, date of manufacture, operator's name, quality report) 4.7. Produce components which meet all the following quality and accuracy requirements: a) correctly formed b) checked against model specification c) free from manufacturing defects d) satisfactory visual appearance and finish 4.8. Demonstrate how to safely shut down equipment on completion of activities.

Additional Assessment Advice

Re: Learning Outcome 2: the computer code and computer programming language used should be one used for computer numerical control (CNC) in current wide use eg G-Code at time of writing.
AC 3.6 - Learner should demonstrate that they can determine material volume from slicing simulation. The learner should demonstrate that there is sufficient material available from previously utilised stock (e.g., mass of filament remaining on spool)
AC 4.2 - At least three work pieces must be completed. The workpieces should include a variety of features such as overhangs, captive fasteners, and integrated assembly.
AC 4.7 - Learner should be capable of utilising standard engineering measuring equipment such as micrometers and vernier calipers, prior to executing these activities.

Assessment Guidance

The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log

Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Title	Producing Composite Mouldings Using Wet Lay-up Techniques
Level	Two
Credit Value	10
Guided Learning Hours (GLH)	80
OCN NI Unit Code	CBG541
Unit Reference No	L/651/0262
Learn Direct Code	XA1
Unit purpose and aim(s): This unit will enable the learner to understand how to produce composite mouldings using wet lay-up laminating techniques	

Learning Outcomes	Assessment Criteria
1. Be able to plan, prepare and carry out a risk assessment for composite laminating activities.	1.1. Describe the health and safety requirements associated with carrying out composite laminating activities. 1.2. Describe how to prepare and plan for composite laminating activities. 1.3. Carry out a risk assessment for a given composite laminating activity.
2. Be able to safely set up and prepare for composite laminating activities using wet lay-up techniques.	2.1. Describe the standards and terminology used for the following wet lay-up techniques used in producing composite laminates: a) resin and fibre weights/volumes b) material orientation c) material identification d) material tailoring e) mixing ratios f) gel times g) exotherm h) bleed plies 2.2. Describe the different types of materials used and their applications in composite laminating processes including: a) resins b) reinforcement catalysts c) accelerators d) additives 2.3. Illustrate how to estimate or calculate resin volume/weight required to wet-out the reinforcing fibres. 2.4. Prepare production tooling including: a) checking that tooling is correct and complete b) cleaning the tooling and removal of resin build-ups c) checking for surface defects d) correctly applying sealers/release agents e) clean and store tooling suitably after use 2.5. Prepare materials for production of composite laminates including: a) obtaining correct materials for given activity and checking fitness for purpose b) cutting materials to correct size and shape c) checking correct quantity of resin is available d) calculating correct resin to fibre ratios

	e) checking correct measure and mix of resin and catalyst f) identification and protection of materials in the work area
3. Be able to safely carry out moulding activities using wet lay-up techniques.	3.1. Describe the following and their applications in the production of composite mouldings: a) different types of fibre materials including fabrics, orientations, their combinations b) different core, insert and filler materials c) different types of production tooling used 3.2. Summarise the methods of preparation for patterns, moulds, and tooling, (including the correct use of surface sealers and release agents). 3.3. Summarise the different methods and techniques used to cure composite mouldings including cure cycles and the need for monitoring. 3.4. Produce different mouldings using two of the following application techniques: a) spray application of fibre/resin b) spray application of a gel coat c) brush application of a gel coat d) brush application of fibre/resin e) roller application of fibre/resin f) removal of voids and air pockets g) brush/roller consolidation h) use of vacuum bagging **and incorporating four of the following shape features:** a) internal corner b) external corner c) horizontal surface d) vertical surface e) return surfaces f) double curvature g) concave surface h) convex surface i) joggle details 3.5. Produce different mouldings using one of the following types of resin: a) bio resin b) acrylic c) polyester d) vinyl ester e) epoxy f) phenolic g) other 3.6. Produce different mouldings using appropriate techniques for one of the following types of fibre from: a) natural fibre b) thermoplastic c) glass d) aramid e) carbon f) hybrid g) other

	3.7. Produce different mouldings using techniques for two of the following types of reinforcement: a) uni-directional b) roving c) braids d) tapes e) chopped strand f) continuous filament g) tissues/veils h) bonded fabrics i) woven j) multi axis/stitched k) other
4. Be able to remove mouldings from the formers and trim and finish to specification.	4.1. Describe the methods and techniques used for the following: a) trimming mouldings prior to release including green trimming b) removing mouldings from production tooling. c) identifying defects in the composite moulding (such as de-lamination, voids, contaminants) 4.2. Demonstrate how to remove moulds including: a) visually checking mouldings to confirm they are complete and free from defects b) using appropriate equipment and gauges to check for dimensional accuracy (such as overall dimensions, thickness of material or moulding, geometric features) c) marking out mouldings for trimming of excess material d) cutting and trimming mouldings, using appropriate tools and equipment (such as cutting wheels/discs, routers, saws) e) carrying out repairs where appropriate f) finishing mouldings, using appropriate tools and equipment (such as rubbing blocks, diamond files, disc or belt sanders, pencil grinders) g) polishing mouldings, using appropriate tools and equipment (such as wet sanding, cutting compounds) 4.3. Produce composite mouldings which comply with one of the following standards: a) components are dimensionally accurate within specification requirements b) finished components meet the required shape and geometry (such as squareness, straightness, angularity and being free from twists) c) completed components are free from defects, sharp edges, or slivers d) components meet company standards and procedures

Additional Assessment Advice
Re AC 2.5 and AC 4.2 The learner should determine and record the individual masses of all materials and consumables prior to laminating and again after removal from tool. Precise matrix and reinforcement masses should then be calculated to determine fibre volume fraction. **At least one of the mouldings produced must be of a significant nature and have a minimum of three of the shape features identified in AC 3.4.**
Assessment Guidance
The following assessment method/s may be used to ensure all learning outcomes and assessment criteria are fully covered.

Assessment Method	Definition	Possible Content
Portfolio of evidence	A collection of documents containing work undertaken to be assessed as evidence to meet required skills outcomes OR A collection of documents containing work that shows the learner's progression through the course	Learner notes/written work Learner log/diary Peer notes Record of observation Record of discussion
Practical demonstration/assignment	A practical demonstration of a skill/situation selected by the tutor or by learners, to enable learners to practise and apply skills and knowledge	Record of observation Learner notes/written work Learner log
Coursework	Research or projects that count towards a learner's final outcome and demonstrate the skills and/or knowledge gained throughout the course	Record of observation Learner notes/written work Tutor notes/record Learner log/diary
E-assessment	The use of information technology to assess learners' work	Electronic portfolio E-tests

Quality Assurance of Centre Performance

External Verification

All OCN NI recognised centres are subject to External Verification. External verification visits and monitoring activities will be conducted annually to confirm continued compliance with the conditions of recognition, review the centre's risk rating for the qualifications and to assure OCN NI of the maintenance of the integrity of the qualifications.

The External Verifier will review the delivery and assessment of the qualifications. This will include the review of a sample of assessment evidence and evidence of the internal verification of assessment and assessment decisions. This will form the basis of the EV report and will inform OCN NI's annual assessment of centre compliance and risk. The External Verifier is appointed by OCN NI.

Standardisation

As a process, standardisation is designed to ensure consistency and promote good practice in understanding and application of standards. Standardisation events:

- make qualified statements about the level of consistency in assessment across centres delivering a qualification
- make statements on the standard of evidence that is required to meet the assessment criteria for units in a qualification
- make recommendations on assessment practice
- produce advice and guidance for the assessment of units
- identify good practice in assessment and internal verification

Centres offering units of an OCN NI qualification must attend and contribute assessment materials and learner evidence for standardisation events if requested.

OCN NI will notify centres of the nature of sample evidence required for standardisation events (this will include assessment materials, learner evidence and relevant assessor and internal verifier documentation). OCN NI will make standardisation summary reports available and correspond directly with centres regarding event outcomes.

Administration

Registration

A centre must register learners within 90 working days of commencement of a qualification.

Certification

Certificates will be issued to centres within 20 working days of receipt of correctly completed results marksheets. It is the responsibility of the centre to ensure that certificates received from OCN NI are held securely and distributed to learners promptly and securely.

Charges

OCN NI publishes all up to date qualification fees in its Fees and Invoicing Policy document. Further information can be found on the centre login area of the OCN NI website.

Equality, Fairness and Inclusion

OCN NI has considered the requirements of equalities legislation in developing the specification for these qualifications. For further information and guidance relating to access to fair assessment and the OCN NI Reasonable Adjustments and Special Considerations policies, centres should refer to the OCN NI website.

Retention of Evidence

OCN NI has published guidance for centres on the retention of evidence. Details are provided in the OCN NI Centre Handbook and can be accessed via the OCN NI website.

OCN NI Level 2 Diploma in Engineering
Qualification Number: 610/2947/6

Operational start date: 15 July 2023
Operational end date: 14 July 2028
Certification end date: 14 July 2030

Open College Network Northern Ireland (OCN NI)
Sirius House
10 Heron Road
Belfast
BT3 9LE

Phone: 028 90463990
Web: www.ocnni.org.uk