Summary of Amendments

Version	Description	Page number
2	Minor terminology updated throughout specification. Unit 3 entry code corrected	34
3	Clarification of internal assessment arrangements	31
	Clarification of terminal rule	33

Contents

1. Qualification Overview

Qualification Title	Engineering
DfE Qualification Type	Technical Award
Ofqual QN	603/7019/1
WJEC Qualification Code	5799QA
DfE Discount Code	XA1
Age group approved for	14+
First teaching	September 2022
First certification	January 2024
Key documents	Sample Assessment Materials Administration Guide Guidance for Teaching: • Assessment Guide • Delivery Guide • Unit 1 Guidance for Teaching • Unit 2 Guidance for Teaching • Unit 3 Guidance for Teaching

1.1 Who is this for?

WJEC Level 1/2 Vocational Awards (Technical Awards) provide learners with opportunities to study vocational subjects alongside GCSEs and other general and vocational qualifications as part of a broad programme of study.

They are primarily designed for learners aged 14-16 and offer an experience that focuses on applied learning, i.e. acquiring and applying knowledge, skills and understanding through purposeful tasks set in sector or subject contexts that have many of the characteristics of real work.

Level 1/2 Vocational Awards (Technical Awards) available in 8 subject areas, listed below, meet Ofqual and DfE requirements for the KS4 performance table qualifications.

- Construction and the Built Environment
- Engineering
- Health and Social Care
- Hospitality and Catering
- ICT
- Performing Arts
- Retail Business
- Sport and Coaching Principles

1.2 Sector overview

Engineering is a driving force in the UK's economy, accounting for 21.4% (£1.2 trillion) of the UK's £5.7 trillion turnover in 2018[1]. However, there is a considerable shortage of appropriately skilled workers in the engineering sector. One of the reasons for this is due to a lack of awareness among young people of the educational routes into engineering occupations, despite the fact that pursuing STEM subjects remains a priority for many young people, and, according to Engineering UK[2], the proportion of young people aged 11 to 14 who said they would consider a career in engineering was 54.7% in 2019.

1.3 Qualification objective

The Vocational Award in Engineering has been designed to support learners in schools and colleges who want to learn about this vocational sector and the potential it can offer them for their careers or further study. It is most suitable as a foundation for further study. This further study would provide learners with the opportunity to develop a range of specialist and general skills that would support their progression to employment.

1.4 Prior learning requirements

Although there are no formal entry requirements, learners would find the following learning skills and aptitudes helpful: basic proficiency in literacy and numeracy, problem solving, and motivation to work independently.

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[1] https://www.engineeringuk.com/research/engineering-uk-report/
[2] https://www.engineeringuk.com/research/engineering-uk-report/

1.5 Equality and fair access

This specification may be followed by any learner, irrespective of gender, ethnic, religious or cultural background. It has been designed to avoid, where possible, features that could, without justification, make it more difficult for a learner to achieve because they have a particular protected characteristic.

The protected characteristics under the Equality Act 2010 are age, disability, gender reassignment, pregnancy and maternity, race, religion or belief, sex and sexual orientation, marriage and civil partnership.

The specification has been discussed with groups who represent the interests of a diverse range of learners, and the specification will be kept under review.

Reasonable adjustments are made for certain learners in order to enable them to access the assessments (e.g. candidates are allowed access to a Sign Language Interpreter, using British Sign Language). Information on reasonable adjustments is found in the following document from the Joint Council for Qualifications (JCQ): Access Arrangements and Reasonable Adjustments: General and Vocational Qualifications.

This document is available on the JCQ website (www.jcq.org.uk). As a consequence of provision for reasonable adjustments, very few learners will have a complete barrier to any part of the assessment.

1.6 What will learners study?

This is a unitised qualification consisting of 3 mandatory units.

Unit	Title	Assessment	GLH
1	Manufacturing engineering products	Internal	48
2	Designing engineering products	Internal	24
3	Solving engineering problems	External	48

2. Specification at a glance

2.1 Subject content

Unit 1 provides learners with the opportunity to interpret different types of engineering information in order to plan how to produce engineering products. Learners will develop knowledge, understanding and skills in using a range of engineering tools and equipment in order to produce and test an end product (page 9).

Unit 2 allows learners to explore how an engineered product is adapted and improved over time, and it offers learners the opportunity to apply their knowledge and understanding to adapt an existing component, element or part of the engineering outcome that they produced for Unit 1 (page 19).

Unit 3 introduces learners to a range of considerations that impact on engineering design and how modern engineering has had an impact on modern day life at home, work and in society in general (page 25).

2.2 Assessment overview

Summary of Assessment
Unit 1: Manufacturing Engineering Products Controlled assessment: 20 hours 40% of qualification 80 marks
An assignment brief will be provided by WJEC that will include a scenario and several tasks available via the WJEC Secure Website.
Unit 2: Designing Engineering Products Controlled assessment: 10 hours 20% of qualification 40 marks
An assignment brief will be provided by WJEC that will include a scenario and several tasks available via the WJEC Secure Website.
Unit 3: Solving Engineering Problems Written examination: time of exam - 1 hour 30 minutes 40% of qualification 80 marks
Questions requiring objective responses, short and extended answers, based around applied situations. Learners will be required to use stimulus material to respond to questions.

2.3 Assessment objectives

Below are the assessment objectives for this specification. Learners must:

AO1

Demonstrate knowledge and understanding from across the specification.

AO2

Apply skills (including practical skills), knowledge and understanding in a variety of contexts and in planning and carrying out investigations and tasks.

AO3

Analyse and evaluate information, making reasoned judgements and presenting conclusions.

The table below shows the weighting of each assessment objective for each unit and for the qualification as a whole.

	AO1	AO2	AO3	Total
Unit 1	4%	24%	12%	40%
Unit 2	1.5%	11%	7.5%	20%
Unit 3	20%	15%	5%	40%
Overall weighting	25.5%	50%	24.5%	100%

3. Units

3.1 Unit format

Unit title:	Summarises, in a concise manner, the content of the unit.
Guided learning hours (GLH):	Guided learning means activities such as classroom-based learning, tutorials and online learning, which is directly supervised by a teacher, tutor or invigilator. It also includes all forms of assessment which take place under the immediate guidance or supervision of a teacher, supervisor or invigilator. GLH has been allocated per unit to support delivery. It is acceptable for centres to deliver this qualification holistically and, therefore, hours per unit are a recommendation only.
Vocational context:	Provides a vocational rationale for the content of the unit.
Overview of unit:	Provides a summary of the unit content. It sets the context of the unit and highlights the purpose of the learning in the unit.
Topics:	Includes the list of topics covered by the unit.
Assessment:	Summarises the assessment method for the unit.

3.2 Amplification

The amplification provided in the right-hand column uses the following four stems:

- 'Learners should know' has been used for the recall of facts such as: legislation and definitions.
- 'Learners should know and understand' has been used for the majority of the unit content where knowledge needs to lead to a sense of understanding.
- 'Learners should be aware of' has been used when the volume of content is quite extensive, and learners do not need to understand all aspects in detail.
- 'Learners should be able to' has been used when learners need to apply their knowledge to a scenario or practical situation.

The subject content is presented in 3 units, each sub-divided into clear and distinct topic areas. Within each topic area the knowledge, understanding and skills are set out with an initial overview and then in two columns. The left-hand column identifies the content to be studied. The right-hand column provides amplification of the knowledge, understanding and skills that learners should develop in this area. Together, these two columns give the full content of the specification. There is no hierarchy implied by the order in which the content is presented, and the order does not imply a prescribed teaching order.

The amplification provided in the right-hand column includes all of the assessable content for the relevant section, unless it states, *'e.g.' 'including'* or '*such as'*. In these cases, the amplification lists relevant content, which should be expanded upon in an appropriate way, taking account of learners' needs and interests. The use of the word '*including*' indicates compulsion (i.e. a question could be specifically set on that aspect). The use of the words *'e.g.'* or *'such as'* are for guidance only, and an alternative can be chosen.

Unit 1

Unit title	Manufacturing Engineering Products
Unit entry code	5799U1
GLH	48
Vocational context	Engineering has sub-sectors, but almost all are linked by the production or manufacture of an end product, environment or system. This unit allows learners to understand how engineering information is used to manufacture or produce these outcomes. From basic hand tools to complex machinery, learners will gain understanding, skills and knowledge of processes and materials, to allow successful products to be produced.
Overview of unit	This unit introduces learners to interpreting different types of engineering information in order to plan how to produce engineered products. Learners will develop the skills needed to work safely with a range of engineering processes, equipment and tools. With these skills, learners will acquire knowledge of a range of engineered processes that are fit for purpose for producing an end product. Finally, learners will learn how to test the final product against the information given in the technical information to ensure that they have met the given standards of the assigned brief.
Topics	1.1 Understanding engineering drawings 1.2 Planning operations 1.3 Using engineering tools and equipment 1.4 Implementing engineering processes
Assessment	This unit is internally assessed through controlled assessment available in January and May each year. Duration: 20 hours Number of marks: 80 Format: The assignment brief will include a scenario and several tasks issued to centres in a candidate assessment pack via the WJEC Secure Website. Tasks are not intended to change for the lifetime of the qualification. This assessment contributes 40% to the overall qualification grade.

1.1 Understanding engineering drawings

In this topic, learners will develop knowledge, understanding and skills in the following areas:

1.1.1 interpreting engineering drawings
1.1.2 interpreting engineering information
1.1.3 presenting engineering information.

Content	Amplification

1.1.1
Interpreting engineering drawings
	Learners should be able to understand engineering drawings, and identify parts and/or components that will enable them to plan a final product, and should be able to:
	• interpret standard engineering symbols, such as:
	  • diameter
	  • radius
	  • surface
	  • angle
	  • offset
	  • tolerances
	• read information, such as:
	  • third angle projection
	  • isometric views
	  • exploded views
	  • sectional views
	  • orthographic projection
	  • detail views
	• interpret drawings to obtain information on:
	  • finishes
	  • title blocks
	  • calculations (linear dimensions and dimensions from a datum)
	• understand sketches, such as:
	  • simple sketches giving clarification or information on construction details
	  • sketched engineering drawings of the manufactured parts produced to recognised standards
	• interpret specific requirements provided in an engineering specification.

1.1.2
Interpreting engineering information
	Learners should be able to interpret key engineering information from:
	• data sheets, providing information such as feed and speed rates, tapping drill sizes, and finishes
	• job sheets, including information about basic details of the parts to be made such as quantity, equipment, and tooling
	• specifications, including specific requirements of the proposed engineered product
	• tolerances, providing:
	  • acceptable levels of accuracy for individual parts
	  • justifications for errors and suggestions to overcome identified problems.

1.1.3
Presenting engineering information
	Learners should be able to present engineering information they have extracted from drawings etc., such as:
	• drilling speeds
	• cutting speeds for correct materials
	• tapping drill sizes
	• finishing details
	• tolerances
	• component details such as
	  • washers
	  • nuts & bolts
	  • set screws
	  • machine screws
	using written documents or digital methods.

1.2 Planning operations

In this section, learners will develop the knowledge, understanding and skills necessary to plan the operations to produce an engineering product using the information and data provided. This includes:

1.2.1 identifying materials
1.2.2 equipment selection
1.2.3 tool selection
1.2.4 planning and sequencing
1.2.5 contingency planning.

Content	Amplification
1.2.1 Identifying materials	Learners should be able to identify which materials are suitable for specific parts of an engineering product and present the information in planning documentation. Learners should be aware of material stock and stock sizes.
1.2.2 Equipment selection	Learners should be able to identify and select the equipment that is needed for each stage of the production of a product: • centre lathe • drills • milling machine • laser cutter • bandsaw • linishers • brazing hearth • welding equipment • buffer/polisher • sheet metal bender using technical details given in an engineering drawing and any other supporting details.

1.2.3
Tool selection
	Learners should be able to identify the tools that are needed for each stage of the production of a product:
	• scriber
	• centre punch
	• callipers
	  • standard
	  • internal
	  • external
	  • odd leg
	• soldering iron
	• steel rule
	• engineers square
	• file
	• dividers
	• micrometer
	• Vernier callipers
	• rivet sets
	• taps and dies
	• hacksaw
	• fret saw
	• former
	• jig
	• pliers
	• screwdriver.

1.2.4
Planning and sequencing
	Learners should be able to present their plan of processes, sequencing, equipment, and tool/machine requirements in planning documentation such as:
	• job sheets
	• planning tables.
	
	Learners should be able to sequence production stages appropriately and present the information in planning documentation demonstrating that they are able to:
	• prioritise activities
	• order the stages appropriately
	• identify parameters relating to:
	  • tolerances
	  • finishes.
	
	Learners should be able to identify time requirements for processing resources in preparation for production and the time needed for each stage.
	
	Learners should be able to present this information in a way that would allow a third party to produce the product.

1.2.5 Contingency planning	Learners should be aware of the need for contingency planning to allow for unforeseen situations, such as: • equipment failure • illness • material shortages • school closures.

1.3 Using engineering tools and equipment

In this topic, learners will develop knowledge, understanding and skills necessary to accurately and safely produce an engineering product:

1.3.1 using engineering tools
1.3.2 using engineering equipment
1.3.3 health and safety.

Content	Amplification

1.3.1
Using engineering tools
	Learners should be able to demonstrate safe working practice with a range of engineering tools, such as:
	• file
	• scriber
	• centre punch
	• tap and die
	• vice
	• hacksaw
	• rivet gun and set
	• engineers square
	• callipers
	• Vernier callipers
	• micrometres
	• pliers
	• shears
	• reamer
	• gauge
	• screwdriver
	• de-burring tool.
	
	Learners should also be aware that tools (tooling) can include specific parts associated with items of equipment in an engineering workshop such as:
	• lathe tools:
	  • knurling tool
	  • cranked turning tool
	  • parting tool
	  • tool holder/tool post
	  • boring bar
	  • chuck
	• hand turning tools – types and uses
	• portable power tools – driver selection, speed and torque settings, charging.

1.3.2
Using engineering equipment
	Learners should be able to demonstrate safe working practice with a range of engineering equipment such as:
	• centre lathes:
	  • turning
	  • facing off
	  • taper turning
	  • knurling
	  • boring
	  • drilling
	  • thread cutting
	• drilling machines – including a range of drill types and trimming tools
	• milling machines:
	  • slot milling
	  • end milling
	  • mill types
	• multimeters – reading values including:
	  • voltage
	  • amps
	  • Ohms/resistance
	  • checking continuity
	• UV PCB light box
	• PCB tank
	• laser cutters
	• vacuum former.

1.3.3 Health and Safety	Learners should be able to follow appropriate Health and Safety procedures when working in engineering workshops by: • assessing potential risks • deciding what control measures are necessary • identifying personal protective equipment (PPE) needed for specific tasks. Learners should also be aware of Health and Safety, risk assessments and safe working practices during the use of engineering equipment.

1.4 Implementing engineering processes

In this section, learners will develop knowledge and understanding of engineering processes used in the development of prototypes and products and, demonstrate their ability to:

1.4.1 apply a range of engineering processes
1.4.2 work with a range of materials
1.4.3 evaluate the quality of engineered products
1.4.4 evaluate own practices and processes.

Content	Amplification
1.4.1 Apply a range of engineering processes	Learners should be able to apply a range of key engineering processes used in engineering, such as: • marking out • cutting • finishing • preparing • shaping • drilling • milling • turning • brazing • joining • filing • soldering • forming. Learners should be able to apply appropriate Health and Safety practices when undertaking practical tasks.

1.4.2
Work with a range of materials
	Learners should know and understand which engineering processes and tools are appropriate for different materials, including:
	• metals
	• non-metals –
	  • plastics
	  • composites
	  • woods
	  • resins.

1.4.3 Evaluate the quality of engineered products	Learners should know and understand that successful engineering outcomes require measuring against given criteria: • inspection techniques • against success criteria • against engineering information • tolerance • quality inspection.
1.4.4 Evaluate own practices and processes	Learners should be able to evaluate their own practices and processes during the planning and production of engineering products or parts of engineering products.

Unit 2

Unit title	Designing Engineering Products
Unit entry code	5799U2
GLH	24
Vocational context	Virtually everything that we interact with from day to day has been through the design process. This unit allows learners to understand how an engineering design process is used to develop or adapt products, and how these solutions help to meet the needs and demands of clients, users and environments. In this unit, learners will become familiar with developing problem-solving skills based on real problems and identified market needs. They will need to analyse a brief and specification and produce a solution that meets those requirements.
Overview of unit	This unit allows learners to experience and gain understanding of how an engineered product is adapted and improved over time. The unit is linked to the engineering product produced in Unit 1 of the qualification. It will require the learner to work to a given brief to adapt an existing component, element or part of the engineering outcome that they produced for Unit 1.
Topics	2.1 Understanding function and meeting requirements 2.2 Proposing design solutions 2.3 Communicating an engineered design solution 2.4 Solving applied engineering problems
Assessment	This unit is internally assessed through controlled assessment available in January and May each year. Duration: 10 hours Number of marks: 40 Format: The assignment brief will include a scenario and several tasks issued to centres in a candidate assessment pack via the WJEC Secure Website. Tasks are not intended to change for the lifetime of the qualification. This assessment contributes 20% to the overall qualification grade.

2.1 Understanding function and meeting requirements

In this section, learners will gain knowledge of how engineered products function and meet the needs and requirements of given situations, briefs and specifications. Focus will be across a range of engineering areas:

2.1.1 primary features of the given engineered product
2.1.2 identifying features of other engineered products
2.1.3 function of the proposed solution.

Content	Amplification

2.1.1.
Primary features of the given engineered product
	Learners should be able to identify primary features of the product, such as:
	• electrical components:
	  • connections
	  • LEDs
	  • resistors
	  • fuses
	  • diodes
	  • power supplies
	• mechanical components:
	  • fixings (nuts, bolts, washers, etc)
	  • clamping devices
	  • adjusting mechanisms
	• properties of component materials:
	  • conductivity
	  • friction
	  • durability
	  • quality.

2.1.2
Identifying features of other engineered products
	Learners should be aware of features of other engineered products that may have similar needs to their given brief such as:
	• aesthetics
	• user/customer/client needs
	• safety
	• ergonomics
	• anthropometrics
	• mechanisms
	• electronics
	• sustainability
	• material properties:
	  • hardness
	  • toughness
	  • malleability
	  • brittleness.
	Learners should be aware of why and how these features are applied on other similar products.

2.1.3 Function of the proposed solution	Learners should be able to explain the functional properties of their design solutions focusing on areas, such as: • mechanical function • electrical function • how components interrelate with one another.

2.2 Proposing Design Solutions

In this section, learners will gain knowledge, understanding and skills in producing specifications based on a brief and their own investigative work. Learners will develop the following skills in producing and presenting creative ideas and solutions:

2.2.1 generating a range of engineered solutions
2.2.2 developing ideas through to a conclusion
2.2.3 communicating design ideas.

Learners will also develop skills which allow them to evaluate their proposals against the given brief and learner generated specification.

Content	Amplification
2.2.1 Generating a range of engineering solutions	Learners should be able to: • identify existing solutions already available that meet or partly meet the problem of the brief • generate ideas related to the engineered solution • generate a range of solutions that meet the given brief and address the problem set • explore implementation of ideas. Learners should be able to develop a range of ideas through to a solution including testing and modelling.
2.2.2 Developing ideas through to a conclusion	Learners should be aware that design solutions must meet a range of specific criteria, including any limitations set by the brief such as those relating to: • materials • sizes • tolerances • cost • operational parameters Learners should determine the most suitable engineering solution by using a suitable evaluative method such as: • a SWOT analysis • a review/evaluation against the given design specification • a review/evaluation against the brief.
2.2.3 Communicating design ideas	Learners should be able to communicate design ideas in a suitable media appropriate to the information being presented. This should: • convey meaning • use appropriate language • have a logical structure • clearly present the information using either ICT or traditional hand-written/illustration methods • use appropriate terminology • include visual support such as simple models, CAD visuals or test rigs.

2.3 Communicating an engineered design solution

In this section, learners will develop knowledge, understanding and skills in using techniques, including traditional and computer aided design (CAD) based processes, to present solutions in an appropriate and meaningful way in relation to:

2.3.1 producing an engineering specification

2.3.2 drawing an engineering design solution that adheres to recognised standards.

Content	Amplification

2.3.1
Producing an engineering specification
	Learners should be able to produce an engineering specification that includes:
	• precise details of requirements, presented in textual form, and/or included on drawings
	• specification points that must be interpreted before work commences, such as:
	  • materials information
	  • technical details
	  • finishing details.

2.3.2
Drawing an engineering design solution that adheres to recognised standards
	Learners should be able to produce engineering drawings, using traditional instruments or CAD based software, of a final proposed engineered product to recognised standards including:
	• a 3rd angle orthographic projection
	• an isometric image.
	
	Learners should be able to produce engineering drawings that include:
	• dimensions and associated symbols
	  • diameter, circumference, radius, height, depth, width
	• conventions
	  • title block
	  • dimension lines
	  • extension lines
	  • centre lines
	  • metric units of measurement
	• hidden detail
	• scale.

2.4 Solving applied engineering problems	
In this section, learners will develop knowledge, understanding and skills in: 2.4.1 using mathematical techniques for solving applied engineering problems 2.4.2 justifying suitable materials for use in the final engineered solution 2.4.3 justifying suitable processes for manufacturing the final engineered solution.	
Content	**Amplification**

2.4.1
Using mathematical techniques for solving applied engineering problems
	Learners should be able to:
	• calculate basic areas and volumes of simple geometric shapes
	• interpret estimates with regards to pricing materials and production rates
	• apply OHM's law to simple problems relating to current, resistance and voltage
	• apply simple ratios and equations to determine mechanical advantage in:
	  ◦ simple gears
	  ◦ levers
	  ◦ pulleys
	• calculate linear dimensions on sketches or drawings using datum points.
	
	Learners should be able to produce responses to engineering problems that:
	• use units of measurement – meters (m) and millimetres (mm)
	• apply appropriate scale to sketches and drawings.

2.4.2 Justifying suitable materials for use in the final engineered solution	Learners should be able to apply methods of testing to justify material selections that are fit for purpose and meet the design specification.
2.4.3 Justifying suitable processes for producing the final engineered solution	Learners should be able to suggest and justify appropriate methods for producing the component parts of their engineering outcome, such as: • method for material removal • methods for shaping and manipulating materials • joining and/or assembly methods • heat and chemical treatments methods • finishing.

Unit 3

Unit title	Solving Engineering Problems
Unit entry code	5799U3
GLH	48
Vocational context	Understanding engineering materials and processes is key to understanding the core principle of Engineering, and fundamental to an engineer's role is finding functional solutions to problems and demands. However, many areas in Engineering are fast evolving, and developments in materials, processes and technologies are constantly re-shaping the sector. This unit considers both the steadfast central tenets of modern Engineering, whilst exploring the impact of engineering developments and achievements in the home and in society in general.
Overview of unit	This unit introduces learners to how engineering design is impacted by a range of external considerations such as the properties of materials, both traditional and smart developing materials, as well as methods of manufacturing in both the traditional and new and emerging technologies. The unit also gives the learner the opportunity to explore how engineering achievements have had an impact on modern day life at home, work and in society in general. Finally, the unit allows learners to develop understanding and skills to assist them in the solving of engineering problems.
Topics	3.1 Understanding the effects of engineering achievements 3.2 Understanding properties of engineering materials 3.3 Understanding methods of preparation, forming, joining and finishing of engineering materials 3.4 Solving engineering problems
Assessment	This unit is externally assessed through a written examination available in January and May/June each year. Duration: 1 hour 30 minutes Number of marks: 80 Format: short and extended answer questions based around applied situations. Learners will be required to use stimulus material to respond to questions. This unit's assessment will require learners to draw on knowledge and understanding from Units 1 and 2. This assessment contributes 40% to the overall qualification grade.

3.1 Understanding the effects of engineering achievements

In this section learners will gain knowledge and understanding of engineering developments relevant to:

3.1.1 describing engineering developments
3.1.2 explaining the effects of engineering achievements
3.1.3 explaining how environmental issues affect engineering applications.

Content	Amplification
3.1.1 Describing engineering developments	Learners should know and understand how engineering developments have an impact on the design of products and structures. These include developments in: • structural design, focusing on the development of bicycles • mechanical design, focusing on the development of theme park rides • electronic design, focusing on the development of mobile phone/smart technology.
3.1.2 Explaining the effects of engineering achievements	Learners should know and understand how the development of engineering products are impacted by changes in: • materials • smart technologies, including voice activated, Bluetooth and Wi-Fi • electronic and micro-electronic components and have affected modern life, including: • in the home • in society.
3.1.3 Explaining how environmental issues affect engineering applications	Learners should know and understand how the manufacture and use of engineered products have an environmental impact in terms of: • materials development • costs • transportation • their use • their disposal • recycling • sustainability. Learners should know and understand how environmental issues affect: • engineering processes • engineering products.

3.2 Understanding properties of engineering materials

In this section, learners will develop knowledge and understanding of the properties of materials and how they react in different situations:

3.2.1 understanding materials, their properties, and their selections for specific purposes
3.2.2 describing properties required of materials for engineering products
3.2.3 explaining how materials are tested for properties.

Content	Amplification
3.2.1 Understanding materials, their properties, and their selection for specific purposes	Learners should know and understand the following materials and their properties, and when they should be used for a specific purpose. • Ferrous, e.g. mild steel, stainless steel, tool steel • non-ferrous, e.g. brass, copper, aluminium • thermoplastics, e.g. acrylic, nylon, HIPS • thermosetting plastics, e.g. urea formaldehyde, silicon • smart, e.g. thermochromic pigments/inks, shape memory alloy, nitinol wire • composite, e.g. carbon fibre, Kevlar.
3.2.2 Describe properties required of materials for engineering products	Learners should know and understand the physical properties of materials, including their: • tensile strength • compressive strength • hardness • toughness • malleability • ductility • conductivity • corrosive resistance • environmental degradation • elasticity and how they can be applied in an engineering context. Learners should know and understand the properties needed for the following engineering products: • mobile phones • security alarm found in the home • bicycles • children's play areas.
3.2.3 Explaining how materials are tested for properties	Learners should know and understand how destructive testing (DT) and non-destructive testing (NDT) is undertaken to determine physical properties of engineering materials, including: • tensile strength • hardness • toughness • malleability • ductility • conductivity • elasticity.

3.3 Understanding methods of preparation, forming, joining and finishing of engineering materials

In this section, learners will gain knowledge, understanding and skills in preparing, using and finishing materials. Learners will also gain knowledge and understanding in engineering processes and machining, in relation to:

3.3.1 describing engineering processes
3.3.2 describing applications of engineering processes
3.3.3 safe working practices.

Content	Amplification
3.3.1 Describing engineering processes	Learners should understand processes, including relevant tools and equipment, used to produce engineering products including: • marking out • cutting • finishing • preparing • shaping • drilling • turning • brazing • joining – permanent and temporary fixings • filing • soldering.
3.3.2 Describing applications of engineering processes	Learners should understand how engineering processes can be used for: • material removal • shaping and manipulation • joining and assembly • heat and chemical treatment.
3.3.3 Safe working practices	Learners should know and understand how to work safely when working in an engineering environment such as a school/college workshop when preparing, using and finishing materials, including by: • carrying out a risk assessment • identifying risks • identifying appropriate control measures.

3.4 Solving engineering problems

In this section, learners will develop knowledge and understanding of:
3.4.1 using mathematical techniques for solving engineering problems
3.4.2 understanding and producing engineering drawings.

Content	Amplification

3.4.1
Using mathematical techniques for solving engineering problems
	Learners should know and understand and be able to use calculations and mathematical techniques that are required to solve engineering problems, including:
	• use of formulae
	  • Ohms law
	  • mechanical advantage
	  • velocity ratio
	• areas and volumes
	• measuring using datums
	• estimation (of cost/materials)
	• average
	• scale (enlargement and reduction)
	• units of measurement including:
	  • metric (e.g. metres, millimetres)
	  • imperial (e.g. feet, inches)
	• time conversion (hours, minutes & seconds)
	• graphs – histogram, bar charts, line graph, pie charts.

3.4.2 Understanding and producing engineering drawings	Learners should understand the following technical details in an engineering drawing: • section views • construction lines • centre lines • hidden details • standard conventions • datums. Learners should be able to interpret and produce a range of engineering drawings including: • third-angle orthographic projections • isometric views • sectional views that include technical details such as: • dimension lines • sectional lines.

4 Assessment

4.1 External assessment (Unit 3)

Unit 3 is assessed through an external examination available in January and May/June each year (first assessment January 2024).

Each external examination will:

- be set and marked by WJEC
- consist of a 1 hour, 30 minute paper
- assess content from each topic in the unit each series
- include 80 marks
- include a balance of short and extended answer questions, based on stimulus material and applied contexts
- only use the command verbs listed in the Assessment Guide (Chapter 4)
- be graded Level 1 Pass, Level 1 Merit, Level 1 Distinction, Level 1 Distinction*, Level 2 Pass, Level 2 Merit, Level 2 Distinction, Level 2 Distinction*.

All content in each topic area will be assessed over the lifespan of the specification. WJEC will produce a mark scheme which will be used as the basis for marking the examination papers.

For external assessments, centres must follow the Joint Council for Qualifications (JCQ) *Instructions for Conducting Examinations*, a copy of which can be accessed from the JCQ website. (www.jcq.org.uk).

4.2 Internal assessment (Units 1 and 2)

Units 1 and 2 are assessed through controlled assessment, submitted for external moderation in January and May each year (first submission in May 2023).

Centres must follow the instructions for running controlled assessments in the Administration Guide and within each Unit Guide. In line with these instructions, centres are required to have in place a controlled assessment policy (which can be part of a centre's NEA policy.

4.3 Synoptic assessment

Unit 3 is synoptic and requires learners to draw on knowledge and experience gained through Units 1 and 2 (see page 25 for details).

4.4 Candidate and assessor packs

Candidate and Assessor Packs are available on the secure website for centres to download. Centres have flexibility in when they schedule internal assessment but must ensure that they are using the correct packs for the series in which they intend to enter the work for moderation. Candidates must not have access to the Candidate Packs until they are ready for assessment which should be after all the teaching and learning for the unit has been completed.

4.5 Managing the assessments

Centres are required to manage and conduct internal assessments in line with the arrangements outlined in the Administration Guide. There are four areas that are controlled: supervision, guidance, and time collaboration. Specific details for Unit 1 and Unit 2 can be found in the SAMs and the corresponding unit guide.

5 Guided Learning Hours and Total Qualification Time

5.1 Guided Learning Hours

Guided learning hours (GLH) means activities such as classroom-based learning, tutorials and online learning, which are directly supervised by a teacher, tutor or invigilator. It also includes all forms of assessment which take place under the immediate guidance or supervision of a teacher, supervisor or invigilator.

The total number of GLH assigned to this qualification is 120 hours.

Guided learning hours are allocated per unit to support centre planning and delivery. It is acceptable for centres to deliver this qualification holistically and, therefore, guided learning hours per unit are a recommendation only.

5.2 Total Qualification Time

Total qualification time (TQT) is the total amount of time, in hours, expected to be spent by a learner to achieve a qualification. It includes both the guided learning hours (GLH) and additional time spent in preparation, study and some formative assessment activities.

The total qualification time for this qualification has been calculated as 180 hours. This includes:

- 120 hours of guided learning and/or supervised assessment
- 60 hours of self-directed study which may include additional assignments and tasks set by the teacher (homework) and independent use of online learning resources.

6 Entries

6.1 Centre approval

In order to offer our qualifications, centres must have WJEC centre approval. The approval process involves completion of the relevant application form(s) and an assessment of the ability of the centre to meet WJEC and relevant JCQ requirements.

If you are a new institution, please read the following documents before contacting us to discuss your prospective centre:

- JCQ General Regulations for Approved Centres
- JCQ Instructions for Conducting Examinations
- WJEC Conditions for Registered Centres

If your centre wishes to submit entries and is not yet registered as a centre, please contact the Centre Support department at WJEC (centres@WJEC.co.uk) for an application form. The completed form must be returned to WJEC no less than five months prior to the relevant entry deadline.

WJEC approved centres must adhere to the General Conditions for WJEC Centres and the appropriate JCQ regulations. All WJEC approved centres with a national centre number (NCN) must complete the annual declaration sent by NCN. Failure to do so will result in suspension of WJEC registration.

6.2 Entry procedure

WJEC Level 1/2 in Engineering will be available for certification from January 2024. Thereafter, each qualification will be available for certification each January and June.

Unit entry

Entry for individual units must be made by submitting the relevant unit codes as indicated on each unit of the specification.

This qualification has a 40% terminal requirement. This means that the external assessment must be taken in the examination series in which the candidate is cashing in the qualification. Candidates can be entered for the external assessment prior to this as a practice attempt however, only the mark from the attempt made in the series in which the candidate is cashing in the qualification will be used in calculating the final overall grade, even if this is lower than a previous attempt.

Qualification entry

Learners will be entered for the qualification when entering for aggregation (cash-in).

Aggregation does not take place automatically; it is necessary to enter the relevant code for aggregation to take place.

Entry codes

		Entry Codes	
		English medium	Welsh medium
Unit 1 Manufacturing engineering products	Internal	5799U1	5799N1
Unit 2 Designing engineering products	Internal	5799U2	5799N2
Unit 3 Solving engineering problems	External – Paper	5799U3	5799N3
	Cash in code	5799QA	5799CA

7 Awarding, grading and reporting

Vocational Awards are awarded on an 8-point scale: Level 2 Distinction*, Level 2 Distinction, Level 2 Merit, Level 2 Pass, Level 1 Distinction*, Level 1 Distinction, Level 1 Merit, Level 1 Pass. Candidates who do not achieve the uniform marks required to achieve a Level 1 Pass will have their achievement recorded as U (unclassified) and will not receive a certificate.

Individual units are recorded on a uniform mark scale (UMS) with the following grade equivalences:

		Level 2				Level 1			
Unit	Max	D*	D	M	P	D*	D	M	P
Unit 1	120	108	96	84	72	60	48	36	24
Unit 2	60	54	48	42	36	30	24	18	12
Unit 3	120	108	96	84	72	60	48	36	24

Qualification	300	270	240	210	180	150	120	90	60

8 Resit arrangements

8.1 Resitting units prior to certification

Candidates may resit each **internally** assessed unit prior to certification but cannot improve previously submitted work. The best uniform mark score from the attempts will be used in calculating the final overall grade.

Candidates may resit the **externally** assessed unit prior to certification; however, this qualification has a 40% terminal requirement which must be satisfied by the externally assessed unit. Therefore, only the uniform mark score from the attempt made in the series in which the candidate is cashing in the qualification will be used in calculating the final overall grade, even if this is lower than the previous attempt.

8.2 Resitting units following certification

Candidates who are unhappy with the grade awarded for the qualification may choose to resit one or more units following certification.

Where the candidate resits the externally assessed unit, only the uniform mark score from the resit attempt will be used in calculating the final overall grade, even if this is lower than the previous attempt. The candidate does not need to resit the internally assessed unit as marks for the internally assessed unit may be carried forward for the lifetime of the specification.

Where the candidate resits the internally assessed unit, the higher of the uniform mark score from either the initial attempt or the resit attempt will be used in calculating the overall grade. The candidate will also need to resit the externally assessed unit to satisfy the terminal rule requirement for the qualification and only the uniform mark score from the resit attempt will be used in calculating the final overall grade, even if this is lower than the previous attempt.

8.3 Post-results services

Following the publication of results for each examination series, WJEC offers a range of post-results services relating to reviews of marking and moderation and access to examination scripts. Information on post-results services can be found on the WJEC website.

9 Malpractice

Information regarding malpractice is available in our Malpractice, A Guide for Centres document.

All cases of suspected or actual malpractice must be reported to WJEC. If candidates commit malpractice they may be penalised or disqualified from the examinations.

In all cases of malpractice, centres are advised to consult the JCQ booklet Suspected Malpractice: Policies and Procedures.

9.1 Preventing malpractice

Candidates must not:

- submit work which is not their own;
- make available their work to other candidates through any medium;
- allow other candidates to have access to their own independently sourced material;
- assist other candidates to produce work;
- use books, the internet or other sources without acknowledgement or attribution;
- submit work that has been word processed by a third party without acknowledgement;
- include inappropriate, offensive or obscene material.

Candidates are not prohibited from lending books or other resources to one another, but they must not plagiarise others' research.

Candidates must not post their work on social media. They should be made aware of the JCQ document Information for candidates – Guidelines when referring to examinations/assessments through the Internet – http://www.jcq.org.uk/exams-office/information-for-candidates-documents/ .

Heads of centre and senior leaders must ensure that those members of teaching staff involved in the direct supervision of candidates producing controlled assessment are aware of the potential for malpractice.

Teaching staff must be reminded that failure to report allegations of malpractice or suspected malpractice constitutes malpractice itself.

Teaching staff must:

- be vigilant in relation to candidate malpractice and be fully aware of the published regulations
- report any alleged, suspected or actual incidents of malpractice to the senior leadership team or directly to WJEC.