Specification

ENGINEERING ELECTRONICS AND COMPUTER CONTROL TECHNOLOGIES

From September 2014

Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies

Issue 3
Pearson
BTEC Level 1/Level 2
First Award in Engineering Electronics and Computer Control Technologies

Specification

First teaching September 2014
Issue 3
Edexcel, BTEC and LCCI qualifications

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This specification is Issue 3. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on our website.

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Welcome to your BTEC First specification

For more than 25 years, BTECs have earned their reputation as well-established, enduringly effective qualifications. They have a proven track record in improving motivation and achievement among young learners. Additionally, BTECs provide progression routes to the next stage of education or into employment.

BTECs are evolving

Informed by recent policy developments, including the Review of Vocational Education – The Wolf Report (March 2011), we have designed this new suite of BTEC Firsts to:

- ensure high quality and rigorous standards
- conform to quality criteria for non-GCSE qualifications
- be fit for purpose for learners, pre- or post-16, in schools and in colleges.

We conducted in-depth, independent consultations with schools, colleges, higher education, employers, the Association of Colleges and other professional organisations. This new suite builds on the qualities – such as a clear vocational context for learning and teacher-led assessment based on centre-devised assignments – that you told us make BTECs so effective and engaging.

This new suite introduces additional features to meet the needs of educators, employers and the external environment. They are fully aligned with requirements for progression – to further study at Level 3, into an apprenticeship or into the workplace. We believe these features will make BTEC even stronger and more highly valued.

What are the key principles of the new suite of BTEC Firsts?

To support young people to succeed and progress in their education, we have drawn on our consultations with you and embedded four key design principles into the new BTEC Firsts.

1 Standards: a common core and external assessment

Each new BTEC Level 2 First Award qualification has an essential core of knowledge and applied skills. We have introduced external assessment appropriate to the sector. This provides independent evidence of learning and progression alongside the predominantly portfolio-based assessment.

2 Quality: a robust quality-assurance model

Building on strong foundations, we have further developed our quality-assurance model to ensure robust support for learners, centres and assessors.

We will make sure that:

- every BTEC learner’s work is independently scrutinised through the external assessment process
- every BTEC assessor will take part in a sampling and quality review during the teaching cycle
- we visit each BTEC centre every year to review and support your quality processes.

We believe this combination of rigour, dialogue and support will underpin the validity of the teacher-led assessment and the learner-centric approach that lie at the heart of BTEC learning.
3 Breadth and progression: all units are mandatory; contextualised English and mathematics

The core and mandatory units, developed in consultation with employers and educators, gives learners the opportunity to gain a broad understanding and knowledge of a vocational sector.

Opportunities to develop skills in English and mathematics are indicated in the units, where appropriate. Learners will have the opportunity to practise these essential skills in naturally occurring and meaningful contexts, where appropriate to the sector.

The skills have been mapped against GCSE (including functional elements) English and mathematics subject content areas.

4 Recognising achievement: opportunity to achieve at Level 1

The new BTEC Firsts will continue to provide for the needs of learners aiming to achieve a Level 2 qualification. However, we have recognised that for some learners achieving this standard in all units within one to two years may not be possible. Therefore, the qualifications have been designed as Level 1/Level 2 qualifications with grades available at Level 2 and at Level 1.

Improved specification and support

In our consultation, we also asked about what kind of guidance you, as teachers and tutors, need. As a result, we have streamlined the specification itself to make the units easier to navigate, and provided enhanced support in the accompanying Delivery Guide.

Thank you

Finally, we would like to extend our thanks to everyone who provided support and feedback during the development of the new BTEC Firsts, particularly all of you who gave up many evenings of your own time to share your advice and experiences to shape these new qualifications. We hope you enjoy teaching the course.
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Earlier issue(s) show(s) previous changes.

If you need further information on these changes or what they mean, contact us via our website at: qualifications.pearson.com
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Purpose of this specification

The purpose of this specification, as defined by Ofqual, is to set out:

- the qualification’s objective
- any other qualification that a learner must have completed before taking the qualification
- any prior knowledge, skills or understanding that the learner is required to have before taking the qualification
- units that a learner must have completed before the qualification will be awarded, and any optional routes
- any other requirements that a learner must have satisfied before the learner will be assessed, or before the qualification will be awarded
- the knowledge, skills and understanding that will be assessed as part of the qualification (giving a clear indication of their coverage and depth)
- the method of any assessment and any associated requirements relating to it
- the criteria against which learners’ level of attainment will be measured (such as assessment criteria)
- any specimen materials (supplied separately)
- any specified levels of attainment.
Qualification title and Qualification Number

<table>
<thead>
<tr>
<th>Qualification title</th>
<th>Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies</th>
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<tbody>
<tr>
<td>Qualification Number (QN)</td>
<td>601/0925/7</td>
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This qualification is on the Regulated Qualifications Framework (RQF).

Your centre should use the Qualification Number (QN) when seeking funding for your learners.

The qualification title, units and QN will appear on each learner’s final certificate. You should tell your learners this when your centre recruits them and registers them with us. Further information about certification is in the Information Manual on our website, qualifications.pearson.com
1 What are BTEC Firsts?

BTEC First qualifications were originally designed for use in colleges, schools and the workplace as an introductory Level 2 course for learners wanting to study in the context of a vocational sector. This is still relevant today. The knowledge, understanding and skills developed when studying a BTEC Level 2 course prepare learners to enter the workplace in due course. Entry-level employment opportunities in engineering include roles such as junior mechanical engineer or technician. Engineering is becoming an exemplar of technical education for 14–16 year olds. The centrality within engineering of ‘making things’ and the labour-market demand for engineering skills, which exceeds supply, underpin an emerging educational landscape that can bring together academic and vocational skills.

These qualifications are intended primarily for learners in the 14–19 age group, but may also be used by other learners who wish to gain an introductory understanding of a vocational area. When taken as part of a balanced curriculum, there is a clear progression route to a Level 3 course or an apprenticeship.

BTECs are vocationally related qualifications, where learners develop knowledge and understanding by applying their learning and skills in a work-related context. Additionally, they are popular and effective because they engage learners in taking responsibility for their own learning and developing skills that are essential for the modern-day workplace. These skills include: teamworking; working from a prescribed brief; working to deadlines; presenting information effectively; and completing administrative tasks and processes accurately. BTEC Firsts motivate learners, and open doors to progression into further study and responsibility within the workplace.

The BTEC First suite continues to reflect this ethos and builds on the recommendations outlined in the Review of Vocational Education – The Wolf Report (March 2011), confirmed the importance of a broad and balanced curriculum for learners.

The BTEC First suite of qualifications

The following qualifications are part of the BTEC First suite:

- Application of Science
- Applied Science
- Art and Design
- Business
- Children’s Play, Learning and Development
- Construction and the Built Environment
- Creative Digital Media Production
- Engineering
- Health and Social Care
- Hospitality
- Information and Creative Technology
- Music
- Performing Arts
- Principles of Applied Science
- Public Services
- Sport
- Travel and Tourism.

Visit www.btec.co.uk for information about these qualifications and also for information about additional qualifications in larger sizes and in different vocational sectors.
Objectives of the BTEC First suite

The BTEC First suite will:

● enable you, as schools, colleges and training providers, to offer a high-quality vocational and applied curriculum that is broad and engaging for all learners
● secure a balanced curriculum overall, so learners in the 14–19 age group have the opportunity to apply their knowledge, skills and understanding in the context of future development
● give learners opportunities to link education and the world of work in engaging, relevant and practical ways
● enable learners to enhance their English and mathematical competence in relevant, applied scenarios
● support learners’ development of transferable interpersonal skills, including working with others, problem solving, independent study, and personal, learning and thinking skills
● give learners a route through education that has clear progression pathways into further study or an apprenticeship.

Breadth and progression

Pearson’s BTEC First in Engineering suite offers a choice of general exploration or detailed specialist studies.

This qualification has a core of underpinning knowledge, skills and understanding. This gives learners the opportunity to:

● gain a broad understanding and knowledge of a vocational sector
● follow a richer and deeper engineering curriculum at Key Stage 4
● investigate areas of specific interest
● develop essential skills and attributes prized by employers, further education colleges and higher education institutions.

This suite of qualifications provides opportunities for learners to progress to either academic or more specialised vocational pathways.

Progression from Level 1

This qualification has been designed to provide a progression route from the following qualifications:

● Pearson BTEC Level 1 Introductory Certificate in Engineering
● Pearson BTEC Level 1 Introductory Diploma in Engineering.

See our website, qualifications.pearson.com, for more details.
2 Key features of the Pearson BTEC Level 1/Level 2 First Award

The Pearson BTEC Level 1/Level 2 First Award:
- is for learners aged 14 years and over
- is a Level 1/Level 2 qualification; the grades range from Level 2 P to Level 2 D*. Learners who do not achieve at Level 2 may be awarded a Level 1 grade. Learners whose level of achievement is below a Level 1 will receive an unclassified (U) result
- is a 120-guided learning hour qualification (equivalent in teaching time to one GCSE)
- has core and mandatory units
- has 25 per cent of the qualification that is externally assessed. Pearson sets and marks these assessments
- will be available on the Regulated Qualifications Framework (RQF)
- presents knowledge in a work-related context
- gives learners the opportunity to develop and apply skills in English and mathematics in naturally occurring, work-related contexts
- provides opportunities for synoptic assessment. See Annexe D for more detailed information.

Learners can register for the Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies from September 2014. The first certification opportunity for this qualification will be 2015.

Types of unit within the qualification

The Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies has core and mandatory units. See Section 4, Qualification Structure for more detailed information.

Core units
- This qualification has two compulsory core units totalling 60 guided learning hours (GLH).
- The core units are designed to cover the knowledge, skills and understanding that employers and educators throughout the sector consider essential for this specialist application.
- One core unit will be internally assessed and one will be externally assessed.

Mandatory unit
- The mandatory unit assesses knowledge, skills and understanding that are not covered within the core units but are also essential for this specialist application.
- The mandatory unit in this qualification is a 60-guided learning hour unit that is internally assessed.
Total qualification time (TQT)

- For all regulated qualifications, Pearson specifies a total number of hours that it is expected learners will be required to undertake in order to complete and show achievement for the qualification: this is the Total Qualification Time (TQT). The TQT value indicates the size of a qualification.
- Within this, Pearson will also identify the number of Guided Learning Hours (GLH) that we expect a centre delivering the qualification will need to provide. Guided learning means activities that directly or immediately involve tutors and assessors in teaching, supervising, and invigilating learners, such as lessons, tutorials, online instruction and supervised study.
- In addition to guided learning, other required learning directed by tutors or assessors will include private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision and independent research.
- Qualifications can also have a credit value, which is equal to one tenth of TQT, rounded to the nearest whole number.

Qualification sizes for BTEC Firsts in the Engineering sector

- This suite of BTEC Firsts for the Engineering sector is available in the following sizes:

<table>
<thead>
<tr>
<th>Qualification</th>
<th>GLH</th>
<th>TQT</th>
</tr>
</thead>
<tbody>
<tr>
<td>First award</td>
<td>120</td>
<td>160</td>
</tr>
<tr>
<td>First certificate</td>
<td>240</td>
<td>320</td>
</tr>
<tr>
<td>First extended certificate</td>
<td>360</td>
<td>480</td>
</tr>
<tr>
<td>First diploma</td>
<td>480</td>
<td>640</td>
</tr>
</tbody>
</table>
Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies
Rationale for the Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies

The rationale for all qualifications in the BTEC First suite in Engineering is to:

- inspire and enthuse learners to consider a career in the engineering industry
- give learners the opportunity to gain a broad knowledge and understanding of, and develop skills in, the engineering industry
- support progression into a more specialised Level 3 vocational or academic course or into an apprenticeship
- give learners the potential opportunity, in due course, to enter employment within a wide range of job roles across the engineering industry, for example Electrical Engineer.

This qualification, one of a number of qualifications in the suite, is the Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies (120 guided learning hour (GLH)). This award can be taken in conjunction with the Pearson BTEC Level 1/Level 2 Award in Engineering Design and Product Investigation.

The qualification has been developed as an engaging and stimulating introduction to the engineering industry. It includes two core units and one mandatory unit that cover the fundamental knowledge and understanding for this specialist application.

Learners are forbidden from taking this qualification alongside or as progression from the following qualifications:

- Pearson BTEC Level 1/Level 2 First Award in Engineering
- Pearson BTEC Level 1/Level 2 First Certificate in Engineering
- Pearson BTEC Level 1/Level 2 First Extended Certificate in Engineering
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Technology pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Maintenance pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Manufacturing pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Mechanical pathway)

Core units

- Unit 1: The Engineered World (externally assessed) – this unit introduces learners to the world of engineering. They will investigate the processes used to manufacture modern products within different engineering sectors. They will also study some of the new developments in materials and engineering technology that impact on life today – or will in the very near future. Engineers must be aware that products and processes may require the use of scarce resources and that this could have an impact on the environment. When an engineered product is made, used and disposed of, any energy wastage and environmental damage must be minimised at all stages. Therefore, learners will also investigate waste reduction and sustainability issues from an engineering perspective, discovering how engineers can help to control and reduce environmental damage.
Unit 36: Electrical and Electronic Circuit Construction and Testing – in this unit learners will construct and test electronic circuits so that they understand how they work. The unit looks at the basics of working safely by applying safe working practices in relation to electrical and electronic systems. This will give learners the ability to identify electrical hazards and eliminate any risks. The unit focuses on the knowledge needed to recognise and select components that are commonly used in electrical and electronic circuits. Learners look at different types of component and learn how to identify and select the circuit symbols to use in the circuits that they will construct. They will then use components and devices to construct an electrical or electronic circuit safely, using a range of techniques. Learners will have the opportunity to test electrical and electronic circuit operation using equipment such as multimeters, oscilloscopes, logic probes and signal generators. They will be able to find and fix faults in the circuits.

Mandatory unit

Unit 37: Computer Applications in Engineering – this unit investigates how technicians use computers when they carry out maintenance on engineering systems. Learners will investigate how computers are used in industry to control processes and manufacturing, and why microprocessors are fitted to domestic appliances such as washing machines. This unit considers why we use microprocessors, how they are linked to other components in an appliance, and why they operate more efficiently when compared to mechanical controllers. Learners will also investigate how a computer-based system can be used to solve a problem, for example producing a simple product on a machine tool which is controlled by a computer. They will consider the problem, plan how to solve it and set up and use the appropriate equipment to solve the problem.

Assessment approach

The Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies includes an externally assessed core unit which introduces externality into vocational programmes of study. This will help learners as they progress either to higher levels of vocational learning or to academic qualifications, by providing independent evidence of learning and progression alongside the portfolio-based assessment. This approach also helps learners to develop their transferable skills in analytical thinking and in applying their knowledge in unfamiliar contexts.

The remaining two units are internally assessed. Internal assessment enables learners to receive feedback on their progress throughout the course as they gather and provide evidence towards meeting the unit assessment criteria.

Delivery strategies should reflect the nature of work within the engineering industry by encouraging learners to research and carry out assessment in the workplace, or in simulated working conditions, wherever possible. It will be beneficial to learners to use local examples, wherever possible, and for your centre to engage with local employers for support and input. This provides a more realistic and motivating basis for learning and can start to ensure learning serves the needs of local areas.

Learners should be encouraged to take responsibility for their own learning and achievement, taking account of industry standards for behaviour and performance.
Progression opportunities

Engineering is one of the STEM (Science, Technology, Engineering, Mathematics) subjects prioritised by government and employers in the UK, and in every successful nation. It is readily associated with progression through sixth form and apprenticeship, further and higher education and towards rewarding employment in sectors of the global economy vital to sustainable growth. It directs learners to see how they can use what they have learned to solve problems and improve lives. Respected engineering qualifications for 14-16 year olds, such as BTECs, provide the STEM learning outcomes required for progression to STEM apprenticeships, further education or higher education, along with significant opportunities to design, create, and test engineered products.

The Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies provides the knowledge, understanding and skills to enable learners to progress to:

- the Pearson BTEC Level 1/Level 2 First Diploma in Engineering
- sixth form and apprenticeships, further education and rewarding employment in sectors of the global economy that are vital to sustainable growth
- Level 3 qualifications, such as BTEC Nationals, specifically the Pearson BTEC Level 3 National in Engineering or an engineering apprenticeship
- related academic qualifications, such as GCE A Level in Maths or Physics.

Learners who achieve the qualification at Level 1 may progress to related Level 2 vocational or academic qualifications, such as BTECs or GCSEs.

Developing employability skills

One of the main purposes of BTEC qualifications is to help learners to progress ultimately into employment. The vast majority of employers require learners to have certain technical skills, knowledge and understanding to work in a particular sector, but they are also looking for employability skills to ensure that employees are effective in the workplace.

Unlike technical skills, which may become outdated over time, employability skills enable learners to adapt to the ever-changing roles needed to survive in the global economy. These skills include self-management, teamworking, business and customer awareness, problem solving, communication, basic literacy and numeracy, a positive attitude to work, and the use of IT.

Throughout the Pearson BTEC Level 1/Level 2 Award in Engineering Electronics and Computer Control Technologies learners should develop a range of employability skills, engage with employers and carry out work-related activities. These opportunities are signposted in the suggested assessment task outlines at the end of each unit.

For example, across the core and mandatory units learners will develop:

- project/self-management and independent learning skills
- communication and teamworking skills
- business and customer awareness skills, as assignments are set in a vocational context
- an awareness of emerging technology and trends.
Stakeholder support

The Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies reflects the needs of employers, further and higher education representatives and professional organisations, such as the Royal Academy for Engineering. Key stakeholders were consulted during the development of this qualification.
4 Qualification structure

The Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies is taught over 120 guided learning hours (GLH).

It has core and mandatory units.

Learners must complete all core and mandatory units.

This BTEC First Award has units that your centre assesses (internal) and a unit that Pearson sets and marks (external).

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<thead>
<tr>
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<th>Core units</th>
<th>Assessment method</th>
<th>GLH</th>
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<td>The Engineered World</td>
<td>External</td>
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<tr>
<td>36</td>
<td>Electrical and Electronic Circuit Construction and Testing</td>
<td>Internal</td>
<td>30</td>
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**Mandatory unit**

<table>
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<tr>
<th>Unit</th>
<th>Core units</th>
<th>Assessment method</th>
<th>GLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Computer Applications in Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
</tbody>
</table>

* Please note that the above unit numbering is used to ensure consistency with the Pearson BTEC Level 1/Level 2 First Award, Certificate, Extended Certificate and Diploma in Engineering. Please refer to Annexes E, F, G, H, I, J, K and L for details.
5 Programme delivery

Pearson does not define the mode of study for BTEC qualifications. Your centre is free to offer the qualification using any mode of delivery (such as full-time, part-time, evening only or distance learning) that meets your learners’ needs. As such, those already employed in the engineering sector could study for the BTEC First Award on a part-time basis, using industry knowledge and expertise gained from the workplace to develop evidence towards meeting the unit assessment criteria.

Whichever mode of delivery is used, your centre must ensure that learners have appropriate access to the resources identified in the specification and to the subject specialists who are delivering the units. This is particularly important for learners studying for the qualification through open or distance learning.

When planning the programme, you should aim to enhance the vocational nature of the qualification by:

- using up-to-date and relevant teaching materials/and or opportunities that make use of scenarios relevant to the scope and variety of employment opportunities available in the sector. These materials/and or opportunities may be drawn from workplace settings where this is feasible. For example, in engineering, you could use case studies or examples of the production of engineered products
- giving learners the opportunity to apply their learning through practical activities found in the workplace. For example, the production of a technical specification when designing solutions in engineering contexts
- including employers in the delivery of the programme and, where appropriate, in the assessment. You may, for example, wish to seek the cooperation of local employers to provide examples of current work procedures and practices
- liaising with employers to make sure a course is relevant to learners’ specific needs. You may, for example, wish to seek employer help in stressing the importance of English and mathematics skills, and of wider skills, in the engineering industry.

Resources

As part of the approval process, your centre must make sure that the resource requirements below are in place before offering the qualification.

- Centres must have appropriate physical resources (for example, equipment, IT facilities, learning materials, teaching rooms) to support the delivery and assessment of the qualification.
- Staff involved in the assessment process must have relevant expertise and/or occupational experience.
- There must be systems in place to ensure continuing professional development for staff delivering the qualification.
- Centres must have appropriate health-and-safety policies in place relating to the use of equipment by learners.
- Centres must deliver the qualification in accordance with current equality legislation.

Your centre should refer to the Teacher guidance section in individual units to check for any specific resources that are required.
Delivery approach

Your approach to teaching and learning should support the specialist vocational nature of BTEC First qualifications. These BTEC Firsts give a balance of practical skill development and knowledge requirements, some of which can be theoretical in nature.

Instruction in the classroom is only part of the learning process. You need to reinforce the links between the theory and practical application, and make sure that the knowledge base is relevant and up to date, by using teaching methods and materials that allow learners to apply their learning to actual events and activities within the sector. Maximum use should be made of the learners’ experience where relevant, for example by encouraging them to reflect on their own experience of work or the experiences of family and friends.

One of the important aspects of your approach to delivery should be to instil in learners who have a limited experience of the world of work some insights into the daily operations that occur in the vocational area being studied. It is suggested that delivery of the BTEC Firsts can be enriched and extended by the use of learning materials, classroom exercises and internal assessments that draw on current practice in and experience of the qualification sector being studied. This may include:

- vocationally specific workplace case study materials
- visiting speakers, and the assistance of local employers
- visits by learners to local workplaces
- inviting relevant contacts to speak to learners about their involvement in engineering in different ways and at different levels
- arranging visits to employers in the engineering sector, such as practitioner workshops and the premises of larger employers
- asking a local employer to set learners an engineering activity to be carried out in groups.

Personal, learning and thinking skills

Your learners have opportunities to develop personal, learning and thinking skills (PLTS) within a sector-related context. See Annexe A for detailed information about PLTS, and mapping to the units in this specification.

English and mathematics knowledge and skills

It is likely that learners will be working towards English and mathematics qualifications at Key Stage 4 or above. This BTEC First qualification provides further opportunity to enhance and reinforce skills in English and mathematics in naturally occurring, relevant, work-related contexts.

English and mathematical skills are embedded in the assessment criteria – see individual units for signposting to English (#) and mathematics (*), Annexe B for high level mapping to GCSE English subject criteria (including functional elements) and Annexe C for mapping to the GCSE mathematics subject criteria (including functional elements).
Mathematics and science in the context of engineering

This qualification gives learners opportunities to apply their mathematical and scientific knowledge to support them in their practical understanding of engineering. Through using applied contexts, knowledge of mathematics and science helps to inform learner understanding, which will better enable them to meet the requirements of this qualification.

There are opportunities within all the units for learners to apply mathematical and scientific knowledge. For example, in Unit 36: Electrical and Electronic Circuit Construction and Testing, learning aim A, learners need to study the electrical and electronic principles relevant to electrical systems, for example: calculation of voltage, current, resistance, power, supply current, fuse ratings, root mean square (RMS) and peak voltage.

Please see Annexe C for mapping to the GCSE mathematics subject criteria (including functional elements).
6 Access and recruitment

Our policy regarding access to our qualifications is that:
- they should be available to everyone who is capable of reaching the required standards
- they should be free from any barriers that restrict access and progression
- there should be equal opportunities for all those wishing to access the qualifications.

This is a qualification aimed at Level 2 learners. Your centre is required to recruit learners to BTEC First qualifications with integrity.

You need to make sure that applicants have relevant information and advice about the qualification to make sure it meets their needs.

Your centre should review the applicant’s prior qualifications and/or experience to consider whether this profile shows that they have the potential to achieve the qualification.

For learners with disabilities and specific needs, this review will need to take account of the support available to the learner during the teaching and assessment of the qualification.

Learners are forbidden from taken this qualification alongside or as progression from the following qualifications:
- Pearson BTEC Level 1/Level 2 First Award in Engineering
- Pearson BTEC Level 1/Level 2 First Certificate in Engineering
- Pearson BTEC Level 1/Level 2 First Extended Certificate in Engineering
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Technology pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Maintenance pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Manufacturing pathway)
- Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Mechanical pathway)

Prior knowledge, skills and understanding

Learners do not need to achieve any other qualifications before registering for a BTEC First. No prior knowledge, understanding or skills are necessary. There are no specific requirements for this qualification.
Access to qualifications for learners with disabilities or specific needs

Equality and fairness are central to our work. Our equality policy requires that all learners should have equal opportunity to access our qualifications and assessments, and that our qualifications are awarded in a way that is fair to every learner.

We are committed to making sure that:

- learners with a protected characteristic (as defined by the Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to learners who do not share that characteristic
- all learners achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Further information on access arrangements can be found in the Joint Council for Qualifications (JCQ) document Access Arrangements, Reasonable Adjustments and Special Consideration for General and Vocational Qualifications. Further details on how to make adjustments for learners with protected characteristics are given in the Pearson Supplementary Guidance for Reasonable Adjustment and Special Consideration in Vocational Internally Assessed Units.
# The layout of units in the specification

Each unit is laid out using the headings given below. Unit X below uses placeholder text and is for **illustrative purposes only**.

<table>
<thead>
<tr>
<th><strong>Unit title</strong></th>
<th>The title reflects the content of the unit.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td>All units and qualifications have a level assigned to them that represents the level of achievement. The National Qualifications Framework level descriptors and similar qualifications at this level inform the allocation of the unit level.</td>
</tr>
<tr>
<td><strong>Unit type</strong></td>
<td>This shows if the unit is core or mandatory.</td>
</tr>
<tr>
<td><strong>Guided learning hours</strong></td>
<td>All units have guided learning hours assigned to them. This is the time when you (as a teacher, tutor, trainer or facilitator) are present to give specific guidance to learners on the unit content.</td>
</tr>
<tr>
<td><strong>Assessment type</strong></td>
<td>Units are either internally or externally assessed. Your centre designs and assesses the internal assessments. Pearson sets and marks the external assessments.</td>
</tr>
<tr>
<td><strong>Unit introduction</strong></td>
<td>The unit introduction is addressed to the learner and gives the learner a snapshot of the purpose of the unit.</td>
</tr>
<tr>
<td><strong>Learning aims</strong></td>
<td>The learning aims are statements indicating the scope of learning for the unit. They provide a holistic overview of the unit when considered alongside the unit content.</td>
</tr>
</tbody>
</table>
Learning aims and unit content

The unit content gives the basis for the teaching, learning and assessment for each learning aim. Topic headings are given, where appropriate.

Content covers:
- knowledge, including definition of breadth and depth
- skills, including definition of qualities or contexts
- applications or activities, through which knowledge and/or skills are evidenced.

Content should normally be treated as compulsory for teaching the unit. Definition of content sometimes includes examples prefixed with ‘e.g.’. These are provided as examples and centres may use all or some of these, or bring in additional material, as relevant.

Assessment criteria

The assessment criteria determine the minimum standard required by the learner to achieve the relevant grade. The learner must provide sufficient and valid evidence to achieve the grade.
Teacher guidance

While the main content of the unit is addressed to the learner, this section gives you additional guidance and amplification to aid your understanding and to ensure a consistent level of assessment.

Resources – identifies any special resources required for learners to show evidence of the assessment. Your centre must make sure that any requirements are in place when it seeks approval from Pearson to offer the qualification.

Assessment guidance – gives examples of the quality of work needed to differentiate the standard of work submitted. It also offers suggestions for creative and innovative ways in which learners can produce evidence to meet the criteria. The guidance highlights approaches and strategies for developing appropriate evidence.

Suggested assignment outlines – gives examples of possible assignment ideas. These are not mandatory. Your centre is free to adapt them, or you can design your own assignment tasks.
8 Internal assessment

Language of assessment
Assessment of the internal and external units for this qualification will be available in English. All learner work must be in English. This qualification can also be made available through the medium of Welsh in which case learners may submit work in Welsh and/or English.

A learner taking the qualification may be assessed in British or Irish Sign Language where it is permitted for the purpose of reasonable adjustment.

Summary of internal assessment
For the Pearson BTEC Level 1/Level 2 First qualifications, the majority of the units are assessed through internal assessment, which means that you can deliver the programme in a way that suits your learners and relates to local need. The way in which you deliver the programme must also ensure that assessment is fair and that standards are nationally consistent over time.

To achieve this, it is important that you:

- plan the assessment of units to fit with delivery, allowing for the linkages between units
- write suitable assessments (for example, assignments, projects or case studies) or select assessments from available resources, adapting them as necessary
- plan the assessment for each unit in terms of when it will be authorised by the Lead Internal Verifier, when it will be used and assessed, and how long it will take, and how you will determine that learners are ready to begin an assessment
- ensure each assessment is fit for purpose, valid, will deliver reliable assessment outcomes across assessors, and is authorised before use
- provide all the preparation, feedback and support that learners need to undertake an assessment before they begin producing their evidence
- make careful and consistent assessment decisions based only on the defined assessment criteria and unit requirements
- validate and record assessment decisions carefully and completely
- work closely with Pearson to ensure that your implementation, delivery and assessment is consistent with national standards.

Assessment and verification roles
There are three key roles involved in implementing assessment processes in your school or college, namely:

- Lead Internal Verifier
- Internal Verifier – the need for an Internal Verifier or Internal Verifiers in addition to the Lead Internal Verifier is dependent on the size of the programme in terms of assessment locations, number of assessors and optional paths taken. Further guidance can be obtained from your Regional Quality Manager or Centre Quality Reviewer if you are unsure about the requirements for your centre
- assessor.
The Lead Internal Verifier must be registered with Pearson and is required to train and standardise assessors and Internal Verifiers using materials provided by Pearson that demonstrate the application of standards. In addition, the Lead Internal Verifier should provide general support. The Lead Internal Verifier:

- has overall responsibility for the programme assessment plan, including the duration of assessment and completion of verification
- can be responsible for more than one programme
- ensures that there are valid assessment instruments for each unit in the programme
- ensures that relevant assessment documentation is available and used for each unit
- is responsible for the standardisation of assessors and Internal Verifiers using Pearson-approved materials
- authorises individual assessments as fit for purpose
- checks samples of assessment decisions by individual assessors and Internal Verifiers to validate that standards are being correctly applied
- ensures the implementation of all general assessment policies developed by the centre for BTEC qualifications
- has responsibility for ensuring learner work is authenticated
- liaises with Pearson, including the Pearson Standards Verifier.

Internal Verifiers must oversee all assessment activity to make sure that individual assessors do not misinterpret the specification or undertake assessment that is not consistent with the national standard in respect of level, content or duration of assessment. The process for ensuring that assessment is being conducted correctly is called internal verification. Normally, a programme team will work together with individuals being both assessors and Internal Verifiers, with the team leader or programme manager often being the registered Lead Internal Verifier.

Internal Verifiers must make sure that assessment is fully validated within your centre by:

- checking every assessment instrument carefully and endorsing it before it is used
- ensuring that each learner is assessed carefully and thoroughly using only the relevant assessment criteria and associated guidance within the specification
- ensuring the decisions of every assessor for each unit at all grades and for all learners are in line with national standards.

Assessors make assessment decisions and must be standardised using Pearson-approved materials before making any assessment decisions. They are usually the teachers within your school or college, but the term ‘assessor’ refers to the specific responsibility for carrying out assessment and making sure that it is done in a way that is correct and consistent with national standards. Assessors may also draft or adapt internal assessment instruments.

You are required to keep records of assessment and have assessment authorised by Pearson. The main records are:

- the overall plan of delivery and assessment, showing the duration of assessment and the timeline for internal verification
- assessment instruments, which are authorised through an Internal Verifier
- assessment records, which contain the assessment decisions for each learner for each unit
• an internal verification sampling plan, which shows how assessment decisions are checked, and that must include across the sample all assessors, unit assessment locations and learners
• internal verification records, which show the outcomes of sampling activity as set out in the sampling plan.

**Learner preparation**

Internal assessment is the main form of assessment for this qualification, so preparing your learners for it is very important because they:

• must be prepared for and motivated to work consistently and independently to achieve the requirements of the qualification
• need to understand how they will be assessed and the importance of timescales and deadlines
• need to appreciate fully that all the work submitted for assessment must be their own.

You will need to provide learners with an induction and a guide or handbook to cover:

• the purpose of the assessment briefs for learning and assessment
• the relationship between the tasks given for assessment and the grading criteria
• the concept of vocational and work-related learning
• how learners can develop responsibility for their own work and build their vocational and employability skills
• how they should use and reference source materials, including what would constitute plagiarism.

**Designing assessment instruments**

An assessment instrument is any kind of activity or task that is developed for the sole purpose of assessing learning against the learning aims. When you develop assessment instruments you will often be planning them as a way to develop learners’ skills and understanding. However, they must be fit for purpose as a tool to measure learning against the defined content and assessment criteria to ensure your final assessment decisions meet the national standard.

You should make sure that assessment tasks and activities enable learners to produce valid, sufficient, authentic and appropriate evidence that relates directly to the specified criteria within the context of the learning aims and unit content. You need to ensure that the generation of evidence is carefully monitored, controlled and produced in an appropriate timescale. This will help you to make sure that learners are achieving to the best of their ability and at the same time that the evidence is genuinely their own.

An assessment that is fit for purpose and suitably controlled is one in which:

• the tasks that the learner is asked to complete will provide evidence for a learning aim that can be assessed using the assessment criteria
• the assessment instrument gives clear instructions to the learner about what they are required to do
• the time allowed for the assessment is clearly defined and consistent with what is being assessed
• you have the required resources for all learners to complete the assignment fully and fairly
• the evidence the assignment will generate will be authentic and individual to the learner
• the evidence can be documented to show that the assessment and verification has been carried out correctly.

You may develop assessments that cover a whole unit, parts of a unit or several units, provided that all units and their associated learning aims are fully addressed through the programme overall. A learning aim must be covered completely in an assessment. Learning aim coverage must not be split between assignments. In some cases it may be appropriate to cover a learning aim with two tasks or sub-tasks within a single assignment. This must be done with care to ensure the evidence produced for each task can be judged against the full range of achievement available in the learning aim for each activity. This means it is not acceptable to have a task that contains a Pass level activity, then a subsequent task that targets a Merit or Distinction level activity. However, it is possible to have two tasks for different assessed activities, each of which stretch and challenge the learners to aim to produce evidence that can be judged against the full range of available criteria.

When you give an assessment to learners, it must include:
• a clear title and/or reference so that the learner knows which assessment it is
• the unit(s) and learning aim(s) being addressed
• a scenario, context, brief or application for the task
• task(s) that enable the generation of evidence that can be assessed against the assessment criteria
• details of the evidence that the learner must produce
• clear timings and deadlines for carrying out tasks and providing evidence.

Your assessment tasks should enable the evidence generated to be judged against the full range of assessment criteria; it is important the learners are given the opportunity for stretch and challenge.

The units include guidance on appropriate approaches to assessment. A central feature of vocational assessment is that it should be:
• current, i.e. it reflects the most recent developments and issues
• local, i.e. it reflects the employment context of your area
• flexible, i.e. it allows you as a centre to deliver the programme, making best use of the vocational resources that you have
• consistent with national standards, with regard to the level of demand.

Your centre should use the assessment guidance within units along with your local resource availability and guidance to develop appropriate assessments. It is acceptable to use and adapt resources to meet learner needs and the local employment context.

You need to make sure that the type of evidence generated fits with the unit requirement, that it is vocational in nature, and that the context in which the assessment is set is in line with unit assessment guidance and content. For many units, this will mean providing for the practical demonstration of skills. For many learning aims, you will be able to select an appropriate vocational format for evidence generation, such as:
• written reports, graphs, posters
• projects, project plans
• time-constrained practical assessments
• audio-visual recordings of portfolio, sketchbook, a working logbook, etc
• presentations.
Authenticity and authentication

You can accept only evidence for assessment that is authentic, i.e. that is the learner’s own and that can be judged fully to see whether it meets the assessment criteria.

You should ensure that authenticity is considered when setting assignments. For example, ensuring that each learner has a different focus for research will reduce opportunities for copying or collaboration. On some occasions it will be useful to include supervised production of evidence. Where appropriate, practical activities or performance observed by the assessor should be included.

Learners must authenticate the evidence that they provide for assessment. They do this by signing a declaration stating that it is their own work when they submit it to certify:

- the evidence submitted for this assignment is the learner’s own
- the learner has clearly referenced any sources used in the work
- they understand that false declaration is a form of malpractice.

Your assessors should assess only learner evidence that is authentic. If they find through the assessment process that some or all of the evidence is not authentic, they need to take appropriate action, including invoking malpractice policies as required.

It is important that all evidence can be validated through verification. This means that it must be capable of being reassessed in full by another person. When you are using practical and performance evidence, you need to think about how supporting evidence can be captured through using, for example, videos, recordings, photographs, handouts, task sheets, etc. This should be submitted as part of the learner’s evidence.

The authentication of learner evidence is the responsibility of your centre. If during external sampling a Pearson Standards Verifier raises concerns about the authenticity of evidence, your centre will be required to investigate further. Depending on the outcomes, penalties may be applied. At the end of this section, you can find an example of a template that can be used to record the declaration of learners in relation to the authenticity of the evidence presented for assessment.

Applying criteria to internal assessments

Each unit and learning aim has specified assessment criteria. Your centre should use these criteria for assessing the quality of the evidence provided. This determines the grade awarded.

Unless specifically indicated by the assessment guidance, assessment criteria are not a set of sequential activities but a way of making a judgement. For example, if a Level 2 Pass specifies a ‘description’ and a Merit an ‘analysis’, these do not require two different activities but rather one activity through which some learners will provide only description evidence and others will also provide analysis evidence. The assessment criteria are hierarchical. A learner can achieve a Merit only if they provide sufficient evidence for the Level 2 Pass and Merit criteria. Similarly, a learner can achieve a Distinction only if they give sufficient evidence for the Level 2 Pass, Merit and Distinction criteria.
A final unit grade is awarded after all opportunities for achievement are given. A learner must achieve all the assessment criteria for that grade. Therefore:

- to achieve a Level 2 Distinction a learner must have satisfied all the Distinction criteria in a way that encompasses all the Level 2 Pass, Merit and Distinction criteria, providing evidence of performance of outstanding depth, quality or application
- to achieve a Level 2 Merit a learner must have satisfied all the Merit criteria in a way that encompasses all the Level 2 Pass and Merit criteria, providing performance of enhanced depth or quality
- to achieve a Level 2 Pass a learner must have satisfied all the Level 2 Pass criteria, showing breadth of coverage of the required unit content and having relevant knowledge, understanding and skills
- a learner can be awarded a Level 1 if the Level 1 criteria are fully met. A Level 1 criterion is not achieved through failure to meet the Level 2 Pass criteria.

A learner who does not achieve all the assessment criteria at Level 1 has not passed the unit and should be given a grade of U (Unclassified).

A learner must achieve all the defined learning aims to pass the internally assessed units. There is no compensation within the unit.

Assessment decisions

Final assessment is the culmination of the learning and assessment process. Learners should be given a full opportunity to show how they have achieved the learning aims covered by a final assessment. This is achieved by ensuring that learners have received all necessary learning, preparation and feedback on their performance and then confirming that they understand the requirements of an assessment, before any assessed activities begin.

There will then be a clear assessment outcome based on the defined assessment criteria. Your assessment plan will set a clear timeline for assessment decisions to be reached. Once an assessment has begun, learners must not be given feedback on progress towards criteria. After the final assignment is submitted, an assessment decision must be given.

An assessment decision:

- must be made with reference to the assessment criteria
- should record how it has been reached, indicating how or where criteria have been achieved
- may indicate why attainment against criteria has not been demonstrated
- must not provide feedback on how to improve evidence to meet higher criteria.

Your Internal Verifiers and assessors must work together to ensure that assessment decisions are reached promptly and validated before they are given to the learner.
Late submission

You should encourage learners to understand the importance of deadlines and of handing work in on time. For assessment purposes it is important that learners are assessed fairly and consistently according to the assessment plan that the Lead Internal Verifier has authorised and that some learners are not advantaged by having additional time to complete assignments. You are not required to accept for assessment work that was not completed by the date in the assessment plan.

Learners may be given authorised extensions for legitimate reasons, such as illness at the time of submission. If you accept a late completion by a learner, the evidence should be assessed normally, unless it is judged to not meet the requirements for authenticity. It is not appropriate, however, to give automatic downgrades on assessment decisions as ‘punishment’ for late submission.

Resubmission of improved evidence

Once an assessment decision is given to a learner, it is final in all cases except where the Lead Internal Verifier approves one opportunity to resubmit improved evidence. The criteria used to authorise a resubmission opportunity are always:

- initial deadlines or agreed extensions have been met
- the tutor considers that the learner will be able to provide improved evidence without further guidance
- the evidence submitted for assessment has been authenticated by the learner and the assessor
- the original assessment can remain valid
- the original evidence can be extended and re-authenticated.

Your centre will need to provide a specific resubmission opportunity that is authorised by the Lead Internal Verifier. Any resubmission opportunity must have a deadline that is within 10 working days of the assessment decision being given to the learner, and within the same academic year. You should make arrangements for resubmitting the evidence for assessment in such a way that it does not adversely affect other assessments and does not give the learner an unfair advantage over other learners.

You need to consider how the further assessment opportunity ensures that assessment remains fit for purpose and in line with the original requirements; for example, you may opt for learners to improve their evidence under supervised conditions, even if this was not necessary for the original assessment, to ensure that plagiarism cannot take place. How you provide opportunities to improve and resubmit evidence for assessment needs to be fair to all learners. Care must be taken when setting assignments and at the point of final assessment to ensure that the original evidence for assessment can remain valid and can be extended. The learner must not have further guidance and support in producing further evidence. The Standards Verifier will want to include evidence that has been resubmitted as part of the sample they will review.
Appeals

Your centre must have a policy for dealing with appeals from learners. These appeals may relate to assessment decisions being incorrect or assessment not being conducted fairly. The first step in such a policy would be a consideration of the evidence by a Lead Internal Verifier or other member of the programme team. The assessment plan should allow time for potential appeals after assessment decisions have been given to learners.

If there is an appeal by a learner you must document the appeal and its resolution.

Dealing with malpractice

Your centre must have a policy for dealing with potential malpractice by learners. Your policy must follow the Pearson Assessment Malpractice policy. You must report serious malpractice to Pearson, particularly if any units have been subject to quality assurance or certification.

Reasonable adjustments to assessment

You are able to make adjustments to assessments to take account of the needs of individual learners in line with Pearson’s Reasonable Adjustments and Special Considerations policy. In most instances this can be achieved simply by application of the policy, for example to extend time or adjust the format of evidence. We can advise you if you are uncertain as to whether an adjustment is fair and reasonable.

Special consideration

You must operate special consideration in line with Pearson’s Reasonable Adjustments and Special Considerations policy. You can provide special consideration only in the time given for evidence to be provided or for the format of the assessment if it is equally valid. You may not substitute alternative forms of evidence to that required in a unit, or omit the application of any assessment criteria to judge attainment. Pearson can consider applications for special consideration in line with the policy.
# Learner Assessment Submission and Declaration

This sheet must be completed by the learner and provided for work submitted for assessment.

<table>
<thead>
<tr>
<th>Learner name:</th>
<th>Assessor name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date issued:</td>
<td>Completion date:</td>
</tr>
</tbody>
</table>

**Qualification:**

**Assessment reference and title:**

Please list the evidence submitted for each task. Indicate the page numbers where the evidence can be found or describe the nature of the evidence (e.g. video, illustration).

<table>
<thead>
<tr>
<th>Task ref.</th>
<th>Evidence submitted</th>
<th>Page numbers or description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments for note by the assessor:

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**Learner declaration**

I certify that the work submitted for this assignment is my own. I have clearly referenced any sources used in the work. I understand that false declaration is a form of malpractice.

Learner signature: __________________________ Date: __________________________
9 External assessment

Externally assessed units have the same grades as internally assessed units:
- Level 2 – Pass, Merit, Distinction
- Level 1
- Unclassified.

The table below shows the type of external assessment and assessment availability for this qualification.

<table>
<thead>
<tr>
<th>Unit 1: The Engineered World</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of external assessment</strong></td>
</tr>
<tr>
<td><strong>Length of assessment</strong></td>
</tr>
<tr>
<td><strong>No. of marks</strong></td>
</tr>
<tr>
<td><strong>Assessment availability</strong></td>
</tr>
<tr>
<td><strong>First assessment for this qualification</strong></td>
</tr>
<tr>
<td><strong>Resit opportunities</strong></td>
</tr>
</tbody>
</table>

Your centre needs to make sure that learners are:
- fully prepared to sit the external assessment
- entered for assessments at appropriate times, with due regard for resit opportunities as necessary.

Sample assessment materials will be available to help centres prepare learners for assessment. Specific arrangements for external assessment are available before the start of each academic year on our website qualifications.pearson.com
Grade descriptors for the internal and external units

Internal units

Each internally assessed unit has specific assessment criteria that your centre must use to judge learner work in order to arrive at a grading decision for the unit as a whole. For internally assessed units, the assessor judges the evidence that the learner has presented to determine whether it meets all the relevant criteria, and then awards a grade at the appropriate level.

The criteria are arrived at with reference to the following grading characteristics:

- applying knowledge and understanding in vocational and realistic contexts, with reference to relevant concepts and processes, to achieve tasks, produce outcomes and review the success of outcomes
- developing and applying practical and technical skills, acting with increasing independence to select and apply skills through processes and with effective use of resources to achieve, explain and review the success of intended outcomes
- developing generic skills for work through management of self, working in a team, the use of a variety of relevant communication and presentation skills, and the development of critical thinking skills relevant to vocational contexts.

External unit

The externally assessed unit is assessed using both marks-based and levels-based schemes. For each external assessment, grade boundaries, based on learner performance, will be set by the awarding organisation.

The following criteria are used in the setting and awarding of the externally assessed unit in this qualification.

Level 2 Pass

Learners are able to recall and apply knowledge in familiar situations including everyday uses of engineered products. They will have a sound understanding of key terms, processes, equipment and technologies. They will be able to interpret information in order to select and apply knowledge of engineering products, processes, materials and technologies. They will be able to define and communicate key aspects of engineering processes, selecting appropriate actions in more simple and familiar contexts. They will be able to relate knowledge of engineering and the way in which engineering relates to sustainability in vocational and realistic situations, making some decisions about valid applications and impact. They will be able to relate the use of engineering processes and modern products to users and purposes.
Level 2 Distinction

Learners are able to synthesise knowledge of engineered products, the materials used to make them and engineering processes, bringing together their understanding of technologies. They will be able to apply understanding of engineering processes to sometimes complex contexts such as modern manufacturing techniques. They will show depth of knowledge and development of understanding of engineering processes and technologies in different situations, being able to make effective judgements based on an analysis of given information. They will be able to analyse engineering products, selecting appropriate materials and making recommendations about applications of processes and their environmental impact. They will be able to make judgements about the efficiency of manufacturing systems and potential impacts on product quality and the environment, and make recommendations about solutions, controls and future planning. They will be able to compare techniques, processes, products and materials to evaluate alternatives against defined criteria.
10 Awarding and reporting for the qualification

The awarding and certification of this qualification will comply with the requirements of the Office of Qualifications and Examinations Regulation (Ofqual).

Calculation of the qualification grade

This qualification is a Level 1/Level 2 qualification, and the certification may show a grade of Level 2 Pass, Level 2 Merit, Level 2 Distinction or Level 2 Distinction*.

If these are not achieved, a Level 1 grade may be awarded. Learners whose level of achievement is below a Level 1 will receive an unclassified U result.

Each individual unit will be awarded a grade of Level 2 Pass, Merit, Distinction or Level 1. Distinction* is not available at unit level. Learners whose level of achievement is below a Level 1 will receive an unclassified U for that unit.

Award of Distinction* (D*)

D* is an aggregated grade for the qualification, based on the learner’s overall performance. In order to achieve this grade, learners need to demonstrate a strong performance across the qualification as a whole.

To achieve a Level 2 qualification, learners must:

- complete and report an outcome for all units within the permitted combination (NB Unclassified is a permitted unit outcome)
- have sufficient points across the core units, i.e. 24 points
- achieve the minimum number of points at a grade threshold from the permitted combination. See the Calculation of qualification grade table.

Learners who do not achieve a Level 2 may be entitled to achieve a Level 1 where they:

- complete and report an outcome for all units within the permitted combination (NB Unclassified is a permitted unit outcome)
- have sufficient points across the core units, i.e. 12 points
- achieve the minimum number of points for Level 1. See the Calculation of qualification grade table.
Points available for unit size and grades

The table below shows the number of points scored per 10 guided learning hours at each grade.

<table>
<thead>
<tr>
<th>Points per grade per 10 guided learning hours</th>
<th>Unclassified</th>
<th>Level 1</th>
<th>Level 2 Pass (P)</th>
<th>Level 2 Merit (M)</th>
<th>Level 2 Distinction (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Pearson will automatically calculate the qualification grade for your learners when your learner unit grades are submitted. Learners will be awarded qualification grades for achieving the sufficient number of points within the ranges shown in the Calculation of qualification grade table.

Example:

A learner achieves a Level 2 Pass grade for a unit. The unit size is 30 guided learning hours (GLH). Therefore they gain 12 points for that unit, i.e. 4 points for each 10 GLH, therefore 12 points for 30 GLH.
Calculation of qualification grade

<table>
<thead>
<tr>
<th>Award (120 GLH)</th>
<th>Grade</th>
<th>Minimum points required</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Level 1</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Level 2 Pass</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Level 2 Merit</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Level 2 Distinction</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>Level 2 Distinction*</td>
<td>90</td>
</tr>
</tbody>
</table>

The tables below give examples of how the overall grade is determined.

**Unit numbering is for illustrative purposes only.**

**Example 1: Achievement of an Award with a Level 2 Merit grade**

<table>
<thead>
<tr>
<th>GLH</th>
<th>Weighting (GLH/10)</th>
<th>Grade</th>
<th>Grade points</th>
<th>Points per unit (weighting x grade points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Core unit</td>
<td>30</td>
<td>3</td>
<td>Level 2 Merit</td>
</tr>
<tr>
<td>Unit 36</td>
<td>Core unit</td>
<td>30</td>
<td>3</td>
<td>Level 2 Pass</td>
</tr>
<tr>
<td>Unit 37</td>
<td>Mandatory unit</td>
<td>60</td>
<td>6</td>
<td>Level 2 Merit</td>
</tr>
<tr>
<td><strong>Qualification grade totals</strong></td>
<td><strong>120</strong></td>
<td><strong>12</strong></td>
<td><strong>Level 2 Merit</strong></td>
<td></td>
</tr>
</tbody>
</table>

The learner has more than sufficient points across the core units to be considered for a Level 2.

The learner has sufficient points for a Level 2 Merit grade.

**Example 2: Achievement of an Award with a Level 2 Pass grade**

<table>
<thead>
<tr>
<th>GLH</th>
<th>Weighting (GLH/10)</th>
<th>Grade</th>
<th>Grade points</th>
<th>Points per unit (weighting x grade points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
<td>Core unit</td>
<td>30</td>
<td>3</td>
<td>Level 2 Merit</td>
</tr>
<tr>
<td>Unit 36</td>
<td>Core unit</td>
<td>30</td>
<td>3</td>
<td>Level 2 Merit</td>
</tr>
<tr>
<td>Unit 37</td>
<td>Mandatory unit</td>
<td>60</td>
<td>6</td>
<td>Level 1</td>
</tr>
<tr>
<td><strong>Qualification grade totals</strong></td>
<td><strong>120</strong></td>
<td><strong>12</strong></td>
<td><strong>Level 2 Pass</strong></td>
<td></td>
</tr>
</tbody>
</table>

The learner has sufficient points across the core units to be considered for a Level 2.

The learner has sufficient points for a Level 2 Pass grade.
Example 3: Achievement of an Award at Level 1 but a Level 2 Pass

<table>
<thead>
<tr>
<th>GLH</th>
<th>Weighting (GLH/10)</th>
<th>Grade</th>
<th>Grade points</th>
<th>Points per unit (weighting × grade points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2</td>
<td>Core unit</td>
<td>30 3</td>
<td>Level 1</td>
<td>2</td>
</tr>
<tr>
<td>Unit 9</td>
<td>Core unit</td>
<td>30 3</td>
<td>Level 1</td>
<td>2</td>
</tr>
<tr>
<td>Unit 12</td>
<td>Mandatory unit</td>
<td>60 6</td>
<td>Level 2 Merit</td>
<td>6</td>
</tr>
<tr>
<td>Qualification grade totals</td>
<td>120 12</td>
<td>Level 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the learner has gained enough points overall for a Level 2, they will get a Level 1 as they did not achieve sufficient points across the core units.

Example 4: The learner has not achieved sufficient points in the core units to gain a Level 2 or Level 1 qualification

<table>
<thead>
<tr>
<th>GLH</th>
<th>Weighting (GLH/10)</th>
<th>Grade</th>
<th>Grade points</th>
<th>Points per unit (weighting × grade points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2</td>
<td>Core unit</td>
<td>30 3</td>
<td>Unclassified</td>
<td>0</td>
</tr>
<tr>
<td>Unit 9</td>
<td>Core unit</td>
<td>30 3</td>
<td>Level 1</td>
<td>2</td>
</tr>
<tr>
<td>Unit 12</td>
<td>Mandatory unit</td>
<td>60 6</td>
<td>Level 2 Merit</td>
<td>6</td>
</tr>
<tr>
<td>Qualification grade totals</td>
<td>120 12</td>
<td>Unclassified</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the learner has gained enough points overall for a Level 1, they will receive an Unclassified grade as they did not achieve sufficient points across the core units.
11 Quality assurance of centres

Pearson will produce on an annual basis the BTEC Quality Assurance Handbook, which will contain detailed guidance on the quality processes required to underpin robust assessment and internal verification.

The key principles of quality assurance are that:

- a centre delivering BTEC programmes must be an approved centre, and must have approval for the programmes or groups of programmes that it is delivering
- the centre agrees, as part of gaining approval, to abide by specific terms and conditions around the effective delivery and quality assurance of assessment; it must abide by these conditions throughout the period of delivery
- Pearson makes available to approved centres a range of materials and opportunities, through online standardisation, intended to exemplify the processes required for effective assessment, and examples of effective standards. Approved centres must use the materials and services to ensure that all staff delivering BTEC qualifications keep up to date with the guidance on assessment
- an approved centre must follow agreed protocols for standardisation of assessors and verifiers, for the planning, monitoring and recording of assessment processes, and for dealing with special circumstances, appeals and malpractice.

The approach of quality-assured assessment is through a partnership between an approved centre and Pearson. We will make sure that each centre follows best practice and employs appropriate technology to support quality-assurance processes, where practicable. We work to support centres and seek to make sure that our quality-assurance processes do not place undue bureaucratic processes on centres.

We monitor and support centres in the effective operation of assessment and quality assurance. The methods we use to do this for BTEC First programmes include:

- making sure that all centres complete appropriate declarations at the time of approval
- undertaking approval visits to centres
- making sure that centres have effective teams of assessors and verifiers who are trained to undertake assessment
- assessment sampling and verification, through requested samples of assessments, completed assessed learner work and associated documentation
- an overarching review and assessment of a centre’s strategy for assessing and quality assuring its BTEC programmes.

An approved centre must make certification claims only when authorised by us and strictly in accordance with requirements for reporting.

Centres that do not fully address and maintain rigorous approaches to quality assurance cannot seek certification for individual programmes or for all BTEC First programmes. Centres that do not comply with remedial action plans may have their approval to deliver qualifications removed.
12 Further information and useful publications

For further information about the qualification featured in this specification, or other Pearson qualifications, please call Customer Services on 0844 576 0026 (calls may be monitored for quality and training purposes) or visit our website qualifications.pearson.com.

Related information and publications include:

- Equality Policy
- Information Manual (updated annually)
- Access Arrangements, Reasonable Adjustments and Special Considerations
- Quality Assurance Handbook (updated annually)
  - Publications on the quality assurance of BTEC qualifications are on our website at www.btec.co.uk/keydocuments

Additional documentation

Additional materials include:

- Sample Assessment Material (for the external unit)
- a guide to Getting Started with BTEC
- guides to our support for planning, delivery and assessment (including sample assignment briefs).

Visit www.btec.co.uk/2012 for more information.

Additional resources

If you need to source further learning and teaching material to support planning and delivery for your learners, there is a wide range of BTEC resources available to you. Any publisher can seek endorsement for their resources, and, if they are successful, we will list their BTEC resources on our website: qualifications.pearson.com
13 Professional development and support

 Pearson supports UK and international customers with training related to BTEC qualifications. This support is available through a choice of training options offered in our published training directory, or through customised training at your centre.

 The support we offer focuses on a range of issues including:

 - planning for the delivery of a new programme
 - planning for assessment and grading
 - developing effective assignments
 - building your team and teamwork skills
 - developing learner-centred learning and teaching approaches
 - building functional skills into your programme
 - building in effective and efficient quality-assurance systems.

 The national programme of training we offer is on our website at qualifications.pearson.com. You can request customised training through the website or you can contact one of our advisors in the Training from Pearson team via Customer Services to discuss your training needs.

 BTEC training and support for the lifetime of the qualification

 Training and networks: our training programme ranges from free introductory events through sector-specific opportunities to detailed training on all aspects of delivery, assignments and assessment. In addition, we have designed our new network events programme to allow you to share your experiences, ideas and best practice with other BTEC colleagues in your region. Sign up to the training you need at: www.btec.co.uk/training

 Regional support: our team of Curriculum Development Managers and Curriculum Support Consultants, based around the country, are responsible for providing advice and support in centres. They can help you with planning and curriculum developments. Call 0844 576 0027 to contact the curriculum team for your centre.

 Your BTEC Support team

 Whether you want to talk to a sector specialist, browse online or submit your query for an individual response, there is someone in our BTEC Support team to help you whenever – and however – you need, with:

 - Welcome Packs for new BTEC centres: if you are delivering BTEC for the first time, we will send you a sector-specific Welcome Pack designed to help you get started with this qualification
 - Subject Advisors: find out more about our subject advisor team – immediate, reliable support from a fellow subject expert – at: qualifications.pearson.com/subjectadvisors
 - BTEC Hotline: call the BTEC Hotline on 0844 576 0026 with your query
Units
Unit 1: The Engineered World

Level: 1 and 2  
Unit type: Core  
Guided learning hours: 30  
Assessment type: External

Unit introduction

What is ‘engineering’? Is it using materials and processes to manufacture a single item? Is it applying new technologies to the mass production of well-known products? Or is it implementing methods to reduce waste and improve the sustainability of energy sources? Engineering is all of these things, and many more. It affects all aspects of our lives, from the daily use of time-saving appliances to performance materials applied in ways we may never have imagined.

In this unit, you will discover the world of engineering. You will investigate the processes used to manufacture modern products within different engineering sectors. You will also study some of the new developments in materials and engineering technology that impact on life today – or will in the very near future.

Engineers must be aware that products and processes may require the use of scarce resources and that this could have an impact on the environment. When an engineered product is made, used and disposed of, any energy wastage and environmental damage must be minimised at all stages. Therefore, you will also investigate waste reduction and sustainability issues from an engineering perspective, discovering how engineers can help to control and reduce environmental damage.

Learning aims

In this unit you will:
A know about engineering processes used to produce modern engineered products
B know about developments in engineering materials and technologies
C understand how engineering contributes to a sustainable future.
**Learning aims and unit content**

<table>
<thead>
<tr>
<th>What needs to be learnt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim A: Know about engineering processes used to produce modern engineered products</strong></td>
</tr>
</tbody>
</table>

**Topic A.1: Engineering sectors and products**
Types of product from the following engineering sectors:
- aerospace, automotive, communications, electrical/electronic, mechanical, biomedical, chemical.

**Topic A.2: Mechanical and electrical/electronic engineering processes**
Processes including health and safety issues, characteristics, applications and advantages/disadvantages of the following engineering processes:
- machining – turning, milling, drilling
- forming – casting, forging
- fabrication – welding, shearing
- electrical/electronic – PCB manufacture, surface mount technology.

**Topic A.3: Scales of production**
Characteristics and advantages/disadvantages of the following scales of production used in engineering manufacture:
- one-off/jobbing production
- batch production
- mass production
- continuous production.

**Topic A.4: Modern production methods**
Applications and advantages/disadvantages of the following modern production methods for production/assembly lines:
- robots
- Computer Numerically Controlled (CNC) machinery.
### What needs to be learnt

**Learning aim B: Know about developments in engineering materials and technologies**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
</table>
| **B.1: Modern and smart materials in engineering** | Applications, characteristics, properties and advantages/disadvantages of the following modern and smart materials used in engineering:  
- modern composite materials – glass reinforced plastic (GRP), carbon fibre, Kevlar®  
- modern high-performance materials – tungsten, titanium, superalloys (nickel based, cobalt based), ceramics (boron carbide, cubic boron nitride, zirconia)  
- smart materials – shape memory alloys (SMAs), shape memory polymers, electrochromic, piezoelectric actuators and transducers. |
| **B.2: Modern material foams in engineering** | Applications, characteristics and advantages/disadvantages of metallic foams as used in the automotive, biomedical and aerospace sectors, e.g. aluminium, steel. |
| **B.3: Modern material processes in engineering** | Process, applications, characteristics and advantages/disadvantages of powder metallurgy: powder mixing/blending, pressing/compacting, sintering. |
| **B.4: New technologies in engineering** | Applications, characteristics and advantages/disadvantages of the following new technologies used in engineering sectors:  
- optical fibres as used in the communications sector  
- hydrogen fuel cells, surface nanotechnology and telematics as used in the automotive sector  
- blended wing bodies as used in the aerospace sector  
- bionics as used in the biomedical sector. |
What needs to be learnt

<table>
<thead>
<tr>
<th>Learning aim C: Understand how engineering contributes to a sustainable future</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topic C.1: Sustainable engineered products</strong></td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td><strong>Topic C.2: Minimising waste production in engineering</strong></td>
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<tr>
<td></td>
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<tr>
<td><strong>Topic C.3: Lean manufacturing</strong></td>
</tr>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Topic C.4: Renewable sources of energy in engineering</strong></td>
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<td></td>
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</tr>
</tbody>
</table>
Teacher guidance

Resources
There are no special resources needed for this unit.

Assessment guidance
This unit is externally assessed using an onscreen test. Pearson sets and marks the test. The test lasts for one hour and has 50 marks. The assessment is available on demand.

Learners will complete an onscreen test that has different types of question including objective and short-answer questions. Where appropriate, questions contain graphics, photos, animations or videos. An onscreen calculator is available for questions requiring calculations. An onscreen notepad is available for making notes. Each item will have an accessibility panel that allows a learner to zoom in and out and apply a colour filter.
Unit 36: Electrical and Electronic Circuit Construction and Testing

Level: 1 and 2
Unit type: Core
Guided learning hours: 30
Assessment type: Internal

Unit introduction

Have you ever wondered how products like amplifiers, power supplies, printed circuit boards and basic computers are constructed? In reality, they are all constructed using similar practical techniques and skills.

This unit will open the door on this fascinating subject and you will construct and test electronic circuits so you understand how they work.

You will start by looking at the basics of working safely by applying safe working practices in relation to electrical and electronic systems. This will give you the ability to identify electrical hazards and eliminate any risks. You will also develop your understanding of how circuits work and carry out calculations relative to circuits.

You will then concentrate on the knowledge needed to select components that are commonly used in electrical and electronic circuits. You will look at different types of component and learn how to select the circuit symbols to use in the circuits that you will construct. Once you have completed this, you will use components and devices to construct an electrical or electronic circuit safely, using a range of techniques.

Finally, you will have the opportunity to test an electrical or electronic circuit operation using equipment such as multimeters, oscilloscopes, logic probes and signal generators. You will be able to find and fix faults in the circuit.

Learning aims

In this unit you will:
A understand safe working practices in the workshop/laboratory and the relevant electrical, electronic and basic circuit operating principles
B be able to select components used in electrical and electronic circuits to construct an electrical or electronic circuit safely
C be able to test and find faults on an electrical or electronic circuit.
Learning aims and unit content

<table>
<thead>
<tr>
<th>What needs to be learnt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim A: Understand safe working practices in the workshop/laboratory and the relevant electrical, electronic and basic circuit operating principles</strong></td>
</tr>
</tbody>
</table>

**Topic A.1: Safe working practices**
Relevant safe working practices in relation to electrical and electronic systems:
- identifying main hazards, e.g. sharp edged hand tools, soldering irons, toxic substances
- inspection and replacement of electrical equipment, e.g. cables and connectors, mains connectors and fuses, portable appliance testing (PAT), compliance with associated legislation
- electric shock prevention and the need for isolation, e.g. residual circuit breakers (RCD), earth leakage circuit breakers (ELCB)
- effective grounding and earthing of non-insulated equipment, e.g. metal enclosures, exposed metal chassis.

**Topic A.2: Electrical and electronic principles**
The main electrical and electronic principles relevant to electrical systems:
- electrical units and the relationship between them, e.g. calculation of voltage, current, resistance, power, supply current, fuse ratings, root mean square (RMS) and peak voltage.

**Topic A.3: Circuits**
The function, operating principles and typical applications of:
- rectifiers
- amplifiers
- smoothing circuits
- power supplies, e.g. standard, dc regulated.
### What needs to be learnt

#### Learning aim B: Be able to select components used in electrical and electronic circuits to construct an electrical or electronic circuit safely

**Topic B.1: Components**

Electrical and electronic components:
- using symbols (BS3939, BS8888)
- using colour codes (value, tolerance, voltage rating)
- by calculation (resistance, voltage, current, power rating)
- visually (component type, outline, physical encapsulation, size, shape).

Range of components, to include:
- cells and batteries, loudspeakers and buzzers, connectors, capacitors, variable and pre-set capacitors, resistors, variable resistors, pre-sets and potentiometers, transformers, inductors and pre-set inductors, diodes, transistors, integrated circuits, switches.

**Topic B.2: Circuit construction**

Use various methods to construct electrical or electronic circuits and understand the function and operation of these circuits, to include:
- construction methods, e.g. bread-boarding, soldering, matrix board, printed circuit board (PCB), other interconnection methods
- simple circuits, e.g. rectifier, smoothing, regulated power supply, transistor amplifier.

**Topic B.3: Safe use of circuit manufacturing equipment**

Safe use of the following:
- hand tools, e.g. screwdriver, pliers, cutters, knives
- soldering equipment, e.g. soldering iron, soldering and desoldering tools
- PCB manufacturing tools, e.g. etching equipment, PCB drills.

#### Learning aim C: Be able to test and find faults on an electrical or electronic circuit

**Topic C.1: Testing**

Various testing techniques to measure parameters on a constructed electrical or electronic circuit:
- simple circuit, e.g. light sensor, temperature sensor, light flasher, test oscillator
- measuring instruments and test equipment, e.g. multimeter, oscilloscope, power supply, signal generator, logic probe, insulated test leads and probes
- circuit parameters, e.g. voltage, current, resistance, voltage gain, frequency, period.

**Topic C.2: Fault-finding techniques**

Using fault-finding techniques, including:
- test point voltage and current measurement (comparison with tables of test voltages, test currents)
- signal tracing, e.g. input to output, output to input, half split method.
## Assessment criteria

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2 Pass</th>
<th>Level 2 Merit</th>
<th>Level 2 Distinction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim A: Understand safe working practices in the workshop/laboratory and the relevant electrical, electronic and basic circuit operating principles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A.1 Identify the safe working practices to consider when building electrical and electronic circuits.</td>
<td>2A.P1 Describe the safe working practices to consider when building electrical and electronic circuits. #</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A.2 Identify the current and voltage in a given simple circuit.</td>
<td>2A.P2 Determine voltage, current, resistance, power, supply current and fuse ratings in a given simple circuit. *</td>
<td>2A.M1 Calculate the relationship between RMS and peak voltage in a given simple circuit. *</td>
<td>2A.D1 Justify the appropriateness of rectifiers, amplifiers, smoothing circuits and power supplies for a typical application. #</td>
</tr>
<tr>
<td>1A.3 Identify the function of rectifiers, amplifiers, smoothing circuits and power supplies.</td>
<td>2A.P3 Describe the function and operation of rectifiers, amplifiers, smoothing circuits and power supplies. #</td>
<td>2A.M2 Explain a typical application each for rectifiers, amplifiers, smoothing circuits and power supplies. #</td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2 Pass</th>
<th>Level 2 Merit</th>
<th>Level 2 Distinction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim B: Be able to select components used in electrical and electronic circuits to construct an electrical or electronic circuit safely</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B.4</td>
<td>Construct an electrical or electronic circuit safely, selecting appropriate components and using one method of construction.</td>
<td>2B.P4 Construct an electrical or electronic circuit safely, selecting appropriate components and using at least two different methods of construction.</td>
<td></td>
</tr>
<tr>
<td>1B.5</td>
<td>Identify the function of an electrical or electronic circuit.</td>
<td>2B.P5 Describe the function and operation of an electrical or electronic circuit.</td>
<td>2B.M3 Explain the function and operation of an electrical or electronic circuit in terms of electrical and electronic principles.</td>
</tr>
<tr>
<td><strong>Learning aim C: Be able to test and find faults on an electrical or electronic circuit</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1C.6</td>
<td>Measure and record two circuit parameters on a simple circuit, using a multimeter.</td>
<td>2C.P6 Measure and record different circuit parameters on a simple circuit to verify whether it is working correctly, using at least two different measuring instruments.</td>
<td>2C.M4 Analyse different circuit parameter faults on a simple circuit, using signal tracing, test point voltage and current measurement techniques.</td>
</tr>
<tr>
<td>2C.D3</td>
<td>Justify the effectiveness of the fault-finding techniques used on different circuit parameter faults on a simple circuit.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Opportunity to assess mathematical skills

#Opportunity to assess English skills
Teacher guidance

Resources

Resources required for this unit are:

- a fully equipped electronics laboratory
- test equipment, including oscilloscopes, signal generators, pulse generators low voltage power supplies and multimeters
- electrical or electronic circuit construction equipment
- computer access for internet-based research.

Assessment guidance

This unit is assessed internally by the centre and externally verified by Pearson. Please read this guidance in conjunction with Section 8 Internal assessment.

The focus of this unit is on selecting electrical and electronic components and using them to construct and test simple circuits.

For 2A.P1, learners need to describe the safe working practices to consider when building electrical and electronic circuits.

For 1A.1, learners need to identify the safe working practices associated with circuit construction.

For 2A.P2 and 2A.M1, learners must solve realistic and contextualised problems using basic electrical and electronic principles.

For 1A.2, learners need to identify the current and voltage in a given simple circuit. Learners need to understand both the function and operating principles of various circuits for 2A.P2, 2A.M1, 2A.P3 and 2A.M2 and must be able to justify the appropriateness for a typical application in 2A.D1.

For 1A.3, learners must identify the function of rectifiers, amplifiers, smoothing circuits and power supplies.

For 2B.P4, learners must construct an electrical or electronic circuit using two different methods of construction, for example rectifier, amplifier, smoothing or power supply. Prior to this they must select appropriate components to use in the circuit. Learners need to demonstrate the safe use of circuit manufacturing equipment within the workshop. Evidence can be a combination of learner-generated supporting evidence and observation records backed up by photographs.

For 1B.4, learners may focus on one method when constructing the electrical or electronic circuit, and need to demonstrate the safe use of hand tools and soldering equipment within the workshop. Prior to this they must select appropriate components to use in the circuit. Evidence can be a combination of learner-generated supporting evidence and observation records backed up by photographs.

For 2B.P5, 2B.M3 and 2B.D2, learners need to understand the function and operation of an electrical or electronic circuit. The circuit studied must be the one that learners constructed in 2B.P4.

For 1B.5, learners need to identify only the function of an electrical or electronic circuit. The circuit studied must be the one that learners constructed in 1B.P4.
Assessment of 2C.P6 will again involve practical activities to enable learners to demonstrate the use of at least two different measuring instruments to measure and record circuit parameters on a simple circuit correctly, for example light sensor, temperature sensor, light flasher, test oscillator.

For 2C.M5, learners need to demonstrate the practical application of fault-finding techniques, before going on to justify the effectiveness of the techniques used for 2C.D3. The activities chosen could replicate the techniques used to find common faults, such as dry joints and broken tracks.

To achieve 1C.6, learners must demonstrate the basic use of a multimeter to measure and record two circuit parameters correctly on a simple circuit.
Suggested assignment outlines

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

<table>
<thead>
<tr>
<th>Criteria covered</th>
<th>Task/Scenario</th>
<th>Assessment evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A.1, 1A.2, 1A.3,</td>
<td>You have recently started work as an apprentice. The company you work for</td>
<td>A poster with includes diagrams and images, which can be taken from reference sources, as long as they are supported by the learner’s ‘own writing’ and sources are referenced.</td>
</tr>
<tr>
<td>2A.P1, 2A.P2,</td>
<td>installs and tests electrical and electronic equipment. You have been asked to</td>
<td>A test devised to confirm understanding of basic electrical/electronic principles.</td>
</tr>
<tr>
<td>2A.P3, 2A.M1,</td>
<td>familiarise yourself with the workshop and have been asked to identify the</td>
<td>A report for the supervisor detailing the function, operation and applications of</td>
</tr>
<tr>
<td>2A.M2, 2A.D1</td>
<td>safe working practices to be considered. As part of this you need to produce</td>
<td>rectifiers, amplifiers, smoothing circuits and power supplies.</td>
</tr>
<tr>
<td></td>
<td>safety posters warning employees of the hazards they are likely to encounter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The company also wants you to show what you have learned at college and has</td>
<td></td>
</tr>
<tr>
<td></td>
<td>set you a test to carry out some basic calculations based on electrical and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>electronic circuits.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>As part of your company induction you are required to know about the company's</td>
<td></td>
</tr>
<tr>
<td></td>
<td>products. Carry out research to discover the function, operation and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>applications of rectifiers, amplifiers, smoothing circuits and power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>supplies.</td>
<td></td>
</tr>
<tr>
<td>Criteria covered</td>
<td>Scenario</td>
<td>Assessment evidence</td>
</tr>
<tr>
<td>------------------</td>
<td>----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>1B.4, 2B.P4, 1B.5, 2B.P5, 2B.M3, 2B.D2</td>
<td>Your employer has asked you to join a team that produces various electrical and electronic circuits for its communications equipment. You have been given a circuit diagram for either an electrical or electronic circuit. You have been asked to build this circuit.</td>
<td>Completed operational circuit. The report should contain an explanation of the operation and function of the components and circuit used.</td>
</tr>
<tr>
<td>1C.6, 2C.P6, 2C.M4, 2C.D3</td>
<td>As part of your ongoing training within the company, the training manager has asked you to test an electrical or electronic circuit and also to carry out some fault finding on a faulty circuit board.</td>
<td>A presentation, which includes an explanation of how the test and fault finding were carried out.</td>
</tr>
</tbody>
</table>
Unit 37: Computer Applications in Engineering

Level: 1 and 2
Unit type: Mandatory
Guided learning hours: 60
Assessment type: Internal

Unit introduction

Have you ever thought about what would happen if all the computer systems in a factory suddenly stopped working? It would be difficult to keep most of the machinery running, there would be no access to stored data, such as technical drawings, and it might not be possible to prepare food for staff. We all rely on computer systems to make our home and working lives more effective and productive.

In this unit, you will start by investigating how technicians use computers when they carry out maintenance on engineering systems. As an example, think about the latest generation of engines built in the UK, which are fitted to commercial aircraft. All the time an engine is running, data about its condition is sent by telemetry to the manufacturer's headquarters. Service technicians download all the details about the engine, carry out the service and record details about components that have been changed and other maintenance work that they have carried out.

You will have the opportunity to investigate how computers are used in industry to control processes and manufacturing. For example, the mass production of bars of chocolate is highly automated – how are computers used to control the temperature and flow of the melted chocolate? In car manufacturing the welding of the body shell is carried out by robots – how are they controlled?

You will then investigate the reasons for fitting microprocessors to domestic appliances such as washing machines. Why we use microprocessors, how they are linked to other components in an appliance, and why they operate more efficiently when compared to mechanical controllers are all questions to consider in this unit.

Finally, you will investigate how a computer-based system can be used to solve a problem, for example producing a simple product on a machine tool which is controlled by a computer. You will consider the problem, plan how to solve it and set up and use the appropriate equipment to solve the problem.

Learning aims

In this unit you will:
A know about computer-aided technology in maintenance operations
B know about computer applications in process control and manufacturing
C understand microprocessor control applications in everyday consumer products
D be able to use computer-based systems to solve an engineering problem
**Learning aims and unit content**

<table>
<thead>
<tr>
<th>What needs to be learnt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim A: Know about computer-aided technology in maintenance operations</strong></td>
</tr>
</tbody>
</table>

**Topic A.1: Use of computer technology to improve the maintenance operations of engineering systems**

Activities, range and scope to include:
- maintenance scheduling and recording, e.g. plant, equipment
- remote, real time monitoring of equipment functionality, e.g. aircraft engines, lifts in buildings, Formula 1 cars, traction units of intercity electric trains.

Using computer equipment in a maintenance activity, range and scope to include:
- hand-held computer devices that give the maintenance engineer essential, on the spot data/information, e.g. routine maintenance checklists, bar code identification of replacement parts, maintenance tasks for a particular piece of equipment, data collection, analysis and fault diagnosis.

Products and systems, e.g.:
- motor vehicles
- air conditioning systems
- machine tools
- earth moving equipment (heavy plant)
- light aircraft
- ships
- medical.

<table>
<thead>
<tr>
<th>What needs to be learnt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim B: Know about computer applications in process control and manufacturing</strong></td>
</tr>
</tbody>
</table>

**Topic B.1 Use and significance of computer applications in industry**

Range and scope, including:
- different industries, e.g. chemical, polymer, electronic, automotive, aerospace, marine, food, confectionary
- process control, e.g. flow rate, temperature, pressure, pH, chemical products, food products, water purification
- manufacturing, e.g. CAD/CAM systems, automated manufacture, movement of products and materials around a production facility, workflow monitoring, progress of customer orders, maintenance of stock levels, Just-in-Time Production (JIT), plant and equipment safety systems, quality control.
### What needs to be learnt

**Learning aim C: Understand microprocessor control applications in everyday consumer products**

#### Topic C.1: The microprocessor as a control device

Use and functions of a microprocessor, including:

- **consumer products**, e.g. washing machine, tumble dryer, microwave oven, refrigerator, TV, motor vehicle ignition system, motor vehicle traction control system, security systems, toys and games, communication devices
- the microprocessor as a control device ("black box")
- component parts connected to the microprocessor –
  - input devices, e.g. temperature sensors, pressure sensors, switches, optical sensors, safety cut-out, proximity sensors
  - output devices, e.g. relays, motors, heaters, pumps, sounder alarms, display panels, safety interlocks
- block diagram representation of the microprocessor control system of a consumer product
- operation of the microprocessor control system fitted to a consumer product
- operating principles of the component parts connected to the microprocessor.

**Learning aim D: Be able to use computer-based systems to solve an engineering problem**

#### Topic D.1: Using a computer-based system to solve a given engineering problem

A solution to the given engineering problem, including:

- planning how to solve the problem
- selecting appropriate equipment
- identifying risks, associated hazards and their control
- setting up equipment safely
- using equipment safely to produce a solution
- presenting the solution.

Engineering problems, such as:

- controlling a production cell
- moving boxes in a packing department
- setting up a programmable logic controller (PLC)
- programming a conveyor
- programming a bead sorter
- producing a component on a rapid prototyping machine.
### Assessment criteria

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2 Pass</th>
<th>Level 2 Merit</th>
<th>Level 2 Distinction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning aim A: Know about computer-aided technology in maintenance operations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1A.1 Identify how computer equipment can aid a given maintenance activity.</td>
<td>2A.P1 Describe the use of computer equipment as an aid to the maintenance of a given engineered product or system. #</td>
<td>2A.M1 Explain the advantages of using computer equipment as an aid to the maintenance of a given engineered product or system. #</td>
<td>2A.D1 Analyse how performance improvements can be achieved on a given engineered product or system. #</td>
</tr>
<tr>
<td><strong>Learning aim B: Know about computer applications in process control and manufacturing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B.2 Identify uses of computers in process control.</td>
<td>2B.P2 Describe the use of computers in process control, using an industry example. #</td>
<td>2B.M2 Compare the use of computers in process control and manufacturing, using examples from two industries. #</td>
<td>2B.D2 Evaluate the use of computers in process control and manufacturing, using examples from two industries. #</td>
</tr>
<tr>
<td>1B.3 Identify uses of computers in manufacturing.</td>
<td>2B.P3 Describe the use of computers in manufacturing, using an industry example. #</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>Level 2 Pass</td>
<td>Level 2 Merit</td>
<td>Level 2 Distinction</td>
</tr>
<tr>
<td>-------------------------</td>
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<td>------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Learning aim C:</strong> Understand microprocessor control applications in everyday consumer products</td>
<td>1C.4 Identify how a microprocessor system controls the operation of a consumer product.</td>
<td>2C.P4 Describe how a microprocessor system controls the operation of a consumer product.</td>
<td>2C.D3 Evaluate the effectiveness of the microprocessor control system fitted to a consumer product.</td>
</tr>
<tr>
<td>1C.4 Identify how a microprocessor system controls the operation of a consumer product.</td>
<td>2C.P4 Describe how a microprocessor system controls the operation of a consumer product.</td>
<td>2C.M3 Explain the operating principles of the component parts of a consumer product that link to its microprocessor control system.</td>
<td>2C.D3 Evaluate the effectiveness of the microprocessor control system fitted to a consumer product.</td>
</tr>
<tr>
<td>Learning aim D: Be able to use computer-based systems to solve an engineering problem</td>
<td>1D.5 Use computer-based equipment safely to solve a given engineering problem.</td>
<td>2D.P5 Set up and use computer-based equipment safely to solve a given engineering problem.</td>
<td></td>
</tr>
<tr>
<td>1D.5 Use computer-based equipment safely to solve a given engineering problem.</td>
<td>2D.P6 Explain how to solve a given engineering problem using computer-based equipment.</td>
<td>2D.M4 Analyse the computer-based solution used to solve a given engineering problem.</td>
<td>2D.D4 Evaluate the computer-based solution used to solve a given engineering problem and make recommendations for improvement.</td>
</tr>
<tr>
<td>1D.6 Identify computer-based equipment to solve an engineering problem.</td>
<td>2D.P6 Explain how to solve a given engineering problem using computer-based equipment.</td>
<td>2D.M4 Analyse the computer-based solution used to solve a given engineering problem.</td>
<td>2D.D4 Evaluate the computer-based solution used to solve a given engineering problem and make recommendations for improvement.</td>
</tr>
</tbody>
</table>

*Opportunity to assess mathematical skills

#Opportunity to assess English skills
Teacher guidance

Resources

The resources required for this unit are:

- computer-based equipment such as a CAD/CAM package, CNC lathe or router,
  rapid prototyping machine, programmable conveyor belt trainer kit, basic pick and
  place robot, maintenance diagnostic equipment.

Assessment guidance

This unit is assessed internally by the centre and externally verified by Pearson.
Please read this guidance in conjunction with Section 8 Internal assessment.

For 2A.P1, learners should consider, in a generic way, the use of computer-based
equipment when carrying out maintenance operations. The key here is to focus on
maintenance and not just routine monitoring without any further action being taken.

For 2A.M1, learners should select (or be given) an engineered product or system to
consider.

To achieve 2A.D1, learners must include some evidence of working with computer-
generated data. This can be given to them but it will add realism if they gather the
data themselves. For example, if they were to investigate the diagnostic testing of a
car engine they could analyse the data, cross reference it to the manufacturer’s data
(hard copy or online) and then analyse how performance improvements to the engine
could be achieved by adjusting some of its parameters.

For 1A.1, learners need to focus on just a single maintenance activity.

For 2B.P2, learners can consider any type of process control provided that it involves
engineering systems, for example temperature control of ovens on a food processing
line or baggage handling at an airport.

For 2B.P3, learners need to focus on manufacturing engineering, for example
CAD/CAM, car body welding using robots or assembling surface mount printed circuit
boards. Please note that evidence for 2B.P2 and 2B.P3 should cover two different
industries.

For 2B.M2, learners need to compare the effectiveness of the use of computers in
two different industries. This could include discussing the differences between the
advantages and disadvantages in both industries.

For 2B.D2, the evaluation should cover aspects such as the value to the industries of
computers and why they are used.

For 1B.2 and 1B.3, learners will identify computer use for a given process control and
manufacturing situation.

For learning aim C, learners should consider the microprocessor as a control unit
(‘black box’). There is no requirement to present detailed information about the inner
workings of the microprocessor. Learners should be guided to select a consumer
product that has clearly identifiable components linked to the microprocessor.

For 2C.P4, evidence should include a block diagram to support a detailed written
description.

To achieve 2C.M3, learners must explain, in detail, the operating principles for the
components which link to the microprocessor, but they do not need to consider the
internal architecture of the microprocessor.
For 2C.D3, earners must evaluate the effectiveness of the microprocessor control system. They should consider aspects such as efficient use of energy and user interaction. For example, if the learner chooses to investigate a washing machine they should be making some comparisons between the new energy efficient smart machines and the older timer controlled ones.

The microprocessor allows much more data to be assessed, with decisions based on need rather than simplistic time cycles, for example ending the spin cycle when a set level of dryness has been achieved.

For 1C.4, learners should produce a block diagram, supported with brief annotation.

Learning aim D tests a learner’s ability to assess a given engineering problem, propose a solution and to then use computer-based equipment to produce the solution. The engineering problem to be solved will be a task that is clearly defined and given to the learner by the assessor, for example producing a simple 2D profile on a CNC bench router, with the starting point being a sketch of the profile, or setting up an automated system for the conveyance and transfer of products from one process to another, with the starting point being a simple activity flow chart.

For 2D.P5, learners need to set up and use computer-based equipment safely to execute their proposed solution. As this is a practical activity, learner evidence should be supplemented by observation records, annotated photographs, screenshots etc.

For 2D.P6, learners need to explain the given problem, decide on a course of action, select suitable computer-based (and other) equipment and put together a written/diagrammatic proposal. Consideration must be given to working safely if practical activities are involved. If a learner’s solution will only involve the use of engineering software, for example a CAD package, safe working can be covered through the sensible use of the software. The learner would be expected to consider aspects such as starting and closing the software, file structure and interfacing to peripheral equipment.

For 2D.M4, learners need to analyse their solution with the aid of a written/diagrammatic report. To achieve this criterion, the learner must provide evidence that they have thought through a solution to the given problem and were able to solve it as specified. If the learner fails to solve the problem fully but presents valid reasons for not doing so the criterion can be awarded.

For 2D.D4, the evaluation must be specific to the equipment used and not simply an overarching, generic evaluation of the wider use of computer-based systems in the engineering industry. Recommendations for improvement must be included.

For 1D.5 and 1D.6, learners will identify the correct equipment to use safely but will not set it up. This will be done for them and they will use the equipment independently but with close supervision. A checklist and observation record is suitable evidence for the achievement of 1D.5 and 1D.6.
**Suggested assignment outlines**

The table below shows a programme of suggested assignment outlines that cover the assessment criteria. This is guidance and it is recommended that centres either write their own assignments or adapt any assignments we provide to meet local needs and resources.

<table>
<thead>
<tr>
<th>Criteria covered</th>
<th>Task/Scenario</th>
<th>Assessment evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A.1, 2A.P1, 2A.M1, 2A.D1</td>
<td>You are spending time in the maintenance department of a company which uses hi-tech manufacturing and materials handling equipment. Your training manager asks you to investigate the use of computer equipment as an aid to maintenance.</td>
<td>A portfolio of the learner’s own written evidence, supported by diagrams and images which should be referenced as appropriate.</td>
</tr>
<tr>
<td>1B.2, 1B.3, 2B.P2, 2B.P3, 2B.M2, 2B.D2</td>
<td>Your training manager has now asked you to investigate how computers are used to control the factory heat treatment ovens and the automated welding line.</td>
<td>A portfolio of the learner’s own written evidence, supported by diagrams and images which should be referenced as appropriate.</td>
</tr>
<tr>
<td>1C.4, 2C.P4, 2C.M3, 2C.D3</td>
<td>Your factory manufactures kitchen domestic appliances. You have been asked to find out how the microprocessor system controls the operation of one of the appliances.</td>
<td>A portfolio of the learner’s own written evidence, supported by block diagrams and images which should be referenced as appropriate.</td>
</tr>
<tr>
<td>1D.5, 1D.6, 2D.P5, 2D.P6, 2D.M4, 2D.D4</td>
<td>Your training manager then asks you to set up and operate a computer-based system to solve an engineering problem that they have identified.</td>
<td>Photographic evidence, an observation record and a written/diagrammatic report. Additional evidence could include a hard copy of slides used for a PowerPoint presentation.</td>
</tr>
</tbody>
</table>
Annexe A

Personal, learning and thinking skills

A FRAMEWORK OF PERSONAL, LEARNING AND THINKING SKILLS 11–19 IN ENGLAND

The framework comprises six groups of skills that are essential to success in learning, life and work. In essence, the framework captures the essential skills of: managing self; managing relationships with others; and managing own learning, performance and work. It is these skills that will enable young people to enter work and adult life confident and capable.

The titles of the six groups of skills are set out below.

- Team workers
- Self-managers
- Independent enquirers
- Reflective learners
- Creative thinkers
- Effective participators

For each group, there is a focus statement that sums up the range of skills. This is followed by a set of outcome statements that are indicative of the skills, behaviours and personal qualities associated with each group.

Each group is distinctive and coherent. The groups are also interconnected. Young people are likely to encounter skills from several groups in any one learning experience. For example, an independent enquirer would set goals for their research with clear success criteria (reflective learner) and organise and manage their time and resources effectively to achieve these (self-manager). In order to acquire and develop fundamental concepts such as organising oneself, managing change, taking responsibility and perseverance, learners will need to apply skills from all six groups in a wide range of learning contexts.
## The skills

### Independent enquirers

**Focus:**
Young people process and evaluate information in their investigations, planning what to do and how to go about it. They take informed and well-reasoned decisions, recognising that others have different beliefs and attitudes.

**Young people:**
- identify questions to answer and problems to resolve
- plan and carry out research, appreciating the consequences of decisions
- explore issues, events or problems from different perspectives
- analyse and evaluate information, judging its relevance and value
- consider the influence of circumstances, beliefs and feelings on decisions and events
- support conclusions, using reasoned arguments and evidence.

### Creative thinkers

**Focus:**
Young people think creatively by generating and exploring ideas, making original connections. They try different ways to tackle a problem, working with others to find imaginative solutions and outcomes that are of value.

**Young people:**
- generate ideas and explore possibilities
- ask questions to extend their thinking
- connect their own and others’ ideas and experiences in inventive ways
- question their own and others’ assumptions
- try out alternatives or new solutions and follow ideas through
- adapt ideas as circumstances change.

### Reflective learners

**Focus:**
Young people evaluate their strengths and limitations, setting themselves realistic goals with criteria for success. They monitor their own performance and progress, inviting feedback from others and making changes to further their learning.

**Young people:**
- assess themselves and others, identifying opportunities and achievements
- set goals with success criteria for their development and work
- review progress, acting on the outcomes
- invite feedback and deal positively with praise, setbacks and criticism
- evaluate experiences and learning to inform future progress
- communicate their learning in relevant ways for different audiences.
### Team workers

**Focus:**
Young people work confidently with others, adapting to different contexts and taking responsibility for their own part. They listen to and take account of different views. They form collaborative relationships, resolving issues to reach agreed outcomes.

**Young people:**
- collaborate with others to work towards common goals
- reach agreements, managing discussions to achieve results
- adapt behaviour to suit different roles and situations, including leadership roles
- show fairness and consideration to others
- take responsibility, showing confidence in themselves and their contribution
- provide constructive support and feedback to others.

### Self-managers

**Focus:**
Young people organise themselves, showing personal responsibility, initiative, creativity and enterprise with a commitment to learning and self-improvement. They actively embrace change, responding positively to new priorities, coping with challenges and looking for opportunities.

**Young people:**
- seek out challenges or new responsibilities and show flexibility when priorities change
- work towards goals, showing initiative, commitment and perseverance
- organise time and resources, prioritising actions
- anticipate, take and manage risks
- deal with competing pressures, including personal and work-related demands
- respond positively to change, seeking advice and support when needed.

### Effective participators

**Focus:**
Young people actively engage with issues that affect them and those around them. They play a full part in the life of their school, college, workplace or wider community by taking responsible action to bring improvements for others as well as themselves.

**Young people:**
- discuss issues of concern, seeking resolution where needed
- present a persuasive case for action
- propose practical ways forward, breaking these down into manageable steps
- identify improvements that would benefit others as well as themselves
- try to influence others, negotiating and balancing diverse views to reach workable solutions
- act as an advocate for views and beliefs that may differ from their own.
### Summary of the PLTS coverage throughout the programme

This table shows where units support the development of personal, learning and thinking skills.

**Key:**

- ✓ indicates opportunities for development
- a blank space indicates no opportunities for development

<table>
<thead>
<tr>
<th>Unit</th>
<th>Independent enquirers</th>
<th>Creative thinkers</th>
<th>Reflective learners</th>
<th>Team workers</th>
<th>Self-managers</th>
<th>Effective participators</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✓</td>
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<td>36</td>
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<td>✓</td>
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<tr>
<td>37</td>
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<td>✓</td>
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</tr>
</tbody>
</table>
Annexe B

**English knowledge and skills signposting**

This table shows where an assessment criterion in a BTEC First unit can provide an opportunity to practise a subject content area from the GCSE English subject criteria (including functional elements).

<table>
<thead>
<tr>
<th>Unit number and title</th>
<th>Learning aim</th>
<th>Assessment criterion reference</th>
<th>Subject content area from the GCSE subject criteria (details of the content area can be found below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1: The Engineered World (externally assessed)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Unit 36: Electrical and Electronic Circuit Construction and Testing</td>
<td>A</td>
<td>2A.P1, 2A.P3, 2A.M2, 2A.D1</td>
<td>2, 5</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2B.P5, 2B.M3, 2B.D2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>2C.M3, 2C.D3</td>
<td></td>
</tr>
<tr>
<td>Unit 37: Computer Applications in Engineering</td>
<td>A</td>
<td>2A.P1, 2A.M1, 2A.D1</td>
<td>2, 5</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>2B.P2, 2B.P3, 2B.M2, 2B.D2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>2C.P4, 2C.M3, 2C.D3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>2D.P6, 2D.M4, 2D.D4</td>
<td></td>
</tr>
</tbody>
</table>
GCSE English subject content area

The topic areas below are drawn from the GCSE English subject criteria.

**Learners should:**
1. analyse spoken and written language, exploring impact and how it is achieved
2. express ideas and information clearly, precisely, accurately and appropriately in spoken and written communication
3. form independent views and challenge what is heard or read on the grounds of reason, evidence or argument
4. understand and use the conventions of written language, including grammar, spelling and punctuation
5. explore questions, solve problems and develop ideas
6. engage with and make fresh connections between ideas, texts and words
7. experiment with language to create effects to engage the audience
8. reflect and comment critically on their own and others’ use of language.

**In speaking and listening, learners should:**
9. present and listen to information and ideas
10. respond appropriately to the questions and views of others
11. participate in a range of real-life contexts in and beyond the classroom, adapting talk to situation and audience and using standard English where appropriate
12. select and use a range of techniques and creative approaches to explore ideas, texts and issues in scripted and improvised work.

**In reading, learners should:**
13. understand how meaning is constructed through words, sentences and whole texts, recognising and responding to the effects of language variation
14. evaluate the ways in which texts may be interpreted differently according to the perspective of the reader.

**In writing, learners should write accurately and fluently:**
15. choosing content and adapting style and language to a wide range of forms, media, contexts, audiences and purposes
16. adapting form to a wide range of styles and genres.
### Annexe C

**Mathematics knowledge and skills signposting**

This table shows where an assessment criterion in a BTEC First unit can provide an opportunity to practise a subject content area from the GCSE mathematics subject criteria (including functional elements).

<table>
<thead>
<tr>
<th>Unit number and title</th>
<th>Learning aim</th>
<th>Assessment criterion reference</th>
<th>Subject content area from the GCSE subject criteria (details of the content area can be found below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1: The Engineered World (externally assessed)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Unit 36: Electrical and Electronic Circuit Construction and Testing</td>
<td>A</td>
<td>2A.P2, 2A.M1</td>
<td>1, 3-6, 10, 11, 13, 21</td>
</tr>
<tr>
<td>Unit 37: Computer Applications in Engineering</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
GCSE mathematics subject content area

The topic areas below are drawn from the GCSE mathematics subject criteria.

Learners should be able to:
1. understand number size and scale and the quantitative relationship between units
2. understand when and how to use estimation
3. carry out calculations involving +, –, ×, ÷, either singly or in combination, decimals, fractions, percentages and positive whole number powers
4. understand and use number operations and the relationships between them, including inverse operations and the hierarchy of operations
5. provide answers to calculations to an appropriate degree of accuracy, including a given power of ten, number of decimal places and significant figures
6. understand and use the symbols =, <, >, ~
7. understand and use direct proportion and simple ratios
8. calculate arithmetic means
9. understand and use common measures and simple compound measures such as speed
10. make sensible estimates of a range of measures in everyday settings and choose appropriate units for estimating or carrying out measurement
11. interpret scales on a range of measuring instruments, work out time intervals and recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction
12. plot and draw graphs (line graphs, bar charts, pie charts, scatter graphs, histograms) selecting appropriate scales for the axes
13. substitute numerical values into simple formulae and equations using appropriate units
14. translate information between graphical and numerical form
15. design and use data-collection sheets, including questionnaires, for grouped, discrete or continuous data, process, represent, interpret and discuss the data
16. extract and interpret information from charts, graphs and tables
17. understand the idea of probability
18. calculate area and perimeters of shapes made from triangles and rectangles
19. calculate volumes of right prisms and of shapes made from cubes and cuboids
20. use Pythagoras’ theorem in 2-D
21. use calculators effectively and efficiently

In addition, Level 2 learners should be able to:
22. interpret, order and calculate with numbers written in standard form
23. carry out calculations involving negative powers (only -1 for rate of change)
24. change the subject of an equation
25. understand and use inverse proportion
26. understand and use percentiles and deciles
27. use Pythagoras’ theorem in 2-D and 3-D
28. use trigonometric ratios to solve 2-D and 3-D problems.
Annexe D

Synoptic assessment

Synoptic assessment in this qualification is embedded throughout the assessment criteria across the units of study. The core units provide the essential knowledge, understanding and skills required for this specialist application and underpin the content of the mandatory unit. Learners studying the Pearson BTEC Level 1/Level 2 First Award in Engineering Electronics and Computer Control Technologies can demonstrate a number of synoptic approaches towards meeting the assessment criteria, including:

- being able to interrelate overarching concepts and issues, bringing together their engineering knowledge
- demonstrating their ability to use and apply a range of different methods and/or techniques in engineering
- synthesising information gained from studying a number of different engineering-related activities
- applying knowledge, understanding and skills from across different units to a particular engineering situation
- evaluating and justifying their decisions, choices and recommendations.

Synoptic assessment in engineering enables learners to demonstrate their ability to integrate and apply knowledge, understanding and skills with breadth and depth. The assessment will show learners’ ability to make connections between, and integrate, different topics from the unit content.

Unit content from Unit 1: The Engineered World underpins some of the knowledge, understanding and skills that can be extended in Unit 36: Electrical and Electronic Circuit Construction and Testing and in Unit 37: Computer Applications in Engineering.

For example, when studying circuit operation and the componentary used in circuits in industrial applications for Unit 36: Electrical and Electronic Circuit Construction and Testing learners must consider products that would be typically found within the content from Unit 1, such as products from the aerospace, automotive, communications or biomedical sectors and especially the electrical/electronic sector. Equally, for example, when studying circuit manufacture in the specialist area of PCB manufacture in Unit 36: Electrical and Electronic Circuit Construction and Testing, advantages and disadvantages for PCB manufacture are covered in Unit 1: The Engineered World. When studying computer applications used in manufacturing for Unit 37: Computer Applications in Engineering learners must consider the scales of production, production methods and lean manufacturing found within the content about producing modern engineered products in Unit 1: The Engineered World.

Centres have the flexibility to assess a number of the criteria across the internally assessed units using integrated themes and assignment tasks, which emphasise the links between features of electrical and electronic circuit applications and computer applications in process control and microprocessor applications in everyday consumer products, drawing the unit content together.
Annexe E

The structure of the Pearson BTEC Level 1/Level 2 First Award in Engineering

This qualification is taught over 120 guided learning hours (GLH). It has core and optional specialist units.

Learners must complete the two core units, and a choice of optional specialist units to reach a total of 120 GLH.

This BTEC First Award has units that your centre assesses (internal) and a unit that Pearson sets and marks (external).

<table>
<thead>
<tr>
<th>Pearson BTEC Level 1/Level 2 First Award in Engineering</th>
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<tbody>
<tr>
<td>Unit</td>
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<tr>
<td>------</td>
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<tr>
<td>1</td>
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<tr>
<td>2</td>
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<td>7</td>
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<tr>
<td>8</td>
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</tbody>
</table>
Annexe F

The structure of the Pearson BTEC Level 1/Level 2 First Certificate in Engineering

This qualification is taught over 240 guided learning hours (GLH). It has core, mandatory and optional specialist units.

Learners must complete the two core units, the two mandatory units, and a choice of optional specialist units to reach a total of 240 GLH.

This BTEC First Certificate has units that your centre assesses (internal) and units that Pearson sets and marks (external).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Core units</th>
<th>Assessment method</th>
<th>GLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Engineered World</td>
<td>External</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Investigating an Engineered Product</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>Mandatory units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Interpreting and Using Engineering Information</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>Mathematics for Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td><strong>Optional specialist units</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Health and Safety in Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Engineering Maintenance</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Engineering Materials</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Computer-aided Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Machining Techniques</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>8</td>
<td>Electronic Circuit Design and Construction</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>11</td>
<td>Electrical and Mechanical Science for Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>Engineering Design</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>13</td>
<td>Engineering Assembly</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>14</td>
<td>Vehicle Engines and Other Systems</td>
<td>Internal</td>
<td>30</td>
</tr>
</tbody>
</table>
Annexe G

The structure of the Pearson BTEC Level 1/Level 2 First Extended Certificate in Engineering

This qualification is taught over 360 guided learning hours (GLH). It has core, mandatory and optional specialist units.

Learners must complete the two core units, the two mandatory units, and a choice of optional specialist units to reach a total of 360 GLH.

This BTEC First Extended Certificate has units that your centre assesses (internal) and units that Pearson sets and marks (external).

<table>
<thead>
<tr>
<th>Pearson BTEC Level 1/Level 2 First Extended Certificate in Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit</td>
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<tr>
<td>------</td>
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<tr>
<td>1</td>
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<td>18</td>
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<td>19</td>
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<td>20</td>
</tr>
</tbody>
</table>
Annexe H

The structure of the Pearson BTEC Level 1/Level 2 First Diploma in Engineering

Learners will take a total of 11–13 units to complete this qualification. The number of units taken is dependent on the size of optional specialist units selected, and the combination of all units should total 480 guided learning hours (GLH).

These units will include:
- 3 core units (totalling 120 GLH)
- 4 mandatory units (totalling 120 GLH)
- 4–6 optional specialist units (totalling 240 GLH), of which at least two must be chosen from Group A.

This BTEC First Diploma has units that your centre assesses (internal) and units that Pearson sets and marks (external).

<table>
<thead>
<tr>
<th>Unit</th>
<th>Core units</th>
<th>Assessment method</th>
<th>GLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Engineered World</td>
<td>External</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Investigating an Engineered Product</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>21</td>
<td>Introduction to Communications for Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>3</td>
<td>Health and Safety in Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Engineering Materials</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>Interpreting and Using Engineering Information</td>
<td>External</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>Mathematics for Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>7</td>
<td>Machining Techniques</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>Electronic Circuit Design and Construction</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>12</td>
<td>Engineering Design</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>15</td>
<td>Operating an Efficient Workplace</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>18</td>
<td>Computer Numerical Control Programming</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>4</td>
<td>Engineering Maintenance</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>Computer-aided Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>11</td>
<td>Electrical and Mechanical Science for Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>13</td>
<td>Engineering Assembly</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Optional specialist units (continued)</td>
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<td></td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>14</td>
<td>Vehicle Engines and Other Systems</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>16</td>
<td>Vehicle Electrical Systems</td>
<td>Internal</td>
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</tr>
<tr>
<td>17</td>
<td>Welding</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>19</td>
<td>Bicycle Servicing and Maintenance</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>Sustainable Vehicle Power and Structure Design</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>22</td>
<td>Continuous Improvement and Problem-Solving</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>23</td>
<td>Electronic Devices and Communication Applications</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>24</td>
<td>Operation and Maintenance of Mechanical Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>25</td>
<td>Operation and Maintenance of Electronic Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>26</td>
<td>Operation and Maintenance of Electrical Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>27</td>
<td>Operation and Maintenance of Fluid Power Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>28</td>
<td>Fabrication Techniques</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>29</td>
<td>Casting Techniques</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>30</td>
<td>Vehicle Maintenance Techniques</td>
<td>Internal</td>
<td>60</td>
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<tr>
<td>31</td>
<td>Production Planning for Engineering</td>
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<tr>
<td>32</td>
<td>Engineering Marking Out</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>33</td>
<td>Preparing and Controlling Engineering Manufacturing Operations</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>34</td>
<td>PC Software and Hardware in Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>35</td>
<td>Application of Quality Control and Measurement in Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
</tbody>
</table>
Annexe I

The structure of the Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Technology Pathway)

Learners will take a total of 11–12 units to complete this qualification. The number of units taken is dependent on the size of optional specialist units selected, and the combination of all units should total 480 guided learning hours (GLH).

These units will include:
- 3 core units (totalling 120 GLH)
- 4 mandatory units (totalling 120 GLH)
- 4–5 optional specialist units (totalling 240 GLH), of which at least one must be chosen from Group A and at least two must be chosen from Group B.

This BTEC First Diploma has units that your centre assesses (internal) and units that Pearson sets and marks (external).

| Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Technology Pathway) |
|---------------------------------|-----------------|-----------------|
| **Unit** | **Core units** | **Assessment method** | **GLH** |
| 1 | The Engineered World | External | 30 |
| 2 | Investigating an Engineered Product | Internal | 30 |
| 21 | Introduction to Communications for Engineering | Internal | 60 |
| **Mandatory units** | | | |
| 3 | Health and Safety in Engineering | Internal | 30 |
| 5 | Engineering Materials | Internal | 30 |
| 9 | Interpreting and Using Engineering Information | External | 30 |
| 10 | Mathematics for Engineering | Internal | 30 |
| **Optional specialist units** | | | |
| **Group A (minimum one unit from this group)** | | | |
| 23 | Electronic Devices and Communication Applications | Internal | 60 |
| 34 | PC Software and Hardware in Engineering | Internal | 60 |
| **Optional specialist units** | | | |
| **Group B (minimum two units from this group)** | | | |
| 4 | Engineering Maintenance | Internal | 30 |
| 6 | Computer-aided Engineering | Internal | 60 |
| 8 | Electronic Circuit Design and Construction | Internal | 60 |
| 11 | Electrical and Mechanical Science for Engineering | Internal | 30 |
| 12 | Engineering Design | Internal | 60 |
| 18 | Computer Numerical Control Programming | Internal | 60 |
| 20 | Sustainable Vehicle Power and Structure Design | Internal | 60 |
Annexe J

The structure of the Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Maintenance Pathway)

Learners will take a total of 12–13 units to complete this qualification. The number of units taken is dependent on the size of optional specialist units selected, and the combination of all units should total 480 guided learning hours (GLH).

These units will include:

- 3 core units (totalling 120 GLH)
- 5 mandatory units (totalling 150 GLH)
- 4–5 optional specialist units (totalling 210 GLH), of which at least one must be chosen from Group A.

This BTEC First Diploma has units that your centre assesses (internal) and units that Pearson sets and marks (external).

<table>
<thead>
<tr>
<th>Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Maintenance Pathway)</th>
<th>Core units</th>
<th>Assessment method</th>
<th>GLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Engineered World</td>
<td>External</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Investigating an Engineered Product</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>21</td>
<td>Introduction to Communications for Engineering</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td><strong>Mandatory units</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Health and Safety in Engineering</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Engineering Maintenance</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Engineering Materials</td>
<td>Internal</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>Interpreting and Using Engineering Information</td>
<td>External</td>
<td>30</td>
</tr>
<tr>
<td>10</td>
<td>Mathematics for Engineering</td>
<td>Internal</td>
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</tr>
<tr>
<td><strong>Optional specialist units</strong></td>
<td></td>
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<tr>
<td><strong>Group A (minimum one unit from this group)</strong></td>
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<tr>
<td>24</td>
<td>Operation and Maintenance of Mechanical Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>25</td>
<td>Operation and Maintenance of Electronic Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>26</td>
<td>Operation and Maintenance of Electrical Systems and Components</td>
<td>Internal</td>
<td>60</td>
</tr>
<tr>
<td>27</td>
<td>Operation and Maintenance of Fluid Power Systems and Components</td>
<td>Internal</td>
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<tr>
<td>Optional specialist unit</td>
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<tr>
<td>Group C</td>
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<tr>
<td>8   Electronic Circuit Design and Construction</td>
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<td>60</td>
<td></td>
</tr>
<tr>
<td>11  Electrical and Mechanical Science for Engineering</td>
<td>Internal</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>13  Engineering Assembly</td>
<td>Internal</td>
<td>30</td>
<td></td>
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<tr>
<td>14  Vehicle Engines and Other Systems</td>
<td>Internal</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>19  Bicycle Servicing and Maintenance</td>
<td>Internal</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>23  Electronic Devices and Communication Applications</td>
<td>Internal</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>30  Vehicle Maintenance Techniques</td>
<td>Internal</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>
Annexe K

The structure of the Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Manufacturing Pathway)

Learners will take a total of 11–12 units to complete this qualification. The number of units taken is dependent on the size of optional specialist units selected, and the combination of all units should total 480 guided learning hours (GLH).

These units will include:

- 3 core units (totalling 120 GLH)
- 4 mandatory units (totalling 120 GLH)
- 4–5 optional specialist units (totalling 240 GLH), of which at least one must be chosen from Group A and at least one must be chosen from group B.

This BTEC First Diploma has units that your centre assesses (internal) and units that Pearson sets and marks (external).

| Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Manufacturing Pathway) |
|-------------------------------|------------------|--------|
| Unit                          | Core units       | Assessment method | GLH |
| 1                             | The Engineered World | External | 30   |
| 2                             | Investigating an Engineered Product | Internal | 30   |
| 21                            | Introduction to Communications for Engineering | Internal | 60   |
| **Mandatory units**           |                  |                  |
| 3                             | Health and Safety in Engineering | Internal | 30   |
| 5                             | Engineering Materials | Internal | 30   |
| 9                             | Interpreting and Using Engineering Information | External | 30   |
| 10                            | Mathematics for Engineering | Internal | 30   |
| **Optional specialist units**|                  |                  |
| **Group A (minimum one unit from this group)** |                  |                  |
| 15                            | Operating an Efficient Workplace | Internal | 60   |
| 22                            | Continuous Improvement and Problem-Solving | Internal | 60   |
| 23                            | Electronic Devices and Communication Applications | Internal | 60   |
| **Optional specialist units**|                  |                  |
| **Group B (minimum one unit from this group)** |                  |                  |
| 4                             | Engineering Maintenance | Internal | 30   |
| 6                             | Computer-aided Engineering | Internal | 60   |
| 7                             | Machining Techniques | Internal | 60   |
| 11                            | Electrical and Mechanical Science for Engineering | Internal | 30   |
| 12                            | Engineering Design | Internal | 60   |
| 13                            | Engineering Assembly | Internal | 30   |
### Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Manufacturing Pathway)

<table>
<thead>
<tr>
<th>Optional specialist units (continued)</th>
<th>Group B (minimum one unit from this group)</th>
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</thead>
<tbody>
<tr>
<td>17 Welding</td>
<td>Internal</td>
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<tr>
<td>18 Computer Numerical Control Programming</td>
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<tr>
<td>28 Fabrication Techniques</td>
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<tr>
<td>29 Casting Techniques</td>
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<td>60</td>
<td></td>
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<tr>
<td>31 Production Planning for Engineering</td>
<td>Internal</td>
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<td></td>
</tr>
<tr>
<td>35 Application of Quality Control and Measurement in Engineering</td>
<td>Internal</td>
<td>60</td>
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</tbody>
</table>
Annexe L

The structure of the Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Mechanical Pathway)

Learners will take a total of 11–13 units to complete this qualification. The number of units taken is dependent on the size of optional specialist units selected, and the combination of all units should total 480 guided learning hours (GLH).

These units will include:
- 3 core units (totalling 120 GLH)
- 4 mandatory units (totalling 120 GLH)
- 4–6 optional specialist units (totalling 240 GLH), of which at least one must be chosen from Group A and at least one unit must be chosen from Group B.

This BTEC First Diploma has units that your centre assesses (internal) and units that Pearson sets and marks (external).

| Pearson BTEC Level 1/Level 2 First Diploma in Engineering (Mechanical Pathway) |
|-----------------------------|---------------------|-----------------|
| Unit                        | Core units          | Assessment method | GLH |
| 1                           | The Engineered World | External         | 30  |
| 2                           | Investigating an Engineered Product | Internal       | 30  |
| 21                          | Introduction to Communications for Engineering | Internal       | 60  |
| **Mandatory units**         |                     |                  |     |
| 3                           | Health and Safety in Engineering | Internal | 30  |
| 5                           | Engineering Materials | Internal | 30  |
| 9                           | Interpreting and Using Engineering Information | External | 30  |
| 10                          | Mathematics for Engineering | Internal | 30  |
| **Optional specialist units** | Group A (minimum one units from this group) |             |     |
| 7                           | Machining Techniques | Internal         | 60  |
| 28                          | Fabrication Techniques | Internal | 60  |
| 29                          | Casting Techniques | Internal         | 60  |
| **Optional specialist units** | Group B (minimum one unit from this group) |             |     |
| 4                           | Engineering Maintenance | Internal | 30  |
| 6                           | Computer-aided Engineering | Internal | 60  |
| 11                          | Electrical and Mechanical Science for Engineering | Internal | 30  |
| 12                          | Engineering Design | Internal         | 60  |
| 13                          | Engineering Assembly | Internal         | 30  |
| 14                          | Vehicle Engines and Other Systems | Internal | 30  |
### Optional specialist units (continued)

**Group B (minimum one unit from this group)**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Name</th>
<th>Type</th>
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ENGINEERING ELECTRONICS AND COMPUTER CONTROL TECHNOLOGIES

Specification