BTEC

Higher Nationals

MARINE ENGINEERING

Specification

LEVEL 4 HNC

LEVEL 5 HND

QCF Accredited

Issue 4
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ALWAYS LEARNING

PEARSON

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This specification is Issue 4. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on our website: www.edexcel.com

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Pearson BTEC Level 4 HNC Diploma in Marine Engineering (QCF)

Pearson BTEC Level 5 HND Diploma in Marine Engineering (QCF)

The Qualifications and Credit Framework (QCF) has been introduced to replace the National Qualifications Framework (NQF). It recognises achievement through the award of credit for units and qualifications, working at all levels between Entry level and level 8.

To accommodate the new framework we have taken the opportunity to revise the academic level and size of the BTEC HNCs (Higher National Certificates). These are now at level 4 and are a minimum of 120 credits in size. They have been nested within the structures of the BTEC HNDs (Higher National Diplomas).

The BTEC HNDs remain as level 5 qualifications. They are a minimum of 240 credits in size.

The qualifications remain as Intermediate level qualifications on the Framework for Higher Education Qualifications (FHEQ). Progression to the BTEC Higher Nationals continues to be from level 3 qualifications and progression from the BTEC Higher Nationals will normally be to qualifications at level 6. Learners' progression routes do not necessarily involve qualifications at every level.

As a nested qualification the HNC is an embedded component of the HND. However, it can be taken as a stand-alone qualification.

If a learner enrols for an HNC they would be eligible to gain a grade for the HNC. If they then move onto an HND, the learner is graded on their HND performance. The grade for the HND will include units from the previously achieved HNC.

If a learner opts to take an HND from the start, then on successful completion of the HND they will receive one grade for the HND achievement only.

If a learner opts to take an HND from the start but later chooses to revert to an HNC programme, then on successful completion of the HNC they will receive a grade for the HNC achievement only.

Existing NQF Higher National units achievement can count towards the QCF BTEC Higher Nationals.

Pearson BTEC Higher Nationals within the QCF, NQF and FHEQ

QCF/NQF/ FHEQ level	Progression opportunities and examples of qualifications within each level
8	PhD/DPhil Professional doctorates (credit based), eg EdD
7	Master's degrees Postgraduate diplomas Postgraduate Certificate in Education (PGCE)
6	Bachelor's degrees, eg BA, BSc Professional Graduate Certificate in Education Graduate certificates and diplomas
5	**Pearson BTEC HNDs** (Higher National Diplomas) Foundation Degrees, eg FdA, FdSc Diplomas of Higher Education (Dip HE)
4	**Pearson BTEC HNCs** (Higher National Certificates) Certificates of Higher Education (Cert HE) Level 4 National Vocational Qualifications (NVQs)
3	Pearson BTEC Level 3 Extended Diplomas Pearson BTEC Level 3 Diplomas Pearson BTEC Level 3 Subsidiary Diplomas Pearson BTEC Level 3 Certificates GCE Advanced Level Level 3 NVQs Advanced Diplomas

UNITS
The units for the Pearson BTEC Higher Nationals in Marine Engineering (QCF) are on the CD ROM that accompanies this specification and on our website.

Contents

Purpose of this specification

The purpose of a 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 they 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 the learner's level of attainment will be measured (such as assessment criteria)
- any specimen materials
- any specified levels of attainment.

Qualification titles covered by this specification

Pearson BTEC Level 4 HNC Diploma in Marine Engineering (QCF)

Pearson BTEC Level 5 HND Diploma in Marine Engineering (QCF)

These qualifications have been accredited to the Qualifications and Credit Framework (QCF). The Qualification Numbers (QNs) for these qualifications are listed below.

These qualification titles are as they will appear on learners' certificates. Learners need to be made aware of this when they are recruited by the centre and registered with Pearson. Providing this happens, centres are able to describe the programme of study leading to the award of the qualification in different ways to suit the medium and the target audience.

Centres are reminded that The Report of the National Committee of Inquiry into Higher Education (the Dearing Report) recommended that they *'develop, for each programme they offer, a 'programme specification' which identifies potential stopping-off points and gives the intended outcomes of the programme ...'*

The Quality Assurance Agency for Higher Education (QAA) has produced guidelines for centres in preparing programme specifications (reference *Guidelines for preparing programme specifications*: QAA 115 06/06) which includes related post-Dearing developments. Annexe 2: *Working with programme specifications: a leaflet for further education colleges* of this QAA document contains additional guidance notes to support further education colleges writing programme specifications for Pearson awards.

Qualification Numbers

The Qualifications and Credit Framework (QCF) code is known as a Qualification Number (QN). Each unit within a qualification will also have a QCF unit code.

The QCF qualification and unit codes will appear on learners' final certification documentation.

The QNs for the qualifications in this publication are:

600/2080/5 Pearson BTEC Level 4 HNC Diploma in Marine Engineering (QCF)

600/2081/7 Pearson BTEC Level 5 HND Diploma in Marine Engineering (QCF)

Introduction

This specification contains the units and associated guidance for the Pearson BTEC Level 4 HNC in Marine Engineering (QCF) and the Pearson BTEC Level 5 HND in Marine Engineering (QCF).

Each unit sets out the required learning outcomes, assessment criteria and content and may also include advice regarding essential delivery and assessment strategies.

This document also contains details of the teaching, learning, assessment and quality assurance of these qualifications. It includes advice about Pearson's policies regarding access to its qualifications, the design of programmes of study and delivery modes.

Structure of the qualification

Pearson BTEC Level 4 HNC

The BTEC Level 4 HNC in Marine Engineering is a qualification with a minimum of 120 credits of which 50 are mandatory core.

The BTEC Level 4 HNC programme must contain a minimum of 65 credits at level 4.

Pearson BTEC Level 5 HND

The BTEC Level 5 HND in Marine Engineering is a qualification with a minimum of 240 credits of which 80 are mandatory core.

The BTEC Level 5 HND programme must contain a minimum of 125 credits at level 5.

Rules of combination for Pearson BTEC Levels 4 and 5 Higher National qualifications

The rules of combination specify the:

- total credit value of the qualification
- minimum credit to be achieved at the level of the qualification
- mandatory core unit credit
- specialist unit credit
- maximum credit that can be centre devised or imported from other QCF BTEC Higher National qualifications.

When combining units for BTEC Higher National qualification it is the centre's responsibility to ensure that the following rules of combination are adhered to:

Pearson BTEC Level 4 HNC in Marine Engineering (QCF)

1 Qualification credit value: a minimum of 120 credits. (A maximum of 55 credits may be at level 5.)

2 Minimum credit to be achieved at the level of the qualification (level 4): 65 credits.

3 Mandatory core unit credit: 50 credits.

4 Specialist unit credit: 70 credits.

5 A maximum of 30 credits can be centre devised or imported from other QCF BTEC Higher National qualifications to meet local needs. Level rules and mandatory core units must not be changed.

Pearson BTEC Level 5 HND in Marine Engineering (QCF)

1 Qualification credit value: a minimum of 240 credits. (A maximum of 30 credits may be at level 6.)

2 Minimum credit to be achieved at the level of the qualification (level 5): 125 credits.

3 Mandatory core unit credit: 80 credits.

4 Specialist unit credit: 160 credits.

5 The requirements of the HNC have to be met.

6 A maximum of 60 credits can be centre devised or imported from other QCF BTEC Higher National qualifications to meet local needs. Level rules and mandatory core units must not be changed.

Structure of the Pearson BTEC Level 4 HNC in Marine Engineering (QCF)

Unit number	Mandatory core units — all three units must be taken	Unit level	Unit credit
1	Analytical Methods for Engineers	4	15
2	Engineering Science	4	15
3	Project Design, Implementation and Evaluation	5	20
	Specialist units group A — choose units with a minimum credit value of 45 credits		
4	Mechanical Principles	5	15
6	Health, Safety and Risk Assessment in Engineering	4	15
7	Business Management Techniques for Engineers	4	15
8	Engineering Design	5	15
24	Applications of Pneumatics and Hydraulics	4	15
43	Plant and Process Principles	5	15
44	Plant Maintenance and Decommissioning	4	15
50	Condition Monitoring and Fault Diagnosis	5	15
55	Instrumentation and Control Principles	4	15
61	Engineering Thermodynamics	5	15
93	Naval Architecture	5	15
94	Marine Electrical Systems	5	15
95	Ship Propulsion and Manoeuvrability	4	15
96	Marine Propulsion Power Plant	5	15
97	Marine Auxiliary Plant	4	15
	Specialist units group B		
13	Application of Machine Tools	4	15
21	Materials Engineering	4	15
23	Engineering Procurement	4	15
26	Employability Skills	5	15
27	Personal and Professional Development	5	15
28	Research Project	5	20
29	Work-based Experience	5	15
30	Quality Assurance and Management	5	15
35	Further Analytical Methods for Engineers	5	15

Unit number	Specialist units group B	Unit level	Unit credit
37	Management of Projects	4	15
38	Managing People in Engineering	5	15
39	Electronic Principles	5	15
41	Fluid Mechanics	4	15
42	Heat Transfer and Combustion	5	15
51	Emergency Shutdown and Safety Systems	4	15
52	Energy Management	5	15
54	Industrial Plant Services	5	15
58	Microprocessor Systems	4	15
59	Advanced Mathematics for Engineering	5	15
60	Dynamics of Machines	4	15
66	Electrical, Electronic and Digital Principles	5	15
68	Applications of Power Electronics	4	15
71	Combinational and Sequential Logic	4	15
76	Managing the Work of Individuals and Teams	5	15

The BTEC Level 4 HNC programme must contain a minimum of 65 credits at level 4.

Structure of the Pearson BTEC Level 5 HND in Marine Engineering (QCF)

Unit number	Mandatory core units – all three units must be taken	Unit level	Unit credit
1	Analytical Methods for Engineers	4	15
2	Engineering Science	4	15
3	Project Design, Implementation and Evaluation	5	20
4	Mechanical Principles	5	15
61	Engineering Thermodynamics	5	15
	Specialist units group A – choose units with a minimum credit value of 75 credits		
6	Health, Safety and Risk Assessment in Engineering	4	15
7	Business Management Techniques for Engineers	4	15
8	Engineering Design	5	15
24	Applications of Pneumatics and Hydraulics	4	15
43	Plant and Process Principles	5	15
44	Plant Maintenance and Decommissioning	4	15
50	Condition Monitoring and Fault Diagnosis	5	15
55	Instrumentation and Control Principles	4	15
93	Naval Architecture	5	15
94	Marine Electrical Systems	5	15
95	Ship Propulsion and Manoeuvrability	4	15
96	Marine Propulsion Power Plant	5	15
97	Marine Auxiliary Plant	4	15
	Specialist units group B		
13	Application of Machine Tools	4	15
21	Materials Engineering	4	15
23	Engineering Procurement	4	15
26	Employability Skills	5	15
27	Personal and Professional Development	5	15
28	Research Project	5	20
29	Work-based Experience	5	15
30	Quality Assurance and Management	5	15
35	Further Analytical Methods for Engineers	5	15
37	Management of Projects	4	15

Unit number	Specialist units group B	Unit level	Unit credit
38	Managing People in Engineering	5	15
39	Electronic Principles	5	15
41	Fluid Mechanics	4	15
42	Heat Transfer and Combustion	5	15
51	Emergency Shutdown and Safety Systems	4	15
52	Energy Management	5	15
54	Industrial Plant Services	5	15
58	Microprocessor Systems	4	15
59	Advanced Mathematics for Engineering	5	15
60	Dynamics of Machines	4	15
66	Electrical, Electronic and Digital Principles	5	15
68	Applications of Power Electronics	4	15
71	Combinational and Sequential Logic	4	15
76	Managing the Work of Individuals and Teams	5	15

The BTEC Level 5 HND programme must contain a minimum of 125 credits at level 5.

Key features

The BTEC Higher Nationals are designed to provide a specialist vocational programme, linked to professional body requirements and National Occupational Standards where appropriate.

They offer a strong, sector-related emphasis on practical skills development alongside the development of requisite knowledge and understanding.

The qualifications provide a thorough grounding in the key concepts and practical skills required in their sector and their national recognition by employers allows direct progression to employment.

A key progression path for the BTEC HNC and HND learners is to the second or third year of a degree or honours degree programme, depending on the match of the BTEC Higher National units to the degree programme in question.

The BTEC HNC and HND in Marine Engineering offer a progression route to the professional qualifications offered by Institute of Marine Engineering Science and Technology (IMarEST).

The BTEC Higher Nationals in Marine Engineering have been developed to focus on:

- the education and training of marine engineers/technicians who are employed at a professional level in a variety of types of technical work, eg design, operation and maintenance of marine systems and equipment
- providing opportunities for marine engineers/technicians to achieve a nationally recognised Level 4 or Level 5 vocationally specific qualification
- providing opportunities for full-time learners to gain a nationally recognised vocationally specific qualification to enter employment as an engineer/technician or progress to higher education vocational qualifications such as a full or part-time degree in marine engineering or related area
- providing opportunities for learners to focus on the development of the higher level skills in a technological and management context
- providing opportunities for learners to develop a range of skills and techniques and attributes essential for successful performance in working life.

This qualification meets the needs of the above rationale by:

- developing a range of skills and techniques, personal qualities and attributes essential for successful performance in working life and thereby enable learners to make an immediate contribution to employment at the appropriate professional level
- preparing individuals for a range of technical and management careers in marine engineering
- equipping individuals with knowledge, understanding and skills for success in employment in the marine engineering-based industry
- providing specialist studies relevant to individual vocations and professions in which learners are working or intend to seek employment in marine engineering and its related industries

- enabling progression to or count towards an undergraduate degree or further professional qualification in marine engineering or related area
- providing partial fulfilment of the underpinning knowledge and understanding requirements for registration as an Incorporated Engineer (IEng).

Professional body recognition

The BTEC Higher Nationals in Marine Engineering have been developed with career progression and recognition by professional bodies in mind. It is essential that learners gain the maximum benefit from their programme of study.

The BTEC Higher Nationals in Marine Engineering provide partial fulfilment of the underpinning knowledge and understanding requirements for registration as an Incorporated Engineer (IEng).

Annexe F contains mapping of the BTEC Higher National in Marine Engineering units against the Engineering Council's Learning Outcomes for IEng.

Centres are advised to contact the Institute of Marine Engineering, Science and Technology (IMarEST) for more information on gaining IEng Accreditation.

Further details of professional body recognition and exemptions for the BTEC Higher Nationals are given in the *BTEC Higher Nationals – Professional Recognition and Progression Directory 2008* available from our website: www.edexcel.com/quals/hn/Pages/Keydocuments.aspx.

National Occupational Standards

Pearson BTEC Higher Nationals in Marine Engineering are designed to relate to the National Occupational Standards in the engineering sector at level 4, which in turn form the basis of the Engineering National Vocational Qualifications (NVQs). BTEC Higher Nationals do not purport to deliver occupational competence in the sector, which should be demonstrated in a work context. However, the qualifications provide underpinning knowledge for the National Occupational Standards, as well as developing practical skills in preparation for work and possible achievement of NVQs in due course.

Annexe B contains mapping of the Higher National units in this specification against relevant Level 4 NVQs where appropriate.

Qualification Requirement

Pearson has published Qualification Requirements as part of the revision of Pearson BTEC Higher Nationals. Qualification Requirements set out the aims and rationale of the qualifications and provide the framework of curriculum content. They also identify the higher-level skills associated with the qualifications and any recognition by relevant professional bodies. The Qualification Requirement for the Pearson BTEC Higher Nationals in Marine Engineering is given in *Annexe A*.

Pearson standard specification titles are developed from the Qualification Requirements. Licensed centres comply with Qualification Requirements when developing Higher Nationals under these standard titles.

Qualification Requirements provide consistent standards within the same vocational area and identify the skills and knowledge that can be expected of any holder of an identical BTEC Higher National. This will allow higher education institutions, employers and professional bodies to confidently provide progression opportunities to successful learners.

Higher-level skills

Learners studying for Pearson BTEC Higher Nationals in Marine Engineering will be expected to develop the following skills during the programme of study:

- analyse, synthesise and summarise information critically
- read and use appropriate literature with a full and critical understanding
- think independently, solve problems and devise innovative solutions
- take responsibility for their own learning and recognise their own learning style
- apply subject knowledge and understanding to address familiar and unfamiliar problems
- design, plan, conduct and report on investigations
- use their knowledge, understanding and skills to evaluate and formulate evidence-based arguments critically and identify solutions to clearly defined problems of a general routine nature
- communicate the results of their study and other work accurately and reliably using a range of specialist techniques
- identify and address their own major learning needs within defined contexts and to undertake guided further learning in new areas
- apply their subject-related and transferable skills in contexts where the scope of the task and the criteria for decisions are generally well defined but where some personal responsibility and initiative is required.

Pearson BTEC Level 4 HNC

The BTEC Level 4 HNC in Marine Engineering provides a specialist work-related programme of study that covers the key knowledge, understanding and practical skills required in the marine engineering sector and also offers particular specialist emphasis through the choice of specialist units.

The BTEC Level 4 HNCs provide a nationally recognised qualification offering career progression and professional development for those already in employment and opportunities to progress into higher education. The qualifications are mode free but they are primarily undertaken by part-time learners studying over two years. In some sectors there are opportunities for those wishing to complete an intensive programme of study in a shorter period of time.

This specification gives centres a framework to develop engaging programmes for higher education learners who are clear about the area of employment that they wish to enter.

The BTEC Level 4 HNC in Marine Engineering offers a progression route for learners who are employed in the marine engineering sector.

Access to suitable marine engineering work situations may allow learners to achieve an NVQ qualification in Marine Engineering Operations, Engineering NVQs or individual NVQ units.

Pearson BTEC Level 5 HND

The BTEC Level 5 HND provides greater breadth and specialisation than the BTEC Level 4 HNC. Pearson BTEC HNDs are mode free but are followed predominately by full-time learners. They allow progression into or within employment in the marine engineering sector, either directly on achievement of the award or following further study to degree level.

The BTEC Level 5 HND in Marine Engineering provides opportunities for learners to apply their knowledge and practical skills in the workplace. Full-time learners have the opportunity to do this through formal work placements or part-time employment experience.

The qualification prepares learners for employment in the marine engineering sector and it is suitable for learners who have already decided that they wish to enter this area of work. Other learners may want to extend the specialism that they followed on the BTEC Level 4 HNC programme or progress into higher education.

Progression from this qualification may well be into or within employment in the marine engineering sector where learners may work towards membership of IMarEST.

The BTEC Level 5 HND in Marine Engineering offers a progression route for learners who are studying on an HNC in Marine Engineering or a relevant level 3 qualification for example a BTEC National in Engineering.

Teaching, learning and assessment

Learners must achieve a minimum of 120 credits (of which at least 65 must be at level 4) on their programme of learning to be awarded a Pearson BTEC Level 4 HNC and a minimum of 240 credits (of which at least 125 must be at level 5) to be awarded a Pearson BTEC Level 5 HND.

The assessment of BTEC Higher National qualifications is criterion-referenced and centres are required to assess learners' evidence against published learning outcomes and assessment criteria.

All units will be individually graded as 'pass', 'merit' or 'distinction'. To achieve a pass grade for the unit learners must meet the assessment criteria set out in the specifications. This gives transparency to the assessment process and provides for the establishment of national standards for each qualification.

The units in the BTEC Higher National qualifications all have a standard format which is designed to provide guidance on the requirements of the qualification for learners, assessors and those responsible for monitoring national standards.

Units

Units have the following sections.

Unit title

The unit title is on the QCF and this form of words will appear on the learner's Notification of Performance (NOP).

Unit reference number

Each unit is assigned a unit reference number that appears with the unit title on the Register of Regulated Qualifications.

QCF level

All units and qualifications within the QCF have a level assigned to them. There are nine levels of achievement, from Entry to Level 8. The QCF Level Descriptors inform the allocation of the level.

Credit value

When a learner achieves a unit, they gain the specified number of credits.

Guided learning hours

Guided learning hours are the times when a tutor, trainer or facilitator is present to give specific guidance towards the learning aim for a programme. This definition covers lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. It also includes assessment by staff where learners are present. It does not include time spent by staff marking assignments or homework where the learner is not present.

Unit aim

This gives a summary of what the unit aims to do.

Essential resources

This section lists any specialist resources needed to deliver the unit. The centre will be asked to make sure that these resources are in place when it seeks approval from Pearson to offer the qualification.

Learning outcomes

The learning outcomes of a unit set out what a learner knows, understands or is able to do as the result of a process of learning.

Assessment criteria

Assessment criteria specify the standard required by the learner to achieve each learning outcome.

Unit amplification

This section clarifies what a learner needs to know to achieve a learning outcome.

Information for tutors

This section gives tutors information on delivery and assessment. It contains the following subsections.

- *Delivery* – explains the content's relationship to the learning outcomes and offers guidance on possible approaches to delivery.
- *Assessment* – gives information about the evidence that learners must produce, together with any additional guidance if appropriate. This section should be read in conjunction with the assessment criteria.
- *Suggested resources* – lists resource materials that can be used to support the teaching of the unit, for example books, journals and websites.

Learning and assessment

The purpose of assessment is to ensure that effective learning of the content of each unit has taken place. Evidence of this learning, or the application of the learning, is required for each unit. The assessment of the evidence relates directly to the assessment criteria for each unit, supported by the generic grade descriptors.

The process of assessment can aid effective learning by seeking and interpreting evidence to decide the stage that learners have reached in their learning, what further learning needs to take place and how best to do this. Therefore, the process of assessment should be part of the effective planning of teaching and learning by providing opportunities for both the learner and assessor to obtain information about progress towards learning goals.

The assessor and learner must be actively engaged in promoting a common understanding of the assessment criteria and the grade descriptors (what it is they are trying to achieve and how well they achieve it) for further learning to take place. Therefore, learners need constructive feedback and guidance about how they may improve. For example, by capitalising on their strengths, and clear and constructive comments about their weaknesses and how these might be addressed.

Assessment instruments are constructed within centres. They should collectively ensure coverage of all assessment criteria within each unit and should provide opportunities for the evidencing of all the grade descriptors.

It is advised that assessment criteria and contextualised grade descriptors are clearly indicated on each assessment instrument to provide a focus for learners (for transparency and to ensure that feedback is specific to the criteria) and to assist with internal standardisation processes. Tasks/activities should enable learners to produce evidence that relates directly to the assessment criteria and grade descriptors.

When centres are designing assessment instruments, they need to ensure that the instruments are valid, reliable and fit for purpose, building on the application of the assessment criteria. Centres are encouraged to place emphasis on practical application of the assessment criteria, providing a realistic scenario for learners to adopt, making maximum use of work-related practical experience and reflecting typical practice in the sector concerned. The creation of assessment instruments that are fit for purpose is vital to achievement and their importance cannot be over-emphasised.

Grading Higher National units

The grading of BTEC Higher National qualifications is at the unit and the qualification level.

Each successfully completed unit will be graded as a pass, merit or distinction.

A pass is awarded for the achievement of all outcomes against the specified assessment criteria.

Merit and distinction grades are awarded for higher-level achievement. The generic merit and distinction grade descriptors listed in *Annexe C* are for grading the total evidence produced for each unit and describe the learner's performance over and above that for a pass grade. They can be achieved in a flexible way, for example in a sequential or holistic mode, to reflect the nature of the sector concerned.

Each of the generic merit and distinction grade descriptors can be amplified by use of **indicative characteristics**. These give a guide to the expected learner performance, and support the generic grade descriptors. The indicative characteristics should reflect the nature of a unit and the context of the sector programme.

The indicative characteristics shown in the table for each of the generic grade descriptors in *Annexe C* **are not exhaustive**. Consequently, centres should select appropriate characteristics from the list **or construct others** that are appropriate for their sector programme and level.

It is important to note that each assessment activity does not need to incorporate all the merit and/or distinction grade descriptors.

Contextualising the generic grade descriptors

The generic merit and distinction grade descriptors need to be viewed as a qualitative extension of the assessment criteria for pass within each individual unit. The relevant generic grade descriptors must be identified and specified within an assignment and the relevant indicative characteristics should be used to place the required evidence in context.

Summary of grades

In order to achieve a **pass** in a unit	• all learning outcomes and associated assessment criteria have been met
In order to achieve a **merit** in a unit	• pass requirements achieved • all merit grade descriptors achieved
In order to achieve a **distinction** in a unit	• pass and merit requirements achieved • all distinction grade descriptors achieved

Calculation of the qualification grade

Pass qualification grade

Learners who achieve the minimum eligible credit value specified by the rule of combination will achieve the qualification at pass grade (see section *Rules of combination for the Pearson BTEC Levels 4 and 5 Higher National qualifications*).

Qualification grades above pass grade

Learners will be awarded a merit or distinction qualification grade by the aggregation of points gained through the successful achievement of individual units. **The graded section of both the HNC and the HND is based on the learner's best performance in units at the level or above of the qualification to the value of 75 credits**.

The number of points available is dependent on the unit grade achieved and the credit size of the unit (as shown in the 'Points available per credit at specified unit grades' table below).

Points available per credit at specified unit grades

Points per credit		
Pass	**Merit**	**Distinction**
0	1	2

Qualification grades

Pearson BTEC Level 4 HNC

Points range	Grade	
0-74	Pass	P
75-149	Merit	M
150	Distinction	D

Pearson BTEC Level 5 HND

Points range	Grade	
0-74	Pass	P
75-149	Merit	M
150	Distinction	D

Annexe E gives examples of how qualification grades are calculated.

The grade achieved in units from an appropriate HNC may contribute to an HND grade.

If a learner moves from HNC to HND then credits from both the HNC and HND can contribute to the best 75 credits of the overall HND grade.

Recognising prior learning and achievement

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is a method of assessment (leading to the award of credit) that considers whether a learner can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess and so do not need to develop through a course of learning.

Pearson encourages centres to recognise learners' previous achievements and experiences in and outside the workplace, as well as in the classroom. RPL provides a route for the recognition of the achievements resulting from continuous learning.

RPL enables recognition of achievement from a range of activities using any valid assessment methodology. If the assessment requirements of a given unit or qualification have been met, the use of RPL is acceptable for accrediting a unit, units or a whole qualification. Evidence of learning must be sufficient, reliable and valid.

Further guidance is available in our policy document *Recognition of Prior Learning Policy and Process*, available on our website at: www.edexcel.com/policies

Quality assurance of Pearson BTEC Higher Nationals

Pearson's quality assurance system for all BTEC higher level programmes on the QCF at Levels 4-7 will ensure that centres have effective quality assurance processes to review programme delivery. It will also ensure that the outcomes of assessment are to national standards.

The quality assurance process for centres offering Pearson BTEC higher level programmes on the QCF at Levels 4-7 comprises three key components:

Approval process

Centres will be required to seek approval to offer BTEC Higher National qualifications in Marine Engineering through the existing Pearson qualification and centre approval process. Prior to approval being given, centres will be required to submit evidence to demonstrate that they:

- have the human and physical resources required for effective delivery and assessment
- understand the implications for independent assessment and agree to abide by these
- have a robust internal assessment system supported by 'fit for purpose' assessment documentation
- have a system to internally verify assessment decisions, to ensure standardised assessment decisions are made across all assessors and sites.

Applications have to be supported by the head of the centre (principal, chief executive etc) and include a declaration that the centre will operate the programmes strictly as approved and in line with Pearson requirements.

Monitoring of internal centre systems

Centres will be required to demonstrate ongoing fulfilment of the centre approval criteria over time and across all programmes. The process that assures this is external examination, which is undertaken by Pearson's appointed External Examiners. Centres will be given the opportunity to present evidence of the ongoing suitability and deployment of their systems to carry out the required functions. This includes the consistent application of policies affecting learner registrations, appeals, effective internal examination and standardisation processes. Where appropriate, centres may present evidence of their operation within a recognised code of practice, such as that of the Quality Assurance Agency for Higher Education. Pearson reserves the right to confirm independently that these arrangements are operating to Pearson's satisfaction.

Pearson will affirm, or not, the ongoing effectiveness of such systems. Where system failures are identified, sanctions (appropriate to the nature of the problem) will be applied in order to assist the centre in correcting the problem.

Independent assessment review

The internal assessment outcomes reached for all the BTEC higher level programmes on the Qualifications and Credit Framework at Levels 4-7 are subject to an independent assessment review by a Pearson-appointed External Examiner.

The outcomes of this process will be to:

- confirm that internal assessment is to national standards and allow certification

or

- make recommendations to improve the quality of assessment outcomes before certification is released

or

- make recommendations about the centre's ability to continue to be approved for the qualifications in question.

Additional arrangement for ALL centres

Regardless of the type of centre, Pearson reserves the right to withdraw either qualification or centre approval when it deems there is an irreversible breakdown in the centre's ability either to quality assure its programme delivery or its assessment standards.

Programme design and delivery

Pearson BTEC Higher National qualifications consist of mandatory core units and specialist units. The specialist units are designed to provide a specific focus to the qualification. Required combinations of specialist units are clearly set out in relation to each qualification in the defined qualification structures provided in this document.

In the BTEC Higher National qualifications each unit's credit value usually consists of multiples of 5 credits. Most units are 15 credits in value. These units have been designed from a learning time perspective. **Each 15-credit unit approximates to a learning time of 150 hours**.

These new BTEC Level 5 HND qualifications are the same size as the Pearson Level 5 BTEC Higher National Diplomas which were accredited onto the National Qualifications Framework (NQF). Therefore, it is expected that these BTEC Level 5 HNDs, accredited onto the Qualifications and Credit Framework (QCF), will also require approximately 960 guided learning hours (GLH).

Consequently, using the above approach, the new BTEC Level 4 HNCs, which are accredited onto the QCF, and are now half the size of the BTEC Level 5 Higher National Diplomas, will require approximately 480 GLH.

Within the information relating to these units on the QCF, each 15-credit unit has been allocated a figure of 60 GLH to help guide centres (other units with smaller or larger credit values have figures calculated on a pro rata basis). Centres delivering these qualifications are required to use their professional expertise in the design and delivery of these qualifications within the overall guided learning hours for the qualification.

Guided learning hours are defined as all the time when a tutor, trainer or facilitator is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. It also includes time spent by staff assessing learners' achievements. It does not include time spent by staff in day-to-day marking of assignments where the learner is not present.

Learning time is defined as the time taken by learners at the level of the unit, on average, to complete the learning outcomes of the unit to the standard determined by the assessment criteria. It should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Centres are advised to consider this definition when planning the programme of study associated with this specification.

Annexe D provides information for centres and learners who wish to compare, for teaching and learning purposes, the units of the NQF Pearson Level 5 BTEC Higher Nationals in Marine Engineering with the new units of the QCF Pearson BTEC Higher Nationals in Marine Engineering.

Mode of delivery

Pearson does not define the mode of study for the BTEC Higher National qualifications. Centres are free to offer the qualification(s) using any mode of delivery that meets the needs of their learners. This may be through traditional classroom teaching, open learning, distance learning or a combination of these. Whatever mode of delivery is used, centres must ensure that learners have appropriate access to the resources identified in the specification and to the subject specialists delivering the units. This is particularly important for learners studying for the qualification through open or distance learning.

Full guidance on our policies on 'distance assessment' and 'electronic assessment' are given on our website.

Learners studying for the qualification on a part-time basis bring with them a wealth of experience that should be utilised to maximum effect by tutors and assessors. Assessment instruments based on learners' work environments should be encouraged. Those planning the programme should aim to enhance the vocational nature of the BTEC Higher National qualification by:

- liaising with employers to ensure that the course is relevant to learners' specific needs
- accessing and using non-confidential data and documents from learners' workplaces
- including sponsoring employers in the delivery of the programme and, where appropriate, in the assessment
- linking with company-based/workplace training programmes
- making full use of the variety of experiences of work and life that learners bring to the programme.

Resources

Pearson BTEC Higher National qualifications are designed to prepare learners for employment in specific industry sectors.

Physical resources need to support the delivery of the programme and the proper assessment of the outcomes and, therefore, should normally be of industry standard.

Staff delivering programmes and conducting the assessments should be familiar with current practice, legislation and standards used in the sector concerned.

Centres will need to meet any specialist resource requirements when they seek approval from Pearson.

Please refer to the *Essential requirements* section in individual units for specialist resource requirements.

Delivery approach

It is important that centres develop an approach to teaching and learning that supports the specialist vocational nature of the BTEC Higher National qualification. Specifications contain a balance of practical skill development and knowledge

requirements, some of which can be theoretical in nature. Tutors and assessors need to ensure that appropriate links are made between theory and practice and that the knowledge base is applied to the sector. This will require the development of relevant and up-to-date teaching materials that allow learners to apply their learning to actual events and activities within the sector. Maximum use should be made of the learner's experience.

Meeting local needs

Centres should note that the qualifications set out in these specifications have been developed in consultation with centres, employers and the Institute of Marine Engineering, Science and Technology (IMarEST), Engineering Council UK and relevant licensed member institutions.

The units are designed to meet the skill needs of the sector and the specialist units allow coverage of the full range of employment within the sector. Centres should make maximum use of the choice available to them within the specialist units to meet the needs of their learners, as well as the local skills and training needs identified by organisations such as Regional Development Agencies and local funding agencies.

Centres may not always be able to meet local needs using the units in this specification. In this situation, centres can seek approval from Pearson to use units from other BTEC Higher National qualifications on the QCF. Centres will need to justify the need for importing units from other specifications and Pearson will ensure that the vocational focus of the qualification remains the same.

Locally-devised specialist units

There may be exceptional circumstances where even the flexibility of importing units from other specifications does not meet a particular local need. In this case, centres can seek permission from Pearson to develop a unit(s) with us to meet this need. Permission will be granted only in a limited number of cases.

Pearson will ensure that the integrity of the qualification is not compromised and that there is a minimum of overlap and duplication of content of existing units. Centres will need strong evidence of the local need and the reasons why the existing standard units are inappropriate. Pearson will validate these units.

Limitations on variations from standard specifications

The flexibility to import standard units from other QCF Pearson BTEC Higher National specifications and/or to develop unique locally-devised specialist units is **limited to a maximum of 30 credits in a BTEC HNC qualification and a maximum of 60 credits only in any BTEC HND qualification**. These units cannot be used at the expense of the mandatory core units in any qualification nor can the qualification rules of combination level rules be compromised.

Access and recruitment

Pearson's 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.

Centres are required to recruit learners to BTEC Specialist qualifications with integrity.

Applicants will need relevant information and advice about the qualification to make sure it meets their needs.

Centres should review the applicant's prior qualifications and/or experience, considering 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 teaching and assessment of the qualification.

Learners may be aged between 14 and 16 and therefore potentially vulnerable. Where learners are required to spend time and be assessed in work settings, it is the centre's responsibility to ensure that the work environment they go into is safe.

Access arrangements and special considerations

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*.

Details on how to make adjustments for learners with protected characteristics are given in the document *Pearson Supplementary Guidance for Reasonable Adjustment and Special Consideration in Vocational Internally Assessed Units*.

Both documents are on our website at: www.edexcel.com/policies

Restrictions on learner entry

The BTEC Higher National qualifications are accredited on the QCF for learners in the following age groups:

- 16-18 years old
- 18 years and older.

Further information and useful publications

To get in touch with us visit our 'Contact us' pages:

- Edexcel: **www.edexcel.com/contactus**
- BTEC: **www.edexcel.com/btec/Pages/contactus**
- Pearson Work Based Learning and Colleges: **www.pearsonwbl.edexcel.com/contactus**
- books, software and online resources for UK schools and colleges: **www.pearsonschoolsandfecolleges.co.uk/contactus**

Key publications:

- *Adjustments for candidates with disabilities and learning difficulties – Access and Arrangements and Reasonable Adjustments, General and Vocational qualifications* (Joint Council for Qualifications (JCQ))
- *Equality Policy* (Pearson)
- *Recognition of Prior Learning Policy and Process* (Pearson)
- *UK Information Manual* (Pearson)
- *UK Quality Vocational Assurance Handbook* (Pearson).

All of these publications are available on our website.

Publications on the quality assurance of BTEC qualifications are available on our website at www.edexcel.com/btec/delivering-BTEC/quality/Pages

Our publications catalogue lists all the material available to support our qualifications. To access the catalogue and order publications, please go to www.edexcel.com/resources/publications/Pages

Additional resources

If you need further learning and teaching materials to support planning and delivery for your learners, there is a wide range of BTEC resources available.

Any publisher can seek endorsement for their resources, and, if they are successful, we will list their BTEC resources on our website at: www.edexcel.com/resources/publications/Pages

Professional body contact details

Engineering Council (UK)
246 High Holborn
London
WC1V 7EX

Telephone: +44 (0)20 3206 0500
Fax: +44 (0)20 3206 0501
Email: staff@engc.org.uk
Website: www.engc.org.uk

Institute of Marine Engineering, Science and Technology (IMarEST)
Algate House
33 Algate High Street
London
EC3N 1EN

Telephone: +44 (0)20 7382 2600
Fax: +44 (0)20 7382 2670
Email: info@imarest.org
Website: www.imarest.org

The Maritime and Coastguard Agency (MCA)
Spring Place
105 Commercial Road
Southampton
Hants
SO15 1EG

Telephone: +44 (0)23 8032 9365
Email: infoline@mcga.gov.uk
Website: http://www.dft.gov.uk/mca

Merchant Navy Training Board
30 ParkStreet
London
SE1 9EQ

Telephone: +44 (0)20 7417 2800
Email: kirsch.edwards@british-shipping.org
Website: http://www.mntb.org.uk

How to obtain National Occupational Standards

The National Occupational Standards for Engineering Leadership can be obtained from:

Semta
14 Upton Road
Watford WD18 0JT

Telephone: 01923 238441
Website: www.semta.org.uk

Professional development and training

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: www.edexcel.com/resources/Training/Pages. You can request customised training through the website or you can contact one of our advisers in the Training from Pearson UK team via Customer Services to discuss your training needs.

BTEC training and support for the lifetime of the qualifications

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. 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.edexcel.com/btec/delivering-BTEC/training/Pages

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. If you would like your Curriculum Development Manager to contact you, please get in touch with your regional office on: 0844 463 2535.

Your Pearson support team

Whether you want to talk to a sector specialist, browse online or submit your query for an individual response, there's someone in our Pearson support team to help you whenever – and however – you need:

- Subject Advisors: find out more about our subject advisor team – immediate, reliable support from a fellow subject expert – at: www.edexcel.com/Aboutus/contact-us/Pages

- Ask the Expert: submit your question online to our Ask the Expert online service www.edexcel.com/aboutus/contact-us/ask-expert/Pages and we will make sure your query is handled by a subject specialist.

Annexe A

Qualification Requirement

BTEC Higher Nationals in Marine Engineering

This qualification requirement will be read in conjunction with overarching guidance from Pearson.

Rationale

BTEC Higher Nationals in Marine Engineering have been developed to focus on:

- the education and training of marine engineers/technicians who are employed at a professional level in a variety of types of technical work, eg design, operation and maintenance of marine systems and equipment
- providing opportunities for marine engineers/technicians to achieve a nationally recognised level 4 or level 5 vocationally specific qualification
- providing opportunities for full-time learners to enter employment as an engineer/technician, or progress to higher education vocational qualifications such as, a full- or part-time degree in marine engineering or related areas
- providing opportunities for learners to focus on the development of the higher level skills in a technological and management context
- providing opportunities for learners to develop a range of skills and techniques and attributes essential for successful performance in working life.

Aims of the qualification

The qualification meets the needs of the above rationale by:

- developing a range of skills and techniques, personal qualities and attributes essential for successful performance in working life and thereby enabling learners to make an immediate contribution to employment
- preparing learners for a range of technical and management careers in marine engineering
- equipping individuals with the knowledge, understanding and skills necessary for success in employment in the marine engineering-based industry
- providing specialist studies relevant to individual vocations and professions within marine engineering and its related industries, in which learners are working or intend to seek employment
- enabling progression to an undergraduate degree or further professional qualification in marine engineering or related areas
- providing a significant basis for progression to Incorporated Engineer level.

Mandatory curriculum

The mandatory curriculum will give learners the opportunity to build on previous attainment while allowing them to progress and study a selection of optional curriculum. It will display the following features:

- a knowledge and use of essential scientific principles to produce routine solutions to familiar marine engineering problems and using this knowledge to model and analyse routine marine engineering systems, processes and products the major scientific principles which underpin the design and operation of engineering systems and provide an overview as the basis for further study in specialist areas of marine engineering
- use of skills and knowledge developed during the course to select a project and agree specifications, implement and evaluate the project and present the project evaluation
- obtaining accurate information on the requirements for an individual or group engineering project
- project work that is of a technical nature and supportive of the orientation of the Marine Engineering Higher National programme, in particular, integrated exercises involving a technical investigation which incorporates a financial appreciation
- knowledge of the calculation of costs associated with engineered products and services
- fundamental analytical knowledge and techniques used for analysis, modelling and solution of realistic engineering problems within marine engineering
- a knowledge of routine mathematical methods essential to marine engineering including an awareness of the functionality of standard methods
- opportunity to experience a design project through appreciation of synthesising parameters affecting design solutions
- the application of engineering principles to the design and manufacture of products, systems and services
- the experience of design modification for an existing system, component or process to meet a specified requirement
- undertaking routine practical or simulation tests of a design solution, report and comment on results
- searching for information related to marine engineering design solution and present it for discussion
- in producing solutions an integration of knowledge of mathematics, science, information technology, design, business context and marine engineering practice, to solve routine problems
- the engineering principles which underpin the design and operation of marine engineering systems and equipment including thermodynamic, power transmission, static and dynamic fluid systems and combustion processes and control systems.

Optional curriculum

The optional curriculum will give learners the opportunity to select a relevant specialism while allowing them to build on learning within the mandatory curriculum. It will display the following features:

- an extended range of mechanical principles for more advanced study and which underpin the design and operation of marine engineering systems including strengths of materials and mechanics of machines
- a knowledge of the principles of fluid mechanics and the techniques used to predict the behaviour of fluids in marine engineering applications
- a knowledge of the application of single phase circuits, amplifiers and digital circuits in engineering applications an understanding of three-phase theory applied to ac machines in a marine engineering context
- the understanding of microprocessor-based systems and their use in marine engineering systems
- knowledge of the principles of thermodynamics and their application to engineering thermodynamic systems and marine propulsion and auxiliary systems
- an understanding of marine propulsion and power systems and the application of the associated principles and laws of mechanics
- knowledge of marine propulsion systems including transmission systems, turbine power plant and the use of diesel engines in marine applications
- the engineering principles which underpin the design and operation of analogue electronics gained through previous study with emphasis on the use of current manufacturers' data and modern circuit analysis techniques
- an understanding of the construction, operation and maintenance of marine auxiliary plant and the distribution of electrical power within a marine environment
- a knowledge of marine legislation and shipboard management practices including managerial roles and management systems
- the principles of naval architecture including ship construction, the forces on ship structures and the factors of resistance to ship motion, propellers, powering estimates and fuel consumption estimates
- an understanding of the issues involved in managing the work of individuals and teams employed in the marine engineering industry.

Annexe B

National Occupational Standards

Mapping against the Level 4 NVQ in Engineering Leadership

The grid below maps the knowledge covered in the Level 4 NVQ in Engineering Leadership against the underpinning knowledge of the QCF Pearson BTEC Higher Nationals in Marine Engineering.

KEY

Relevant NVQ units are listed where the BTEC unit provides partial coverage of the underpinning knowledge and understanding. A blank space indicates no coverage of the underpinning knowledge.

BTEC HN unit / NVQ	Unit 1	Unit 2	Unit 3	Unit 4	Unit 6	Unit 7	Unit 8	Unit 13	Unit 21	Unit 23	Unit 24	Unit 26	Unit 27	Unit 28	Unit 29	Unit 30	Unit 35	Unit 37	Unit 38	Unit 39	Unit 41
Level 4 NVQ in Engineering Leadership							Units 8, 9			Unit 13				Unit 6		Unit 18					
	Unit 42	**Unit 43**	**Unit 44**	**Unit 50**	**Unit 51**	**Unit 52**	**Unit 54**	**Unit 55**	**Unit 58**	**Unit 59**	**Unit 60**	**Unit 61**	**Unit 66**	**Unit 68**	**Unit 71**	**Unit 76**	**Unit 93**	**Unit 94**	**Unit 95**	**Unit 96**	**Unit 97**
Level 4 NVQ in Engineering Leadership																					

Annexe C

Grade descriptors

Pass grade

A **pass grade** is achieved by meeting all the requirements defined in the assessment criteria for pass for each unit.

Merit grade

Merit descriptors	**Exemplar indicative characteristics** **Centres can identify and use other relevant characteristics. This is NOT a tick list.**
In order to achieve a **merit** the learner must:	The learner's evidence shows, for example:
• identify and apply strategies to find appropriate solutions	• effective judgements have been made • complex problems with more than one variable have been explored • an effective approach to study and research has been applied
• select/design and apply appropriate methods/techniques	• relevant theories and techniques have been applied • a range of methods and techniques have been applied • a range of sources of information has been used • the selection of methods and techniques/sources has been justified • the design of methods/techniques has been justified • complex information/data has been synthesised and processed • appropriate learning methods/techniques have been applied
• present and communicate appropriate findings	• the appropriate structure and approach has been used • coherent, logical development of principles/concepts for the intended audience • a range of methods of presentation have been used and technical language has been accurately used • communication has taken place in familiar and unfamiliar contexts • the communication is appropriate for familiar and unfamiliar audiences and appropriate media have been used.

Distinction grade

Distinction descriptors	Exemplar indicative characteristics Centres can identify and use other relevant characteristics. This is NOT a tick list.
In order to achieve a **distinction** the learner must:	The learner's evidence shows, for example:
• use critical reflection to evaluate own work and justify valid conclusions	• conclusions have been arrived at through synthesis of ideas and have been justified • the validity of results has been evaluated using defined criteria • self-criticism of approach has taken place • realistic improvements have been proposed against defined characteristics for success
• take responsibility for managing and organising activities	• autonomy/independence has been demonstrated • substantial activities, projects or investigations have been planned, managed and organised • activities have been managed • the unforeseen has been accommodated • the importance of interdependence has been recognised and achieved
• demonstrate convergent/lateral/ creative thinking	• ideas have been generated and decisions taken • self-evaluation has taken place • convergent and lateral thinking have been applied • problems have been solved • innovation and creative thought have been applied • receptiveness to new ideas is evident • effective thinking has taken place in unfamiliar contexts.

Annexe D

Unit mapping overview

New QCF versions of the BTEC Higher National units in Marine Engineering (specification start date 01/07/2011) mapped against the NQF BTEC Higher National units in Marine Engineering (specification end date 31/12/2010).

Unit number	QCF unit title	Maps to NQF unit number	Level of similarity between units
1	Analytical Methods for Engineers	3	F
2	Engineering Science	2	F
3	Project Design, Implementation and Evaluation	4	F
4	Mechanical Principles	18	F
6	Health, Safety and Risk Assessment in Engineering	27	F
7	Business Management Techniques for Engineers	1	F
8	Engineering Design	6	F
13	Application of Machine Tools	20	F
21	Materials Engineering	N/A	F
23	Engineering Procurement	N/A	F
24	Applications of Pneumatics and Hydraulics	19	F
26	Employability Skills	N/A	N
27	Personal and Professional Development	N/A	N
28	Research Project	N/A	N
29	Work-based Experience	N/A	N
30	Quality Assurance and Management	29	F
35	Further Analytical Methods for Engineers	N/A	F
37	Management of Projects	30	F
38	Managing People in Engineering	N/A	F
39	Electronic Principles	25	F
41	Fluid Mechanics	N/A	F
42	Heat Transfer and Combustion	N/A	F
43	Plant and Process Principles	5	F

Unit number	QCF unit title	Maps to NQF unit number	Level of similarity between units
44	Plant Maintenance and Decommissioning	N/A	F
50	Condition Monitoring and Fault Diagnosis	N/A	F
51	Emergency Shutdown and Safety Systems	N/A	F
52	Energy Management	N/A	F
54	Industrial Plant Services	N/A	F
55	Instrumentation and Control Principles	24	F
58	Microprocessor Systems	9	F
59	Advanced Mathematics for Engineering	N/A	N
60	Dynamics of Machines	N/A	F
61	Engineering Thermodynamics	10	P
66	Electrical, Electronic and Digital Principles	22	P
68	Applications of Power Electronics	N/A	F
71	Combinational and Sequential Logic	23	F
76	Managing the Work of Individuals and Teams	26	F
93	Naval Architecture	7	F
94	Marine Electrical Systems	8	F
95	Ship Propulsion and Manoeuvrability	95	P
96	Marine Propulsion Power Plant	14	P
97	Marine Auxiliary Plant	16	P

KEY

P – Partial mapping (some topics from the old unit appear in the new unit)

F – Full mapping (topics in old unit match new unit exactly or almost exactly)

X – Full mapping + new (all the topics from the old unit appear in the new unit, but new unit also contains new topic(s))

N – New unit

Unit mapping in depth

New QCF versions of the BTEC Higher National units in Marine Engineering (specification start date 01/07/2011) mapped against the NQF BTEC Higher National units in Marine Engineering (specification end date 31/12/2010).

New QCF units		NQF units		Mapping/comments (new topics in italics)
Number	**Name**	**Number**	**Name**	
1	Analytical Methods for Engineers	3	Analytical Methods for Engineers	Full mapping
2	Engineering Science	2	Engineering Science	Full mapping
3	Project Design, Implementation and Evaluation	4	Project	Full mapping
4	Mechanical Principles	18	Mechanical Principles	Full mapping
6	Health, Safety and Risk Assessment in Engineering	27	Health, Safety and Risk Assessment	Full mapping
7	Business Management Techniques for Engineers	1	Business Management for Engineers	Full mapping
8	Engineering Design	6	Engineering Design	Full mapping
13	Application of Machine Tools	20	Application of Machine Tools	Full mapping
21	Materials Engineering	N/A	Materials Engineering	Full mapping
23	Engineering Procurement	N/A	Procurement	Full mapping
24	Applications of Pneumatics and Hydraulics	19	Applications of Pneumatics and Hydraulics	Full mapping
26	Employability Skills	N/A		

New QCF units		NQF units		Mapping/comments (new topics in italics)
Number	**Name**	**Number**	**Name**	
27	Personal and Professional Development	N/A		
28	Research Project	N/A		
29	Work-based Experience	N/A		
30	Quality Assurance and Management	29	Quality Assurance and Management	Full mapping
35	Further Analytical Methods for Engineers	N/A	Further Analytical Methods for Engineers	Full mapping
37	Management of Projects	30	Project Management	Full mapping
38	Managing People in Engineering	N/A	People Management	Full mapping
39	Electronic Principles	25	Electronics	Full mapping
41	Fluid Mechanics	N/A	Fluid Mechanics	Full mapping
42	Heat Transfer and Combustion	N/A	Heat Transfer and Combustion	Full mapping
43	Plant and Process Principles	5	Plant and Process Principles	Full mapping
44	Plant Maintenance and Decommissioning	N/A	Plant Maintenance and Management	Full mapping
50	Condition Monitoring and Fault Diagnosis	N/A	Condition Monitoring and Fault Diagnosis	Full mapping
51	Emergency Shutdown and Safety Systems	N/A	Emergency Shutdown and Safety Systems	Full mapping
52	Energy Management	N/A	Energy Management	Full mapping
54	Industrial Plant Services	N/A	Industrial Plant Services	Full mapping

New QCF units		NQF units		Mapping/comments (new topics in italics)
Number	**Name**	**Number**	**Name**	
55	Instrumentation and Control Principles	24	Instrumentation and Control Principles	Full mapping
58	Microprocessor Systems	9	Microprocessor Systems	Full mapping
59	Advanced Mathematics for Engineering	N/A		
60	Dynamics of Machines	N/A	Dynamics of Machines	Full mapping
61	Engineering Thermodynamics	10	Marine Engineering Thermodynamics	Full mapping for learning outcomes 1, 2 and 3. New material for learning outcome 4. Learning outcome 3 material in NQF Unit 10 is covered in QCF Unit 54.
66	Electrical, Electronic and Digital Principles	22	Digital and Analogue Devices and Circuits	Full mapping for learning outcome 4. Application of complex notation in the analysis of single phase circuits, application of circuit theory to the solution of circuit problems.
68	Applications of Power Electronics	N/A	Applications of Power Electronics	Full mapping
71	Combinational and Sequential Logic	23	Combinational and Sequential Logic	Full mapping
76	Managing the Work of Individuals and Teams	26	Managing the Work of Individuals and Teams	Full mapping
93	Naval Architecture	7	Naval Architecture	Full mapping
94	Marine Electrical Systems	8	Marine Electrical Systems	Full mapping
95	Ship Propulsion and Manoeuvrability	12	Marine Turbine Propulsion and Power Systems	Learning outcome 1 and 2 moved to Unit 96. New learning outcomes covering propeller design, ship manoeuvrability and low speed ship handling systems.
96	Marine Propulsion Power Plant	14	Marine Propulsion Systems	Learning outcome 1 moved to Unit 95. Electrical propulsion introduced.
97	Marine Auxiliary Plant	16	Marine Auxiliary Plant	Learning outcome 4 moved to Unit 96, and replaced by understand air compressors used in ships.

Annexe E

Calculation of the qualification grade

Pass qualification grade

Learners who achieve the minimum eligible credit value specified by the rule of combination will achieve the qualification at pass grade (see section *Rules of combination for the Pearson BTEC Levels 4 and 5 Higher National qualifications*).

Qualification grades above pass grade

Learners will be awarded a merit or distinction qualification grade by the aggregation of points gained through the successful achievement of individual units. **The graded section of both qualifications is based on the learner's best performance in units at the level or above of the qualification to the value of 75 credits.**

The number of points available is dependent on the unit grade achieved and the credit size of the unit (as shown in the 'Points available per credit at specified unit grades' table below).

Points available per credit at specified unit grades

Points per credit		
Pass	**Merit**	**Distinction**
0	1	2

Qualification grades

Pearson BTEC Level 4 HNC

Points range	Grade	
0-74	Pass	P
75-149	Merit	M
150	Distinction	D

Pearson BTEC Level 5 HND

Points range	Grade	
0-74	Pass	P
75-149	Merit	M
150	Distinction	D

Examples of possible learner profiles of the best 75 credits at the level of the qualification or above. These tables fit both HNC and HND qualifications.

Unit grade	Credits achieved at each unit grade	Points per credit	Points scored
Pass	30	0	0
Merit	30	1	30
Distinction	15	2	30
		Total	**60**
		Qualification grade	**Pass**

Unit grade	Credits achieved at each unit grade	Points per credit	Points scored
Pass	15	0	0
Merit	45	1	45
Distinction	15	2	30
		Total	**75**
		Qualification grade	**Merit**

Unit grade	Credits achieved at each unit grade	Points per credit	Points scored
Pass	30	0	0
Merit	15	1	15
Distinction	30	2	60
		Total	**75**
		Qualification grade	**Merit**

Unit grade	Credits achieved at each unit grade	Points per credit	Points scored
Pass	0	0	0
Merit	15	1	15
Distinction	60	2	120
		Total	**135**
		Qualification grade	**Merit**

Unit grade	Credits achieved at each unit grade	Points per credit	Points scored
Pass	0	0	0
Merit	0	1	0
Distinction	75	2	150
		Total	**150**
		Qualification grade	**Distinction**

Annexe F

IEng mapping

Pages 17 and 18 of the Engineering Council's publication *The Accreditation of Higher Education Programmes* state the specific Engineering Learning Outcomes for IEng accreditation. These are provided below, together with Pearson's numbering system for each of the Engineering Learning Outcomes.

Edexcel No	IEng Learning Outcome
	Underpinning science and mathematics, and associated engineering disciplines, as defined by the relevant engineering institution
US1i	Knowledge and understanding of the scientific principles underpinning relevant current technologies, and their evolution;
US2i	Knowledge and understanding of mathematics necessary to support application of key engineering principles.
	Engineering Analysis
EA1i	Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement;
EA2i	Ability to apply quantitative methods and computer software relevant to their engineering technology discipline(s), frequently within a multidisciplinary context;
EA3i	Ability to use the results of analysis to solve engineering problems, apply technology and implement engineering processes;
EA4i	Ability to apply a systems approach to engineering problems through know-how of the application of the relevant technologies.
	Design
D1i	Define a problem and identify constraints;
D2i	Design solutions according to customer and user needs;
D3i	Use creativity and innovation in a practical context;
D4i	Ensure fitness for purpose (including operation, maintenance, reliability etc);
D5i	Adapt designs to meet their new purposes or applications.

	Economic, social, and environmental context
S1i	Knowledge and understanding of commercial and economic context of engineering processes;
S2i	Knowledge of management techniques which may be used to achieve engineering objectives within that context;
S3i	Understanding of the requirement for engineering activities to promote sustainable development;
S4i	Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
S5i	Understanding of the need for a high level of professional and ethical conduct in engineering.
	Engineering Practice
EP1i	Understanding of and ability to use relevant materials, equipment, tools, processes, or products;
EP2i	Knowledge and understanding of workshop and laboratory practice;
EP3i	Knowledge of contexts in which engineering knowledge can be applied (eg operations and management, application and development of technology etc);
EP4i	Ability to use and apply information from technical literature;
EP5i	Ability to use appropriate codes of practice and industry standards;
EP6i	Understanding of the principles of managing engineering processes;
EP7i	Awareness of quality issues and their application to continuous improvement.

Learning Outcomes for IEng Programmes																								
		US1i	US2i	EA1i	EA2i	EA3i	EA4i	D1i	D2i	D3i	D4i	D5i	S1i	S2i	S3i	S4i	S5i	EP1i	EP2i	EP3i	EP4i	EP5i	EP6i	EP7i
1	Analytical Methods for Engineers		■			■																		
2	Engineering Science	■	■			■																		
3	Project Design, Implementation and Evaluation					■	■	■	■	■	■													
4	Mechanical Principles	■	■		■	■	■												■					
6	Health, Safety and Risk Assessment in Engineering					■	■									■			■		■			
7	Business Management Techniques for Engineers		■	■																			■	
8	Engineering Design			■	■	■		■	■	■	■	■	■					■			■	■		
13	Application of Machine Tools															■		■	■	■	■			
21	Materials Engineering	■				■												■						
23	Engineering Procurement													■						■			■	
24	Applications of Pneumatics and Hydraulics	■					■		■		■					■								
26	Employability Skills					■								■			■							
27	Personal and Professional Development							■						■			■				■			
28	Research Project			■				■	■	■											■	■		
29	Work-based Experience			■			■											■						

Learning Outcomes for IEng Programmes																							
		US1i	US2i	EA1i	EA2i	EA3i	EA4i	D1i	D2i	D3i	D4i	D5i	S1i	S2i	S3i	S4i	S5i	EP1i	EP2i	EP3i	EP4i	EP5i	EP6i	EP7i
30	Quality Assurance and Management		■	■																■	■			■
35	Further Analytical Methods for Engineers		■	■	■		■																	
37	Management of Projects													■						■			■	
38	Managing People in Engineering		■											■		■							■	
39	Electronic Principles	■		■		■		■	■										■		■			
41	Fluid Mechanics	■	■	■	■	■	■																	
42	Heat Transfer and Combustion	■	■	■	■	■																		
43	Plant and Process Principles	■	■			■	■																	
44	Plant Maintenance and Decommissioning															■					■	■		
50	Condition Monitoring and Fault Diagnosis										■								■		■	■		
51	Emergency Shutdown and Safety Systems	■														■					■	■		
52	Energy Management	■		■		■	■								■	■					■			
54	Industrial Plant Services			■		■	■				■										■			
55	Instrumentation and Control Principles		■			■	■																	
58	Microprocessor Systems	■	■	■	■		■	■	■									■			■	■		

Learning Outcomes for IEng Programmes																								
		US1i	US2i	EA1i	EA2i	EA3i	EA4i	D1i	D2i	D3i	D4i	D5i	S1i	S2i	S3i	S4i	S5i	EP1i	EP2i	EP3i	EP4i	EP5i	EP6i	EP7i
59	Advanced Mathematics for Engineering		■	■	■	■																		
60	Dynamics of Machines		■	■		■	■																	
61	Engineering Thermodynamics		■			■	■																	
66	Electrical, Electronic and Digital Principles	■			■	■	■	■	■										■					
68	Applications of Power Electronics	■		■		■													■					
71	Combinational and Sequential Logic	■				■		■	■	■								■	■					
76	Managing the Work of Individuals and Teams													■										
93	Naval Architecture		■			■	■								■	■						■		
94	Marine Electrical Systems		■			■	■									■		■						
95	Ship Propulsion and Manoeuvrability		■			■	■											■	■	■	■			
96	Marine Propulsion Power Plant		■			■	■				■							■						
97	Marine Auxiliary Plant		■			■	■	■								■				■	■			

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