



Arrangements for:

**National Certificate in Engineering
Systems**

at SCQF level 5

Group Award Code: GD2F 45

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Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of National Qualification Group Awards.

History of changes

It is anticipated that changes will take place during the life of the qualification, and this section will record these changes. This document is the latest version and incorporates the changes summarised below.

Version number	Description	Date
06	Revision of Unit: J12W 75 - Energy: An Introduction has replaced F3FN 11 - Energy: An Introduction which finished on 31/07/2018. "Energy/Renewable cluster" Units Updated	09/07/21
05	Additional Units added to Material Removal Practice: Turning (F5WD 11) Material Removal Practice (F5WC 11)	July 2020
04	Revision of Unit: D36H 10 Work Experience <i>has been revised by</i> HF88 44 Work Placement <i>and will finish on</i> 31/07/2017.	22/07/16
03	Additional units added to the general optional section of the award Mechanical Engineering Principles F6X712 Electrical Principles F5HL12 Engineering Dynamics: An Introduction F5K6 12	23/03/16
02	H23W 75 Literacy <i>has been added as an alternative to</i> F3GB 11 Communication.	14/05/20

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1 Introduction

This is the Arrangements Document for the new Group Award; National Certificate in Engineering Systems, at SCQF level 5, which was validated in June 2011. This document includes: background information on the development of the Group Award, its aims, guidance on access, details of the Group Award structure, and guidance on delivery.

This Group Award has been designed to allow articulation to the National Certificate in Engineering Systems at SCQF level 6 and to be flexible enough to be used for stand-alone purposes. This Group Award will also prove to be suitable for progression to other SCQF level 6 engineering awards. The award is flexible enough to allow suitable candidates to fast track to engineering HNC awards, if appropriate Units are achieved.

The primary focus of this Group Award is to provide candidates with a range of engineering practical skills relevant to the title, supported by relevant theory where appropriate. This award is suitable for those candidates who wish to become skilled crafts persons/trades persons, maintenance fitters or operatives. The core engineering Units of the award encompass mechanical, electrical and electronic engineering within an engineering systems context. This means that the core engineering skills will be related to a chosen engineering discipline as shown in the option groupings in Section 5.1.

2 Rationale for the development of the Group Awards

The Group Award NC Engineering Systems at SCQF level 6 was inclusive of Oil and Gas (OPITO) engineering and operations technicians Modern Apprenticeship (MA), and was developed purely for these markets. However the sector identified a need for an award that underpins and articulates onto the level 6 award. This level 5 Group Award was developed for, but is not exclusive to, full time candidates that do not meet the entry requirements of the level 6 award. It may, for example, be deliverable in some form of school/college/industry partnership.

Also, the arrangement documents for the suite of NQGA engineering awards refer to the old award National Certificate in Engineering Practice (G587 04) as being replaced by two new awards; Mechanical Maintenance Engineering as well as Manufacturing Engineering both at SCQF level 5. However, after these awards were created, the Engineering Systems SCQF level 6 award was developed and the arrangements document for the Engineering Systems SCQF level 6 award refers to this as replacing the old award in Multi-Discipline Engineering as well as serving engineering systems. All documents refer to the need for such courses to meet industry and Sector Skills Council requirements. While these developments were taking place, the HNC/HND Engineering Systems award has proved to be successful with full-time candidates as well as part-time candidates in employment. This had created a need for a SCQF level 5 Group Award that was not served either by the new Maintenance Engineering or Manufacturing Engineering awards.

To address this gap this new Group Award has been developed to be inclusive of mechanical, electrical and electronic skills as well as taking on current and future developments in engineering and is particularly relevant to the findings of the 'Skills Action Plan' for Scotland produced by SEMTA.

The National Certificate in Engineering Systems at SCQF level 5 represents economic contribution to the key sectors of engineering industry identified by the Scottish Government such as Renewables and Oil and Gas. In facilitating progression to NC level 6 Frameworks, HN and then to degree level studies, the NC in Engineering Systems provides a progression path to higher qualifications and consequential better career prospects. This also clearly has a benefit to Scotland's economy.

Labour market information was pulled together from various sources including the Sector Skills Council (SEMTA) and Future Skills Scotland (see table 1).

Table 1: Types of Market Research used to support National Certificate in Engineering developments

Type of Research	Nature of Research
Desk based research	<ul style="list-style-type: none"> ◆ Analysis of trends in engineering as revealed in Futureskills Scotland/Sector Skills Council reports ◆ Consultation report prepared by an SQA consultant on an educational view of the engineering landscape up to and beyond 2010
Consultations with Further Education and Training Providers	<ul style="list-style-type: none"> ◆ Initial consultation with FE college members of HN Engineering Systems QST ◆ Initial questionnaire survey with FE colleges ◆ Consultation with the Scottish Association for Engineering Education (SAFEED).
Consultation with Employers	<ul style="list-style-type: none"> ◆ Initial questionnaire survey and consultation with local and national employers ◆ Discussions led by developing partner colleges with their respective employer companies

It is important to emphasise that the analysis, feedback and comments arising from the various market research exercises carried out for the development of the new NC Engineering awards have been used by the QDT to inform this development.

This Group Award also strongly supports the Skills for Scotland agenda, particularly in respect of providing some of the underpinning knowledge required of a modern apprenticeship programme in engineering,

A wide range of the valued practical skills, identified during the market research, have also been embedded to meet the needs of employers who wish learners to attain qualifications that meet current industry demands.

Further analysis and market research has identified that the awards will provide existing and new markets with opportunities to:

- ◆ Widen participation
- ◆ Provide a range of transferable skills
- ◆ Provide for 16–19 age groups
- ◆ Offer re-training opportunities for adult returners

The framework within this Group Award contain Units which will provide an opportunity to develop a candidate's ability to be flexible and to work co-operatively with others thus addressing the priorities contained with Curriculum for Excellence (CfE) and the qualities of good citizenship.

3 Aims of the Group Awards

In this section details are provided regarding the aims, rationale, target groups and employment opportunities for the National Certificate in Engineering Systems award at level 5

3.1 Principal aims of the Group Award

The principal aim of the NC Engineering Systems NQGA at level 5 is to prepare candidates for employment or higher education, from which they can pursue a career in the industry.

The framework of Units has been designed to ensure the following aims of the award.

- 3.1.1** Provide candidates with the necessary skills to work at craft level in an engineering environment or to progress to technician level courses.
- 3.1.2** Provide awards that create a route for progression towards meeting the academic requirements for Engineering Technician status,
- 3.1.3** Provide an award that give candidates a flexible articulation route to an HNC or HND then degree, in an engineering or related subject discipline.
- 3.1.4** Allow candidates to develop knowledge, understanding and skills in communication, numeracy and information and communication technology that underpin and support their studies in engineering.
- 3.1.5** Allow candidates to develop knowledge, understanding and skills in an area of engineering with a systems approach to engineering.
- 3.1.6** Allow candidates a degree of specialisation in engineering relevant to the area of engineering covered by the framework options.
- 3.1.7** On successful completion of award, allow candidates to achieve Core Skills in *Communication, Numeracy and Information and Communication Technology (ICT)* and provide candidates with opportunities to develop their *Problem Solving and Working with Others* Core Skills.

3.2 Other aims of the Group Award

Other aims of the National Certificate in Engineering Systems SCQF level 5 are to:

- 3.2.1** Enhance candidates' employment prospects.
- 3.2.2** Support candidates' career development and Continuing Professional Development.

3.2.3 Enable progression within the SCQF (Scottish Credit and Qualifications Framework).

3.2.4 Develop learning and transferable skills.

The following table highlights how both the principal and other aims are mapped against the mandatory and restricted core Units, and collectively the optional Units.

Table 2: Mapping of Framework against Aims

Unit title	Code	3.1.1	3.1.2	3.1.3	3.1.4	3.1.5	3.1.6	3.1.7	3.2.1	3.2.2	3.2.3	3.2.4
Mandatory												
Communication	F3GB 11	✓	✓	✓	✓			✓	✓	✓	✓	✓
Mathematics: Craft 1	F3HV 11	✓	✓	✓	✓			✓	✓	✓	✓	✓
Engineering: Using Information Technology	F5D6 11	✓	✓	✓	✓			✓	✓	✓	✓	✓
Engineering Systems: Principles	FN3J11	✓	✓	✓		✓			✓	✓	✓	✓
Engineering Systems: Test and Measurement	FN3L11	✓	✓	✓		✓			✓	✓	✓	✓
Engineering Systems: Applications	FN3K11	✓	✓	✓		✓			✓	✓	✓	✓
Restricted core <i>Candidates must complete two out of five restricted core Units</i>												
Electrical Wiring Skills	F5HP 11	✓	✓	✓			✓		✓	✓	✓	✓
Engineering Workshop Skills	F5WA 11	✓	✓	✓			✓		✓	✓	✓	✓
Practical Electronics	F5JJ 11	✓	✓	✓			✓		✓	✓	✓	✓
Engineering Materials	F5W9 11	✓	✓	✓			✓		✓	✓	✓	✓
Graphical Engineering Communication	F5FP 11	✓	✓	✓	✓			✓	✓	✓	✓	✓
Optional Section <i>Candidates must complete four out of 51 optional Units</i>												
Optional Units		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

3.3 Target groups

This National Certificate in Engineering Systems at SCQF level 5 is intended for school leavers, adult returners and those in employment. However, the primary focus is different from other engineering level 5 awards in that it has been designed to provide a balance of relevant technological principles and practical applications using a ‘top-down’ systems approach.

The award can be delivered by full-time, day-release or other part-time modes of delivery (eg block-release, evening class, etc). For example, it may be delivered on a full-time basis to school leavers and adult returners where the delivery may be combined with a suitable SVQ/NVQ, such as Performing Engineering Operations at level 1 and 2 (SCQF level 4 and 5), providing candidates with opportunities to acquire a wide range of skills and knowledge as part of a pre-apprenticeship

programme. This award may also be delivered to candidates in employment to provide underpinning knowledge and skills for a related SVQ/NVQ that they may have embarked upon.

3.4 Employment opportunities

The NC Engineering Systems at SCQF level 5 has been developed to provide the knowledge, understanding and skills for those seeking employment now, or at some future date, as an engineer. Such employment opportunities arise frequently in both private business and in the public sector.

It has been devised to allow centres flexibility, with regard to options offered, which will allow candidate progression to either a level 6 award or an HNC/HND award. This flexibility also allows certification of the award through either through single discipline topics or along a cross-discipline route as individual single options can be taken from any option stream. The framework in section 5 should prove flexibility for centres to meet the requirements for local employers and individual clients.

4 Access to Group Awards

4.1 Access Requirements

Access to this Group Award, is similar to that employed with other engineering Group Awards at SCQF level 5 and should be based on a broad approach to candidate selection. However, it is essential that candidates have the potential and ability to complete the award successfully. The course would be suitable for learners who have experienced breadth and depth of learning across SCQF level 4 mathematics and/or a science based subject as well as communications at this level.

The following are simply recommendations and should not be seen as a definitive or prescriptive list of entry requirements. The purpose is simply to give guidance on the selection of suitable candidates.

It is at the discretion of the presenting centre whether to consider applicants with a different experiential background who could benefit from taking the course or Units within the course, eg adult returners and overseas candidates with relevant work experience.

The following list is not exhaustive but these current technology based qualifications are deemed to be relevant.

- ◆ Mathematics Standard Grade at General level
- ◆ Mathematics at Intermediate 1
- ◆ Mathematics at SCQF level 4
- ◆ Physics Standard Grade at General level
- ◆ Physics at Intermediate 1
- ◆ Physics at SCQF level 4
- ◆ Technological Studies Standard Grade at General level
- ◆ Technological Studies at Intermediate 1
- ◆ Skills for Work Engineering at Intermediate 1
- ◆ Skills for Work Energy at Intermediate 2

4.2 Core Skills Entry Profile

The recommended minimum Core Skills entry profile for the National Certificate in Engineering Systems at SCQF level 5:

<i>Communication</i>	SCQF level 4
<i>Numeracy</i>	SCQF level 4
<i>Information and Communication Technology (ICT)</i>	SCQF level 4
<i>Problem Solving</i>	SCQF level 4
<i>Working with Others</i>	SCQF level 3

4.3 Alternative Access Arrangements

The presenting centre may operate alternative access arrangements in cases where the candidate has the required competences in a given area. These arrangements are as follows:

- ◆ Assessment on demand
- ◆ Credit transfer
- ◆ Accreditation of prior learning
- ◆ Relevant work experience

5 Group Award structure

National Certificate in Engineering Systems at SCQF level 5

This award, like other SCQF level 5 engineering awards, has been designed with the following three sections:

- ◆ Mandatory core
- ◆ Restricted core
- ◆ Optional, which includes the following clusters:
 - General
 - Mechanical
 - Electrical/Electronic
 - Aerospace
 - Fabrication and Welding
 - Energy/Renewables

Mandatory Core (6 credits)

- ◆ F3GB 11 Communication Core Skills Unit (1 credit at SCQF level 5)
- ◆ F3HV 11 Mathematics: Craft 1 (1 credit at SCQF level 5)
- ◆ F5D6 11 Engineering: Using Information Technology (1 credit at SCQF level 5)
- ◆ FN3J 11 Engineering Systems: Principles (1 credit at SCQF level 5)
- ◆ FN3L 11 Engineering Systems: Test and Measurement (1 credit at SCQF level 5)
- ◆ FN3K 11 Engineering Systems: Applications (1 credit at SCQF level 5)



Restricted Core (a minimum of 2 credits)

Two out of 5 Unit credits at SCQF level 5 required which relate closely to the context of the award.



Optional Section (4 credits)

A choice of **any 4** Unit credits from **any** cluster within the Group Award. These credits do not necessarily have to come from the same cluster but should reflect local needs.

5.1 Framework

National Certificate — 12 credits (72 SCQF points)

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Mandatory core (Total 6 credits)				
Communication OR *Literacy	F3GB 11 H23W 75	6	5	1
Mathematics: Craft 1	F3HV 11	6	5	1
Engineering: Using Information Technology	F5D6 11	6	5	1
Engineering Systems Principles	FN3J11	6	5	1
Engineering Systems Test and Measurement	FN3L11	6	5	1
Engineering Systems Applications	FN3K11	6	5	1
Restricted core (minimum of 2 credits from 5)				
Electrical Wiring Skills	F5HP 11	6	5	1
Engineering Workshop Skills	F5WA 11	6	5	1
Practical Electronics	F5JJ 11	6	5	1
Engineering Materials	F5W9 11	6	5	1
Graphical Engineering Communication	F5FP 11	6	5	1
General cluster				
Mechanical Engineering Principles	F6X712	6	6	1
Electrical Principles	F5HL12	6	6	1
Engineering Dynamics: An Introduction	F5K6 12	6	6	1
Mathematics: Craft 2	F3HW 11	6	5	1
Computer Aided Draughting (CAD) for Engineers	F5H4 11	6	5	1
Mathematics: Technician 1	F3HX 12	6	6	1
Work Placement	HF88 44*	6	4	1
Mechanical Engineering Principles	F5K1 11	6	5	1
Electrical Principles	F5HK 11	6	5	1
Engineering Quality: An Introduction	F5FM 12	6	6	1
Engineering Project	F5DE 11	6	5	1
Health and Safety: Engineering	F5DG 11	6	5	1
Mechanical cluster				
Engineering Assembly Skills	F5W6 11	6	5	1
Robotic and Automated Systems	F5H6 12	6	6	1
Engineering Dimensional Control	F5W7 11	6	5	1
Engineering Prime Movers	F5K4 11	6	5	1
Pneumatics and Hydraulics	F5K2 11	6	5	1
Maintenance Safety	F5J4 11	6	5	1
Plant Installation	F5J2 11	6	5	1
Plant Maintenance Practice	F5J3 11	6	5	1
Material Removal Practice: Turning	F5WD 11	6	5	1
Material Removal Practice	F5WC 11	6	5	1

Electrical/Electronics cluster				
Earthing Systems	F5HE 11	6	5	1
Rotating Electrical Machines	F5JK 11	6	5	1
Safe Working Practices	F5JL 11	6	5	1
Electrical Plant Safety and Maintenance	F5HH 11	6	5	1
Fundamental Electronics	F5DH 11	6	5	1
Electronic Test Equipment and Measurement	F5DC 11	6	5	1
Electrical Testing and Measurement	F5HM 11	6	5	1
Combinational Logic	F5HA 11	6	5	1
Soldering and Circuit Assembly Techniques	F5JW 11	6	5	1
Electronic Simulation and Testing	F5HS 11	6	5	1
Applications of Programmable Logic Controllers	F5H0 12	6	6	1
Transformation and Rectification	F5JY 11	6	5	1
Aeronautical cluster				
Aircraft Maintenance	F5GP 11	6	5	1
Aviation Practice	F5H2 11	12	5	2
Aircraft Design: An Introduction	F5GN 12	6	5	1
Aeronautical Engineering Fundamentals	F5GM 12	6	6	1
Aircraft Power Plant	F5GX 12	6	6	1
Fabrication and Welding cluster				
Metal Inert Gas (MIG) Metal Active Gas (MAG) Welding Skills	F5F7 12	6	6	1
Manual Metal Arc (MMA) Welding Skills	F5F6 12	6	6	1
Tungsten Inert Gas (TIG) Welding Skills	F5FC 12	6	6	1
Fabrication Skills	F5FG 11	12	5	2
Thermal Joining Skills	F5F2 11	6	5	1
Thermal Cutting Skills	F5F1 11	6	5	1
Energy/Renewable cluster				
Energy: An Introduction	J12W 75*	6	5	1
Energy: Domestic Wind Turbine Systems	J12Y 75*	6	5	1
Energy: Domestic Solar Hot Water Systems	J130 75*	6	5	1
Energy: Employability and Careers	J12X 75*	3	5	0.5
Energy and the Individual	J131 75*	3	5	0.5
Energy: Oil/Gas Extraction	J133 75*	3	5	0.5
Energy: Conventional Technologies and the Grid	J132 75*	3	5	0.5
Domestic Wind Systems	FF2R 12	6	6	1
Domestic Hydro Generation Systems	FF2T 12	6	6	1
Domestic Fuel Cell Technology Systems	FF2V 12	6	6	1
Off Shore Renewable Energy	FV2X11	6	5	1

5.2 Mapping information

The Sector Skills Council (SSC), SEMTA, have published the National Occupational Standards for the various disciplines in Engineering. The main aim of this award is to complement the existing suite of qualifications that supports these disciplines, and the nature of this award is to provide flexibility to address the gap of provision at this level. It would be too detailed to map against all the National Occupational Standards available. Therefore the QDT decided to map against selected vocational qualifications in Engineering, refer to Appendix 1:

- ◆ Performing Engineering Operations: SVQ level 2
- ◆ Engineering Maintenance: SVQ level 3 — Mechanical
- ◆ Engineering Maintenance: SVQ level 3 — Electrical
- ◆ Engineering Maintenance: SVQ level 3 — Electronic
- ◆ Engineering Maintenance: SVQ level 3 — Engineering Systems

The following table is a summary of the mapping against the National Occupational Standards:

Table 3: Summary of Mapping against National Occupational Standards

Unit title	NOS	PEO: SCQ level 2	SVQ level 3: Mechanical	SVQ level 3: Electrical	SVQ level 3: Electronic
Mandatory	Code				
Communication	F3GB 11	✓	✓	✓	✓
Mathematics: Craft 1	F3HV 11	✓	✓	✓	✓
Engineering: Using Information Technology	F5D6 11	✓	✓	✓	✓
Engineering Systems: Principles	FN3J 11	✓	✓	✓	
Engineering Systems: Test and Measurement	FN3L 11				
Engineering Systems: Applications	FN3K 11				
Restricted core candidates must complete two out of five restricted core Units					
Electrical Wiring Skills	F5HP 11	✓	✓	✓	
Engineering Workshop Skills	F5WA 11	✓	✓	✓	✓
Practical Electronics	F5JJ 11	✓	✓	✓	✓
Engineering Materials	F5W9 11				
Graphical Engineering Communication	F5FP 11	✓	✓	✓	✓
Optional Section Candidates must complete four out of 51 optional Units					
Optional Units		✓	✓	✓	✓

5.3 Opportunities to develop Core Skills

Opportunities to develop aspects of the Core Skills within the Group Award at SCQF level 5 are identified in the table in Appendix 2. Progress in development will be dependent on the delivery centre resources and the approaches taken to learning and teaching.

The following table provides details of the recommended entry levels and minimum exit levels of this Group Award.

Table 5: Recommended Core Skills Entry/Exit Level

Core Skill	Recommended Entry Level (SCQF level)	Exit Level (Minimum)
Communication	4	5
Information and Communication Technology (ICT)	4	5
Numeracy	4	5*
Problem Solving	4	4
Working with Others	3	4

Tutors/Lecturers should also seek opportunities to integrate Core Skills within their teaching and learning programmes as shown in Appendix 2. Such opportunities may include, but not be limited to, the following:

Core Skills Exit Profile

The minimum Core Skills exit profile for this award is in line with all National Certificates in Engineering at SCQF level 5 and is as follows:

Communication at SCQF level 5 — F3GB 11: the *Communication* Core Skills Unit at SCQF level 5 is one of the six Units in the mandatory core section of course.

Using Number Core Skill component at SCQF level 5 is embedded in the mandatory Unit *F3HV 11: Mathematics: Craft 1*.

*Only fully embedded if centre chooses the specific options of Graphical Engineering Communication and Engineering Dimensional Control within the Restricted core section.

Information and Communication Technology (ICT) at SCQF level 5 is embedded in the mandatory Unit *F5D6 11: Engineering: Using Information Technology*.

In addition, the following guidelines indicate where *Problem Solving* and *Working with Others* can be integrated into course delivery.

Problem Solving

All elements of the Core Skill of *Problem Solving* underpin the technical competencies developed in the award. As each Unit is undertaken, candidates learn to identify, consider and take into account a range of factors impacting on practical engineering work. Specifications are interpreted, and decisions are made on techniques, tools and materials which comply with regulatory and safety requirements. Implementing these effectively includes the ability to adapt and modify approaches as necessary. Inspection and testing provide opportunities for the review and evaluation of achievement, with assessor guidance and feedback.

Working with Others

Small group investigative and experimental activities as part of formative work will support candidates particularly those with no industrial experience. All practical learning and assessment tasks can develop team working skills and support the ability to form working relationships in practical vocational contexts. Feedback from assessors on good practise will be ongoing. Organised site visits can involve contributing and co-operating in group activities and observation of industry practice.

Further Core Skills development opportunities are identified in each of the individual NQ Unit specifications.

5.4 Articulation, professional recognition and credit transfer

This award provides progression to the National Certificate in Engineering Systems at SCQF level 6. It will also provide opportunities for progression within the industry or to further academic study. This includes a number of SQA awards such as NCs in Engineering at SCQF level 6 and HNCs in Engineering. This is subject to undertaking Units relevant to the chosen discipline and to Core Skills requirements.

See Appendix 3.

6 Approaches to delivery and assessment

Appendix 4, provides examples of various indicative sequences for delivering this Group Award for both full and part time candidates as well as a fast track route for articulation to HN courses. Like other SCQF level 5 engineering awards its framework has three sections:

- ◆ Mandatory core
- ◆ Restricted core
- ◆ Optional

From the beginning of the development of the existing suite of National Certificates in Engineering, market research evidence pointed clearly to the inclusion of three common mandatory Units in *Communication, Numeracy/Mathematics* and *Information Technology* within each NC. It is important that these mandatory core Units are not delivered in isolation but rather their delivery and assessment is integrated fully with the engineering Units in the award. For example, experience shows that teaching mathematics within an engineering context helps candidates to grasp more effectively important numerical and mathematical concepts, formulae and problem solving approaches. Likewise information technology has more

relevance to candidates when it is set within an engineering context. For this reason, the Unit *Engineering: Using Information Technology* at SCQF level 5 has an Outcome where candidates have to use and apply engineering software.

Experience has shown that centres have faced many challenges when delivering and assessing Communication within engineering programmes of study. Candidates struggle to see the relevance of *Communication* when it is taught in isolation to the rest of an engineering course. This issue has been addressed in the new awards by including the Core Skill *Communication* Unit at SCQF level 5 in all National Certificates in Engineering at level 5. In doing this it is hoped that centres will try to deliver and assess Core Skills in *Communication* as part of the delivery and assessment of engineering Units. For example, an activity within an engineering Unit which requires candidates to engage in group discussions provides lecturers with opportunities not only to develop candidate's technical skills but also their oral communication skills. Likewise report writing in engineering Units should provide opportunities to develop important written communication skills.

The Engineering Systems NC adds an additional dimension in that the mandatory core also includes an inclusive systems approach to engineering, ie it covers the three main areas of mechanical, electrical and electronic engineering. The context of this systems approach can be using any of the themes identified in the groupings of options. Various indicative timetables are shown in Appendix 4.

Content and context

The mandatory core section of this award has been designed to reflect as closely as possible the title of the Group Award and as such it is this section that defines the unique nature of the award. For example, a candidate taking a National Certificate in Engineering Systems at SCQF level 5 will study three Core Skills, in common with other engineering awards at this level, plus three engineering systems Units:

- ◆ *Engineering Systems Principles*
- ◆ *Engineering Systems Test and Measurement*
- ◆ *Engineering Systems Applications*

The restricted core section, where a minimum of 2 credits are required, allows centres to give each course a practical or theoretical bias. Some centres may wish to deliver all five Units in the restricted core and choose one optional Unit from elsewhere in the framework.

The optional clusters of the National Certificate in Engineering Systems are designed to allow some degree of flexibility in the choice of Units studied as part of the National Certificate programme. This will allow centres to focus on specific areas of engineering if they so wish or to adopt a cross discipline approach.

Delivery and assessment

This award can be delivered by a range of different delivery modes. For example, it may be delivered on a day-release, block-release or evening class basis to candidates in employment. Alternatively, it may be delivered on a full-time basis to school leavers, adult returners, etc.

Examples of possible part-time and full-time timetables are shown in Appendix 4.

Tutors/lecturers may use a variety of teaching and learning approaches in delivering the Units in the award. These may include lecturing, group work, laboratory exercises, practical work, computer simulation (using appropriate software packages), investigative work (including the use of the internet), project work and case studies. The use of open and distance learning and online materials may help to supplement and support the learning that takes place in the classroom, laboratory or workshop.

Industrial visits are strongly recommended wherever possible to allow candidates to see examples of engineering systems in operation and to observe the application of engineering principles and practices in real engineering environments.

Centres, working on their own or in partnership, might also wish to consider the following approaches in delivering the Group Award and/or individual Units:

- ◆ Development of paper based and/or electronic assessment and teaching and learning materials for individual NQ Units.
- ◆ Identification and sharing of good candidate learning support materials already available on the internet.
- ◆ Identification of various sources of information, including those found on the internet, to allow candidates to undertake more in-depth investigations in given subject areas.
- ◆ Use of e-mentoring arrangements to support candidates who study at a distance.

Centres should take account of information contained in the recommended entry statement in NQ Unit specifications in sequencing the delivery of Units.

Core Skills

Tutors/Lecturers should also seek opportunities to integrate Core Skills within their teaching and learning programmes as shown in Appendix 4, and take note of the recommendations highlighted in the previous Section 5.4: Development of Core Skills.

Assessment

The assessment strategy adopted for this award should be in line with that used for all other engineering SCQF level 5 awards.

The strategy should ensure that:

- 1 Consistent, rigorous and efficient approaches are adopted to the development and administration of NQ Engineering assessment instruments, which satisfy nationally agreed standards.
- 2 The assessment load on candidates and staff is sensible and that assessment does not unduly detract from teaching and learning.
- 3 As far as possible reliable and rigorous verification processes are put in place in order to ensure that consistent national standards are achieved for all NQ Engineering Unit assessments.

Assessment support packs

Assessment support packs are available for some of the Units included in this award and can be found on the secure part of the SQA website.

Formative Assessment

Formative assessment should be used throughout the delivery of NQ Units to reinforce learning, build candidates' confidence and prepare them for summative assessment.

7 General information for centres

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* (www.sqa.org.uk).

Open learning

Advice on the use of online and open and distance learning materials is given in individual NQ Unit specifications where it is considered that these modes of delivery are appropriate. However, where such modes of delivery are used due regard must be paid to assessment. Planning would be required by centres to ensure the sufficiency and authenticity of candidate evidence.

Arrangements would be required to be put in place to ensure that the assessment or assessments were conducted under the conditions specified in the Unit specification. For example, in the case of a Unit which involved a test a centre would have to make arrangements for the test to be conducted under controlled, supervised conditions. Likewise, where a Unit involves a practical based assessment, a centre would have to make arrangements for candidates to come into the centre (or other appropriate venue) to undertake the assessment under the conditions specified in the NQ Unit specification.

8 General information for candidates

This award is particularly suitable for you if you are seeking a broad introduction to the world of engineering with particular emphasis given to mechanical, electrical and electronic engineering. The award contains a suitable balance of practical work and supporting theory and is suitable for candidates who have experienced breadth and depth of learning across SCQF level 4 Mathematics and/or a science based subject as well as communications at this level or relevant experience.

On successful completion of the award, you could progress to either a suitable SCQF level 6 National Certificate in Engineering or to an HNC in Engineering depending upon options completed as part of this award.

Award content

The NC course consists of 12 credits, 6 of which are mandatory, 2 are taken from a restricted choice of five subjects and the remaining 4 can be selected from a variety of areas including Mechanical, Electrical, Fabrication and Welding, Aeronautics and Energy/Renewables.

The 6 mandatory credits contain three Engineering Systems Units:-

- ◆ Principles
- ◆ Test and Measurement
- ◆ Applications

Whilst completing these Units you will obtain the necessary skills to analyse mechanical, electronic, electrical systems and use instrumentation to measure a variety of quantities, therefore obtaining practical skills backed up by theory.

The remaining three mandatory Units are in communication, mathematics and information technology. These are essential skills to have in any sector of employment where you will have to be confident in communicating with people at all levels within an organisation as well as being able to understand technical information. Mathematics is crucial as it will provide you with the skills needed in other engineering subjects such as being able to transpose formulae. IT skills are also important in the workplace to enable you to produce reports, presentations, conduct internet research and communicate by e-mail.

The two Units to be taken from the restricted core will be selected with your options in mind. The possibilities are *Graphical Engineering Communication*, *Engineering Materials* or more practical classes in either Mechanical, Electrical or Electronic workshops.

The remaining four Units can be taken from any of the options stated above to allow you to specialise in an engineering area of your choice, eg Renewables.

This Group Award is suitable for both full-time and part-time candidates depending upon your centre of study.

Learning and teaching

You should expect a variety of learning and teaching methods to be used by your lecturers on the NC in Engineering Systems including lecturing, practical, demonstration, measurement, testing, computer simulation, group work and investigation.

Industrial visits may also be included to allow you to see engineering systems in a real context.

Assessment

You will be continually assessed during the course by means of practical exercises and written text. Your Tutor/lecturer will tell you at the start of each Unit what format the assessments will take.

Entry requirements

To gain access onto the NC Engineering Systems level 5 you will need to have qualifications at SCQF level 4 in appropriate subjects such as Mathematics, Physics, Technological Studies and Skills for Work. Alternatively, you may be a mature candidate with relevant engineering work experience.

Progression

On successful completion of the Engineering Systems NC at SCQF level 5, you will be able to progress onto a level 6 engineering NC programme. However, if you have shown particular ability in areas such as mathematics, the centre may allow you to fast track by completing subjects at level 6 so that you can progress directly onto an HNC.

Alternatively, you may use the SCQF level 5 qualification to gain employment as an apprentice engineer within your specialised area or to gain work at a craft level.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

9 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a new way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at www.scqf.org.uk

SCQF credit points: One SCQF credit point equates to 10 hours of learning. NQ Units at SCQF levels 2–6 are worth 6 SCQF credit points, NQ Units at level 7 are worth 8 SCQF points.

SCQF levels: The SCQF covers 12 levels of learning. National Qualification Group Awards are available at SCQF levels 2–6 and will normally be made up of National Units which are available from SCQF levels 2–7.

Dedicated Unit to cover Core Skills: This is a non-subject Unit that is written to cover one or more particular Core Skills.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie outwith automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the National Certificate/National Progression Award from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised National Certificates/National Progression Awards are those developments or revisions undertaken by a group of centres in partnership with SQA.

10 Appendices

Appendix 1: Links to National Occupational Standards

Appendix 2: Core Skills opportunities

Appendix 3: Progression and Articulation within the suite of Engineering Group Awards

Appendix 4: Indicative sequence of delivery

Appendix 1: Links to National Occupational Standards

The following tables match those in other Engineering NQGA Arrangements Documents. Only tables relating to electronics, electrical and mechanical strands are included, though additional routes exist.

Level 5 Electronics Award

Table 1		
Reference No.	QCA Code	Title
EEE3/001	Y/101/8210	Complying with statutory regulations and organisational safety requirements
EEE3/002	L/101/7250	Using and interpreting engineering drawings and documents
EEE3/003	R/101/7251	Working efficiently and effectively in engineering
EEE3/006	R/102/9738	Providing technical guidance to others
EEE3/010	Y/102/9742	Selecting and preparing materials and components for manufacturing
EEE3/014	M/102/9746	Processing electronic components within the manufacturing system
EEE3/015	T/102/9747	Checking the compliance of electronic components against the specification
EEE3/017	F/102/9749	Assembling and wiring electronic equipment and systems
EEE3/018	T/102/9750	Testing post-production electronic components and circuits
EEE3/020	F/102/9752	Preparing facilities for testing electronic components and circuits

Electronics level 5 — Mapping

Unit title	level	001	002	003	006	010	014	015	017	018	020
Communication	5	✓	✓	✓							
Information Technology	5	✓	✓	✓							
Mathematics/Numeracy	5		✓	✓							
Electrical Principles	5	✓	✓	✓						✓	
Fundamental Electronics	5	✓	✓	✓	✓	✓	✓		✓	✓	✓
Electronic Test Equipment and Measurement	5	✓	✓	✓				✓		✓	✓
Soldering and Circuit Assembly Techniques	5	✓	✓	✓		✓	✓	✓	✓	✓	✓
Semiconductor Applications	5	✓	✓	✓	✓		✓			✓	✓
Combinational Logic	5	✓	✓	✓	✓		✓			✓	✓
Electronic Simulation and Testing	5	✓	✓	✓						✓	✓
Practical Electronics	5	✓	✓	✓		✓	✓	✓	✓	✓	✓
Transformation and Rectification	5	✓	✓	✓	✓					✓	✓
Safe Working Practice	5	✓	✓	✓			✓	✓	✓	✓	✓
Circuit Element Devices	5	✓	✓	✓	✓		✓	✓		✓	✓

NQGA — NC Electrical Engineering levels 5 and 6

Alignment to National Occupational Standards and Units

Table 1 indicates **SEMTA** Units used in the mapping exercise

SEMTA Units: Electrical and Electronic Engineering level 3

Table 1	
Reference No.	Title
EEE3/001	Complying with statutory regulations and organisational safety requirements
EEE3/002	Using and interpreting engineering drawings and documents
EEE3/003	Working efficiently and effectively in engineering
EEE3/006	Providing technical guidance to others
EEE3/026	Assembling rotor and armature windings
EEE3/027	Assembling stator windings
EEE3/028	Assembling and fitting commutators
EEE3/029	Balancing assembled rotors or armatures
EEE3/030	Assembling and fitting electrical rotating equipment
EEE3/034	Carrying out functional tests on electrical equipment
EEE3/035	Locating and diagnosing faults in electrical systems and equipment

NC Electrical Engineering level 5 — Mapping

Unit title	level	001	002	003	006	026	027	028	029	030	034	035
Communication	5	✓	✓	✓								
Engineering: Information Technology	5	✓	✓	✓								
Mathematics: Craft 1	5		✓	✓								
Electrical Principles	5	✓	✓	✓								✓
Fundamental Electrical Systems	5	✓	✓	✓	✓							
Electrical Testing and Measurement	5	✓	✓	✓	✓						✓	✓
Electrical Wiring Skills	5	✓	✓	✓	✓						✓	
Earthing Systems	5	✓	✓	✓	✓						✓	✓
Rotating Electrical Machines	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Safe Working Practices	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Electrical Plant Safety and Maintenance	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

NQGA — Manufacturing Engineering at SCQF level 5 and level 6

Alignment to National Occupational Standards (NOS)

Table 1 indicates Units used in the mapping exercise

Table 1: NOS — Mechanical Manufacturing Engineering		
Ref.	NOS No.	Unit title
1	MME3.01	Complying with Statutory Regulations and Organisational Safety Requirements
2	MME3.02	Using and Interpreting Engineering Data and Documentation
3	MME3.03	Working Efficiently and Effectively in Engineering
4	MME3.04	Setting Centre Lathes for Production
5	MME3.05	Machining Components Using Centre Lathes
6	MME3.08	Setting Milling Machines for Production
7	MME3.09	Machining Components Using Milling Machines
8	MME3.30	Loading and Proving NC/CNC Machine Tool Programs
9	MME3.31	Carrying Out CNC Machine Tool Programming
10	MME3.32	Setting NC/CNC Turning Machines for Production
11	MME3.33	Machining Components Using NC/CNC Turning Machines
12	MME3.34	Setting NC/CNC Milling Machines for Production
13	MME3.35	Machining Components Using NC/CNC Milling Machines
14	MME3.50	Setting NC/CNC Machining Centres for Production
15	MME3.51	Machining Components Using NC/CNC Machining Centres
16	MME3.60	Producing Components Using Hand Fitting Techniques
17	MME3.61	Assembling Mechanical Products
18	MME3.72	Repairing and Modifying Mechanical Assemblies
19	MME3.73	Checking Completed Assemblies Comply with Specification

NQGA Manufacturing Engineering (SCQF level 5)																					
National Occupational Standards																					
Unit title	C/RC	level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Mathematics	C	5		✓							✓										
Information Technology	C	5	✓	✓						✓	✓	✓	✓	✓	✓	✓	✓				
Communication	C	5	✓	✓	✓																
Engineering Assembly Skills	RC	5	✓	✓	✓													✓	✓	✓	✓
Engineering Dimensional Control	RC	5		✓	✓		✓		✓				✓		✓		✓	✓			
Engineering Manufacturing Processes	RC	5		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Engineering Workshop Skills	RC	5	✓	✓	✓													✓	✓		
Industrial CNC Machining	RC	5	✓	✓	✓					✓		✓	✓	✓	✓	✓	✓				
Engineering Material Removal Principles	RC	5		✓		✓	✓	✓	✓			✓	✓	✓	✓	✓	✓				
Material Removal Practice: Turning	RC	5	✓	✓	✓	✓	✓														
Material Removal Practice: Milling	RC	5	✓	✓	✓			✓	✓												

Appendix 2: Core Skills opportunities

NC Engineering Systems SCQF level 5 Framework Units — Core Skills Development Opportunities

Note: CT = Critical Thinking P & O = Planning & Organisation: R and E = Reviewing & Evaluating

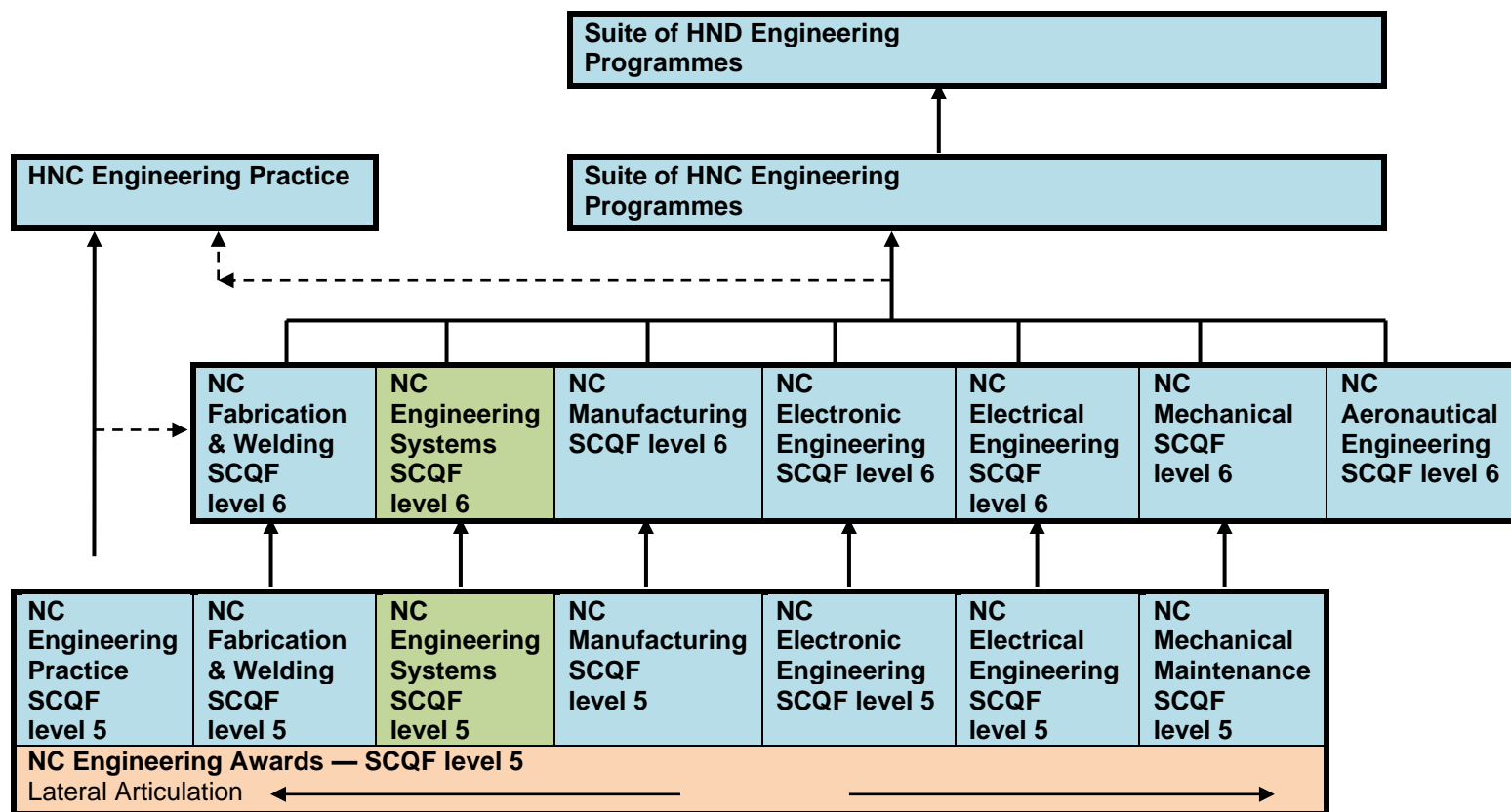
E () = Embedded Core Skill (SCQF level)

Unit title	Communication			Numeracy		Using Information Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Info.		CT	P & O	R & E	
Communication	SCQF level 5	SCQF level 5	SCQF level 5							
Mathematics: Craft 1				SCQF level 5	SCQF level 5					
Engineering: Using Information Technology						SCQF level 5				SCQF level 5
Engineering Systems: Principles	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5				
Engineering Systems: Test and Measurement	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	
Engineering Systems: Applications	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	
Electrical Wiring Skills				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	
Engineering Workshop Skills				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5		SCQF level 5
Practical Electronics		SCQF level 5	SCQF level 5				SCQF level 5	SCQF level 5		
Engineering Materials							SCQF level 5	SCQF level 5	SCQF level 5	
Graphical Engineering Communication					SCQF level 5					
Mathematics: Craft 2				SCQF level 5	SCQF level 5					
Computer Aided Draughting (CAD) for Engineers				SCQF level 5	SCQF level 5	SCQF level 5				
Mathematics: Technician 1		SCQF level 6	SCQF level 6							
Work Experience							SCQF level 4	SCQF level 4	SCQF level 4	SCQF level 4
Mechanical Engineering Principles				SCQF level 5			SCQF level 5	SCQF level 5		
Electrical Principles				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	
Engineering Quality: An Introduction							SCQF level 6	SCQF level 6	SCQF level 6	SCQF level 5

Unit title	Communication			Numeracy		Using Information Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Info.		CT	P & O	R & E	
Engineering Project		SCQF level 5			SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	
Health and Safety: Engineering							SCQF level 5	SCQF level 5		SCQF level 5
Engineering Assembly Skills			SCQF level 5				SCQF level 5	SCQF level 5		SCQF level 5
Robotic and Automated Systems	SCQF level 5	SCQF level 5					SCQF level 5		SCQF level 5	
Engineering Dimensional Control					SCQF level 5					
Engineering Prime Movers							SCQF level 5			SCQF level 4
Pneumatics and Hydraulics					SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 4
Maintenance Safety	SCQF level 5	SCQF level 5	SCQF level 5							SCQF level 4
Plant Installation			SCQF level 5		SCQF level 5		SCQF level 5	SCQF level 5		SCQF level 4
Plant Maintenance Practice			SCQF level 5				SCQF level 5			SCQF level 4
Earthing Systems	SCQF level 5	SCQF level 5					SCQF level 5	SCQF level 5	SCQF level 5	
Rotating Electrical Machines		SCQF level 5	SCQF level 5			SCQF level 5				
Safe Working Practices		SCQF level 5	SCQF level 5						SCQF level 5	SCQF level 6
Electrical Plant Safety and Maintenance						SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 5
Fundamental Electronics							SCQF level 5	SCQF level 5		
Electronic Test Equipment and Measurement							SCQF level 5	SCQF level 5		
Electrical Testing and Measurement				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5
Combinational Logic				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5		
Soldering and Circuit Assembly Techniques				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5		SCQF level 5
Electronic Simulation and Testing						SCQF level 5				SCQF level 5
Applications of Programmable Logic Controllers	SCQF level 5	SCQF level 5			SCQF level 5		SCQF level 5			
Transformation and Rectification				SCQF level 5	SCQF level 5					

Unit title	Communication			Numeracy		Using Information Technology	Problem Solving			Working with Others
	Read	Write	Oral	Using Number	Using Graphical Info.		CT	P & O	R & E	
Aircraft Maintenance							SCQF level 5	SCQF level 5		
Aviation Practice				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5
Aircraft Design: An Introduction			SCQF level 6				SCQF level 6	SCQF level 6		
Aeronautical Engineering Fundamentals	SCQF level 6	SCQF level 6	SCQF level 6							
Aircraft Power Plant			SCQF level 6		SCQF level 6					
Metal Inert Gas (MIG)/Metal Active Gas (MAG) Welding Skills			SCQF level 6				SCQF level 6	SCQF level 6		
Manual Metal Arc (MMA) Welding Skills							SCQF level 6			SCQF level 6
Tungsten Inert Gas (TIG) Welding Skills							SCQF level 6			SCQF level 6
Fabrication Skills					SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	
Thermal Joining Skills							SCQF level 5	SCQF level 5	SCQF level 5	
Thermal Cutting Skills				SCQF level 5	SCQF level 5		SCQF level 5	SCQF level 5	SCQF level 5	
Energy: An Introduction						SCQF level 5				
Energy: Domestic Solar Hot Water Systems							SCQF level 5	SCQF level 5		
Energy: Domestic Wind Turbine Systems							SCQF level 5	SCQF level 5		
Energy: Employability and Careers	SCQF level 5	SCQF level 5				SCQF level 5				
Energy and the Individual	SCQF level 5	SCQF level 5	SCQF level 5			SCQF level 5				
Energy: Oil/Gas Extraction	SCQF level 5	SCQF level 5	SCQF level 5			SCQF level 5				
Energy: Conventional Technologies and the Grid	SCQF level 5	SCQF level 5	SCQF level 5			SCQF level 5				
Off Shore Renewable Energy Systems	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	(E) SCQF level 5			
Domestic Wind Systems				SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5			SCQF level 4
Domestic Hydro Generation Systems				SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 4
Domestic Fuel Cell Technology Systems				SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5	SCQF level 5		SCQF level 4

Appendix 3: Progression and Articulation within the suite of Engineering Group Awards



Appendix 4: Indicative sequence of delivery

National Certificate in Engineering Systems purely with an **Engineering focus** — 18 credits to full-time candidates

Mandatory core — 6 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1
Engineering Systems: Principles	1	5	FN3J 11	2
Engineering Systems: Test and Measurement	1	5	FN3L 11	2
Engineering Systems: Applications	1	5	FN3K 11	2

Restricted core — 2 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Mechanical Engineering Principles	1	5	F5K1 11	1
Electrical Principles	1	5	F5HK 11	1
Engineering Project	1	5	F5DE 11	2
Health and Safety: Engineering	1	5	F5DG 11	1
Pneumatics and Hydraulics	1	5	F5K2 11	2
Engineering Assembly Skills	1	5	F5W6 11	2
Engineering Dimensional Control	1	5	F5W7 11	1
Electronic Test Equipment and Measurement	1	5	F5DC 11	1
Applications of PLCs	1	6	F5HO 12	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with a **Mechanical Bias** — 18 credits to full-time candidates

Mandatory core — 6 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1
Engineering Systems: Principles	1	5	FN3L 11	2
Engineering Systems: Test and Measurement	1	5	FN3K 11	2
Engineering Systems: Applications	1	5	FN3L 11	2

Restricted core — 2 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Mechanical Engineering Principles	1	5	F5K1 11	1
Electrical Principles	1	5	F5HK 11	1
Engineering Project	1	5	F5DE 11	2
Health and Safety: Engineering	1	5	F5DG 11	1
Pneumatics and Hydraulics	1	5	F5K2 11	2
Engineering Assembly Skills	1	5	F5W6 11	2
Engineering Dimensional Control	1	5	F5W7 11	1
Robotic and Automated Systems	1	6	F5H6 12	2
Engineering Prime Movers	1	5	F5K4 11	1

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with an **Electrical/Electronics Bias** — 18 credits to full-time candidates

Mandatory core — 6 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1
Engineering Systems: Principles	1	5	FN3L 11	2
Engineering Systems: Test and Measurement	1	5	FN3K 11	2
Engineering Systems: Applications	1	5	FN3L 11	2

Restricted core — 2 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Electrical Wiring Skills	1	5	F5HP 11	1
Practical Electronics	1	5	F5JJ 11	2

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Rotating Electrical Machines	1	5	F5JK 11	2
Safe Working Practices	1	5	F5JL 11	1
Electrical Principles	1	5	F5HK 11	1
Electrical Plant Safety and Maintenance	1	5	F5HH 11	1
Fundamental Electronics	1	5	F5DH 11	1
Combinational Logic	1	5	F5HA 11	2
Applications of PLCs	1	6	F5HO 12	2
Electronic Test Equipment and Measurement	1	5	F5DC 11	1
Soldering and Circuit Assembly Techniques	1	5	F5JW 11	1
Electronic Simulation and Testing	1	5	F5HS 11	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with an **Aeronautical Bias** — 18 credits to full-time candidates

Mandatory core — 6 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1
Engineering Systems: Principles	1	5	FN3L 11	2
Engineering Systems: Test and Measurement	1	5	FN3K 11	2
Engineering Systems: Applications	1	5	FN3L 11	2

Restricted core — 2 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Mechanical Engineering Principles	1	5	F5K1 11	1
Electrical Principles	1	5	F5HK 11	1
Health and Safety: Engineering	1	5	F5DG 11	1
Aircraft Power Plants	1	6	F5GX 12	2
Aircraft Maintenance	1	5	F5GP 11	2
Aviation Practice	2	5	F5H2 11	1/2
Aircraft Design: An Introduction	1	6	F5GN 12	1
Aeronautical Engineering Fundamentals	1	6	F5GM 12	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with a **Fabrication and Welding Bias** — 18 credits to full-time candidates

Mandatory core — 3 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1

Restricted core — 5 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Systems: Principles (Mandatory)	1	5	FN3L 11	2
Engineering Systems: Test and Measurement (Mandatory)	1	5	FN3K 11	2
Engineering Systems: Applications (Mandatory)	1	5	FN3L 11	2
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Engineering Project	1	5	F5DE 11	2
Health and Safety: Engineering	1	5	F5DG 11	1
Metal Inert Gas (MIG/MAG) Welding Skills	1	6	F5F7 12	1
Manual Metal Arc (MMA) Welding Skills	1	6	F5F6 12	1
Tungsten Inert Gas (TIG) Welding Skills	1	6	F5FC 12	2
Fabrication Skills	2	5	F5FG 11	1/2
Thermal Joining Skills	1	5	F5F2 11	1
Thermal Cutting Skills	1	5	F5F1 11	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with an **Energy and Renewable Bias** — 18 credits to full-time candidates

Mandatory core — 3 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1

Restricted core — 5 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Systems: Principles (Mandatory)	1	5	FN3L 11	2
Engineering Systems: Test and Measurement (Mandatory)	1	5	FN3K 11	2
Engineering Systems: Applications (Mandatory)	1	5	FN3L 11	2
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Mechanical Engineering Principles	1	5	F5K1 11	1
Electrical Principles	1	5	F5HK 11	1
Engineering Project	1	5	F5DE 11	2
Energy: An Introduction	1	5	J12W 75*	1
Energy: Domestic Solar Hot Water Systems	1	5	J130 75*	2
Energy: Domestic Wind Turbine Systems	1	5	J12Y 75*	1
Off Shore Renewable Energy	1	5	FV2X 11	2
Energy: Employability and Careers	0.5	5	J12X 75*	1
Energy and the Individual	0.5	5	J131 75*	1
Energy: Oil/Gas Extraction	0.5	5	J133 75*	2
Energy: Conventional Technologies and the Grid	0.5	5	J132 75*	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with a **Multidisciplinary Engineering focus** — 18 credits to full-time candidates on a **FAST TRACK** programme facilitating progression onto a HNC Engineering Systems.

Mandatory core — 3 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Communication	1	5	F3GB 11	2
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1

Restricted core — 5 credits required at SCQF level 5

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Systems: Principles (Mandatory)	1	5	FN3L 11	2
Engineering Systems: Test and Measurement (Mandatory)	1	5	FN3K 11	2
Engineering Systems: Applications (Mandatory)	1	5	FN3L 11	2
Engineering Workshop Skills	1	5	F5WA 11	1
Graphical Engineering Communication	1	5	F5FP 11	1

Optional Units

Unit title	Credit value	SCQF level	Code	Delivery Semester
Mathematics: Craft 2	1	5	F3HW 11	1
Mathematics: Technician 1	1	6	F3HX 12	2
Electrical Principles	1	5	F5HK 11	1
Engineering Project	1	5	F5DE 11	2
Computer Aided Draughting (CAD) for Engineers	1	5	F5H4 11	2
Pneumatics and Hydraulics	1	5	F5K2 11	2
Engineering Assembly Skills	1	5	F5W6 11	1
Mechanical Engineering Principles	1	5	F5K1 11	1
Electronic Test Equipment and Measurement	1	5	F5DC 11	1
Applications of PLCs	1	6	F5HO 12	2

Appendix 4: Indicative sequence of delivery (continued)

National Certificate in Engineering Systems with a **Multidisciplinary Engineering focus** — 12 credits to part-time/day release candidates.

Mandatory core — 3 credits required at SCQF level 5

1st Year

Unit title	Credit value	SCQF level	Code	Delivery Semester
Graphical Engineering Communication	1	5	F5FP 11	1
Mathematics: Craft 1	1	5	F3HV 11	1
Engineering: Using Information Technology	1	5	F5D6 11	1
Mechanical Engineering Principles	1	5	F5K1 11	2
Electrical Principles	1	5	F5HK 11	2
Pneumatics and Hydraulics	1	5	F5K2 11	2

2nd Year

Unit title	Credit value	SCQF level	Code	Delivery Semester
Engineering Systems: Principles (Mandatory)	1	5	FN3L 11	1
Engineering Systems: Test and Measurement (Mandatory)	1	5	FN3K 11	1
Engineering Systems: Applications (Mandatory)	1	5	FN3L 11	1
Engineering Project	1	5	F5DE 11	2
Applications of PLCs	1	6	F5H0 12	2
Communication	1	5	F3GB 11	2