National Unit specification: general information

Unit title: Engineering Systems: Applications (SCQF level 5)

Unit code: FN3K 11

Superclass: VF

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Source: Scottish Qualifications Authority

Version: 02

Summary

This Unit will provide candidates with the necessary knowledge and skills required in order to undertake an investigation into an engineering system. This will be in the context of a related engineering industry that includes, mechanical, electrical and electronic engineering. Typical areas could be oil and gas, renewable energy, process control as well as many other engineering and related industries.

This Unit is part of the Mandatory Core of the National Certificate in Engineering Systems (SCQF level 5) and can also be taken as a freestanding Unit.

The Unit is particularly suitable for those candidates wishing to embark upon a career in engineering or technology.

Outcomes

1 Apply a block diagram approach to the analysis of engineering systems.
2 Determine the operating principles of engineering systems.
3 Complete a function specification and evaluation of engineering systems.

Recommended entry

While entry is at the discretion of the centre, candidates would normally be expected to have attained a minimum of a general grade in one science, mathematics or technology based Standard Grade as well as a minimum of a general grade in Standard Grade English or relevant equivalent qualifications.

National Unit specification: general information (cont)

Unit title: Engineering Systems: Applications (SCQF level 5)

Credit points and level

1 National Unit credit at SCQF level 5: (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

- Using Graphical Information at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

National Unit specification: statement of standards

Unit title: Engineering Systems: Applications (SCQF level 5)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Outcome 1

Apply a block diagram approach to the analysis of engineering systems.

Performance Criteria

(a) An accurate block diagram, showing all relevant sub-systems, is constructed for a given engineering system.
(b) All blocks are correctly labelled with regard to title, inputs and outputs.
(c) All signal/process flow directions are accurately annotated.
(d) Produce a summary report detailing the correct function of the overall system.

Outcome 2

Determine the operating principles of engineering systems.

Performance Criteria

(a) Interpret drawings, diagrams and technical information to correctly determine the function of blocks within a given engineering system.
(b) Correctly identify input and output parameters for blocks within the system.
(c) Correctly determine the operating principles of blocks within the system.

Outcome 3

Complete a function specification and evaluation of engineering systems.

Performance Criteria

(a) Correctly compile a function specification for a given engineering system using a given specification template.
(b) Prepare a presentation outlining the correct operation of the engineering system and blocks within the system.
(c) Correctly evaluate the effectiveness of the engineering system in accordance with given evaluation parameters.

National Unit specification: statement of standards (cont)

Unit title: Engineering Systems: Applications (SCQF level 5)

Evidence Requirements for this Unit

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Performance evidence as well as written and/or recorded oral evidence is required which demonstrates that the candidate has achieved all Outcomes to the standards specified in the Outcome and Performance Criteria.

This evidence should be produced under supervised, controlled conditions at appropriate points throughout the Unit either on an Outcome by Outcome basis or as integrated assessments. All calculations and measurements should be given using the relevant SI units of measurement.

The required evidence, for all Outcomes, is as follows:

With regard to Outcome 1

- The engineering system must comprise of a minimum of four blocks and contain electromechanical elements.
- Each block should be correctly labelled with a title descriptive of the block function and all inputs and outputs identified.
- All signal/process flow directions are accurately indicated.
- The summary report must comprise of between 200 and 400 words detailing the correct function of the overall system.

With regard to Outcome 2

- Correctly determine the function of two blocks (1 electrical/electronic and 1 mechanical/ electromechanical) within a given engineering system through interpretation of given drawings, diagrams and technical information.
- Correctly identify input and output parameters (values/range) for two blocks (1 electrical/electronic and 1 mechanical/electromechanical) within a given engineering system.
- Correctly determine the operating principles of two blocks (1 electrical/electronic and 1 mechanical/electromechanical) within a given engineering system through interpretation of given drawings, diagrams and technical information.

National Unit specification: statement of standards (cont)

Unit title: Engineering Systems: Applications (SCQF level 5)

With regard to Outcome 3

- Correctly compile a function specification for a given engineering system using a given specification template including a minimum of five relevant topics such as operating conditions, environmental conditions, mounting constraints, connection details, power requirements, maintenance details, disposal requirements and performance measurements.
- Prepare an electronic presentation, using power-point or other suitable presentation aid, correctly outlining the operation of the engineering system and blocks within the system. The candidate is not required to deliver the presentation but only to prepare and submit the presentation for assessment purposes.
- Correctly evaluate the effectiveness of the engineering system in accordance with given evaluation parameters. These evaluation parameters must either include a comparison with comparable products, if appropriate, or an evaluation of the product overall and may in line with the topics selected for the function specification.

National Unit specification: support notes

Unit title: Engineering Systems: Applications (SCQF level 5)

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit forms part of the National Qualification Group Awards (NQGA) in Engineering Systems at SCQF level 5, but may also be offered on a free standing basis.

The aim of this Unit is to provide candidates with the skills to analyse fundamental engineering principles that may be employed within an engineering system and has been designed to provide an equal treatment to mechanical and electrical quantities.

On successful completion of the Unit candidates will have developed the knowledge, understanding and skills to investigate a typical engineering systems application in order to develop a function specification and evaluate the effectiveness of the engineering system.

Centres may choose to employ an engineering system relevant to centre resources and other course content.

Guidance on learning and teaching approaches for this Unit

It is recommended that the Unit is by a series of investigations developed from the statement of standards section of the Unit. This will include candidates investigating engineering systems, or sub-systems, to study their principles of operation by investigation and measurement. If appropriate, centres may wish to allow candidates to perform experiments on engineering systems, or sub-systems, by integrating the evidence requirements for this Unit with the evidence requirements for the following two Units:

Engineering Systems: Test and Measurement at SCQF level 5
Engineering Systems: Principles at SCQF level 5

Guidance on approaches to assessment for this Unit

The evidence requirements necessitate each candidate submitting a portfolio of accurate results from experiments and investigations. Centres will need to issue candidates with suitable logbooks containing relevant information with regard to equipment choices, health and safety requirements and any other essential information.

National Unit specification: support notes (cont)

Unit title: Engineering Systems: Applications (SCQF level 5)

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Opportunities for developing Core Skills

In this Unit candidates will investigate an engineering system. This will be in the context of a related engineering industry that includes, mechanical, electrical and electronic engineering. Typical areas could be oil and gas, renewable energy, process control as well as many other engineering and related industries.

Candidates will:

- complete reports
- draw engineering diagrams
- prepare an electronic presentation

This Unit has the Numeracy component of Using Graphical Information embedded in it, so when candidates achieve this Unit their Core Skills profile will be updated to show they have achieved Using Graphical Information at SCQF Level 5. In addition, as candidates are doing this Unit they will be developing aspects of the Core Skills in Communication and Information technology.

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**

History of changes to Unit

Version	Description of change	Date
02	Core Skills Component Using Graphical Information at SCQF level 5 embedded.	08/08/2011