National Unit Specification: general information

UNIT Engineering Quality: An Introduction (SCQF level 6)

CODE F5FM 12

SUMMARY

This Unit may form part of a National Qualification Group Award but may also be offered on a free-standing basis.

This Unit is designed to provide candidates with a basic knowledge and understanding of engineering quality. During the delivery of this Unit, candidates will learn about terminology commonly used in quality assurance systems. They will develop the knowledge and understanding to produce process models for engineering products or service and explain the ways in which input factors influence the quality of such products or services. Candidates will also learn how functions and individuals in organisations contribute to the quality of products or services. They will also carry out an engineering inspection relevant to the engineering area they are studying.

This Unit is suitable for candidates training to be aeronautical, fabrication and welding, manufacturing, mechanical or multi-disciplinary engineering craftspersons or technicians.

OUTCOMES

1 Explain quality terminology.
2 Explain the factors affecting the quality of an engineering product or service.
3 Describe the contributions functions and individuals in organisations make to maintaining engineering quality standards.
4 Carry out an engineering inspection.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, some experience of working in an engineering environment would be advantageous.

Administrative Information

Superclass: VD

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit at SCQF level 6 (6 SCQF credit points at SCQF level 6*).

**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

There is no automatic certification of Core Skills in this Unit.

The Unit provides opportunities for candidates to develop aspects of the following Core Skills:

Problem Solving (SCQF level 6)
Working with Others (SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

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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

Explain quality terminology.

Performance Criteria

(a) State correctly a definition of the term ‘quality’.
(b) State correctly the principal factors and standards which contribute to the quality of a given engineering product or service.
(c) Explain clearly the difference between quality control and quality assurance.
(d) Explain correctly the details that appear on an engineering specification which include quality requirements.

OUTCOME 2

Explain the factors affecting the quality of an engineering product or service.

Performance Criteria

(a) Illustrate clearly a process model for an engineering product or service.
(b) Explain correctly the influence of input factors on the quality of the product or service.
(c) Explain correctly any steps that can be taken to change the input factors with a view to improving the quality of the product or service.

OUTCOME 3

Describe the contributions functions and individuals in organisations make to maintaining engineering quality standards.

Performance Criteria

(a) Identify correctly the main functions in an organisation that are involved in the delivery of an engineering product or service.
(b) Describe correctly the contributions some of the main functions in an organisation make to the quality of an engineering product or service.
(c) State correctly the contributions made by a given individual employed in an organisation to maintaining the quality of an engineering product or service.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Carry out an engineering inspection.

Performance Criteria

(a) Interpret correctly an inspection procedure in relation to a given engineering standard which is applied to an engineering product or service.
(b) Carry out correctly an inspection procedure to confirm if an engineering product or service meets a given standard or not.
(c) Record correctly if an engineering product or service conforms or does not conform with a given standard.

EVIDENCE REQUIREMENTS FOR THIS UNIT

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

Written and/or recorded oral and performance evidence supplemented with an assessor observation checklist(s) should be produced to demonstrate that a candidate has achieved all Outcomes and Performance Criteria.

Outcomes 1, 2 and 3

Outcomes 1, 2 and 3 may be assessed on an individual basis, as a combination of Outcomes or as a single assessment covering all three Outcomes. The total assessment time for the three Outcomes must not exceed 1 hour and 40 minutes. The Outcomes must be assessed under supervised, closed-book conditions in which candidates may use reference materials provided by the centre but are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment.

With regard to Outcome 1

- Candidates must state four factors and two standards which contribute to the quality of a given engineering product or service
- Candidates must explain a minimum of two details that appear on an engineering specification containing quality requirements

With regard to Outcome 2

- The process model must have a minimum of four inputs
- Candidates must explain a minimum of two actions that can be taken to change input factors with a view to improving the quality of the product or service

National Unit Specification: statement of standards (cont)

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With regard to Outcome 3

- Candidates must identify four main functions in an organisation that are involved in the delivery of a product or service
- Candidates must explain the contributions three functions in an organisation make to the quality of a product or service which may include the quality function
- Candidates must state the contributions made by one of the following individuals employed in an organisation to maintaining the quality of a product or service:
  - process operator
  - craftsperson
  - technician

Outcome 4

Candidates must be assessed under supervised, open-book conditions.

National Unit Specification: support notes

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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 Qualifications Group Award in Aeronautical Engineering, Fabrication and Welding Engineering, Manufacturing Engineering and Mechanical Engineering at SCQF level 6, but may also be offered on a free-standing basis.

The aim of this Unit is to provide candidates with a basic knowledge and understanding of engineering quality. On successful completion of this Unit candidates will have learnt about terminology commonly used in quality assurance systems. They will also have developed the knowledge and understanding to produce process models for engineering products or services and explain how the input factors in these models influence the quality of the products or services. Candidates will be able to explain the way in which functions and individuals in organisations contribute to the quality of an engineering product or service. They will also be able to carry out an engineering inspection and record results correctly.

It is recommended that the delivery of Outcome 1 commences with the lecturer providing a brief history of engineering quality from early attempts at standardisation, through inspection and quality control to modern quality assurance systems. Such a review will help candidates to set the subject of engineering quality within a proper context. Candidates should examine definitions of quality and quality terminology, including quality assurance and quality control, taken from current international standards. However, candidates should not learn such definitions and terminology ‘parrot fashion’ but rather be encouraged to develop a sound knowledge and understanding of such definitions and terminologies by applying them to the delivery of engineering products or services. Candidates should also examine the content of engineering specifications containing quality requirements.

In Outcome 2 candidates should explore the ways in which process modelling can be used to model how an engineering product or service is delivered. Particular attention should be paid in such models to input factors such as staffing, materials, machinery, methods and environment. Candidates should examine the ways in which such inputs influence the quality of an engineering product or service. They should also consider ways in which making changes to inputs can lead to improvements in the quality of a product or service (eg improving staff skills by suitable training, improving materials purchasing arrangements, procuring modern computer-based equipment, developing improved quality procedures and practices etc.).

In Outcome 3 candidates should examine organisational issues that influence the quality of an engineering product or service. This may begin by considering the organisational structures of typical engineering companies; identifying the various functions within such companies. Candidates should then explore the role that different functions within companies play in ensuring that quality engineering products and services are delivered. Such explorations may include the role that the quality function within companies makes to maintain the quality of products or services. Finally candidates should examine what contributions a process operator, craftsperson or technician plays in delivering a quality engineering product or service.

National Unit Specification: support notes (cont.)

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In Outcome 4 candidates should be taught the importance inspection plays in ensuring the quality of engineering products or services. Candidates should examine ways in which modern inspection procedures are carried out including the ways decisions on conformance are recorded. They should then undertake inspections applicable to the area of engineering they are studying and record results appropriately.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit may be delivered by a combination of lectures, case studies, group discussions, investigations, practical activities and industrial visits.

Investigations of relevant written and electronic materials (including those on the Internet) will allow candidates to develop their knowledge and understanding of various quality standards.

Guest lecturers from industry may help to develop candidates' knowledge and understanding of a range of engineering quality subjects.

Structured industrial visits will allow candidates to explore the ways in which different companies have implemented and maintained their quality systems. It should also allow them to examine the ways that different functions in companies contribute to the maintenance of quality standards.

Video/DVD materials on various quality subjects may be useful in supporting the teaching/learning process.

The Unit should be fully supported with relevant learning materials (eg handouts in paper and electronic form, textbooks, on-line materials etc.)

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

All aspects of the Core Skill of *Problem Solving* will be developed and enhanced as candidates apply their knowledge and understanding to complex practical tasks in an engineering context. Creative thinking is needed to analyse the many factors affecting quality of a product or service. Candidates consider specifications, customer requirements and safety regulations, translating given information to carry out an inspection operation efficiently. Conformance or non-conformance in relation to a given standard has to be determined and recorded. Feedback from the assessor could support techniques in analytical evaluation.

Understanding the roles that individuals and functions within an organisation have in establishing and maintaining systems and procedures is critical. Practical formative work can provide an environment in which to discuss, review and evaluate Quality Management and enhance skills in co-operative working. If group work in quality procedures is used in the formative stages candidates could discuss case studies, and agree the nature and scope of team goals, roles and responsibilities in the process. They could be asked to demonstrate techniques to be used or explain conclusions, reviewing and evaluating their own potential contribution to efficient quality standards.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Centres are encouraged to use formative assessment extensively as it plays a particularly important role in allowing candidates to develop a sound knowledge and understanding of engineering quality subjects.

Outcomes 1, 2 and 3

Regardless of whether assessment is carried out on an individual basis, as a combination of Outcomes or on a single, holistic basis any assessment paper(s) used may comprise of a suitable balance of short answer, restricted response and structured questions. Such assessment(s) may be suitable for on-line delivery.

Outcome 4

Outcome 4 may be assessed by a practical exercise in which a pro forma inspection sheet is used. Candidates would be required to interpret a given standard, carry out a physical inspection and complete the pro forma, then reach a decision on the conformance or otherwise of the product or service. This decision could then be recorded on the pro forma.

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**