National Unit Specification: general information

UNIT Mathematics: Craft 1 (SCQF level 5)

CODE F3HV 11

SUMMARY

This Unit is intended primarily for those candidates who wish to develop their knowledge and understanding of Mathematics at SCQF level 5 with a view to supporting and underpinning their studies in an engineering discipline. In such cases, delivery of the Unit should be set within the context of the award to which it contributes. The Unit is designed to develop aspects of the candidate's skills in numeracy, geometry, graphical communication, trigonometry and algebra, and to apply these skills in the appropriate engineering context. It is envisaged that the content of each Outcome is delivered and assessed with specific reference to the candidate's engineering specialism, where appropriate.

OUTCOMES

1 Round numbers, use scientific notation, percentages and ratios in engineering contexts.
2 Calculate areas, perimeters, volumes and surface areas of simple shapes in engineering contexts.
3 Read scales, tables, graphs and charts which relate to engineering applications.
4 Use Pythagoras' Theorem and sin/cos/tan in right-angled triangles in engineering contexts.
5 Substitute numerical values into simple engineering formulae.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- Standard Grade Mathematics at General level
- Mathematics Intermediate 1 Course

Administrative Information

Superclass: RB

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit at Intermediate 2 (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 Number* at SCQF level 5.

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

Round numbers, use scientific notation, percentages and ratios in engineering contexts.

Performance Criteria

(a) Round a number correctly to a given number of significant figures and/or decimal places.
(b) Convert a number correctly from standard notation to scientific notation or vice versa and use a calculator correctly to add or subtract or multiply or divide numbers in scientific notation.
(c) Calculate correctly a percentage of a quantity and express correctly a quantity as a percentage of another.
(d) Calculate correctly quantities linked by a given ratio and split a quantity correctly according to a given ratio.

OUTCOME 2

Calculate areas, perimeters, volumes and surface areas of simple shapes in engineering contexts.

Performance Criteria

(a) Calculate correctly areas and perimeters of squares or rectangles or triangles or circles.
(b) Calculate correctly volumes and surface areas of cubes or cuboids or cylinders or (other) prisms or spheres.

OUTCOME 3

Read scales, tables, graphs and charts, which relate to engineering applications.

Performance Criteria

(a) Extract information from a scale correctly.
(b) Extract information from a table correctly.
(c) Extract information from a graph correctly.
(d) Extract information from a chart correctly.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Use Pythagoras' Theorem and sin/cos/tan in right-angled triangles, in engineering contexts

Performance Criteria

(a) Use Pythagoras' Theorem correctly to calculate an unknown side in a right-angled triangle.
(b) Use sin or cos or tan correctly to calculate an unknown side and angle in a right-angled triangle.

OUTCOME 5

Substitute numerical values into simple engineering formulae.

Performance Criteria

(a) Substitute numerical values correctly into engineering formulae involving addition or subtraction or multiplication or division of terms, and combinations of these operations.
(b) Substitute numerical values correctly into engineering formulae involving simple powers: squares or square roots or cubes or cube roots.

EVIDENCE REQUIREMENTS FOR THIS UNIT

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

Evidence should be produced under closed-book, supervised conditions in response to an appropriate set of questions. The evidence may be gathered:

- in a single, end-of-Unit assessment

or

- on an Outcome by Outcome basis

or

- by a combination of Outcomes

The total time allowed for the assessment(s) should not exceed two hours.

Candidates should be given access to calculators and an appropriate formula sheet. Sufficient working must be shown to demonstrate the method of solution.

Sampling of content may be appropriate, but assessment questions must be constructed to enable evidence to be produced which demonstrates achievement of all Outcomes and Performance Criteria.

Where reassessment is needed, a different set of questions must be used on each assessment occasion.

National Unit Specification: statement of standards (cont)

UNIT Mathematics: Craft 1 (SCQF level 5)

The Assessment Support Pack for this Unit provides sample assessment material and marking information. Centres wishing to develop their own assessments must refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

UNIT Mathematics: Craft 1 (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 is a mandatory Unit of the National Certificate Group Awards in Engineering, but can also be a free-standing Unit. This Unit aims to build on and extend the candidate's mathematical knowledge and skills.

It is envisaged that the content of this Unit is delivered in the engineering context appropriate to the candidate, whether as a mandatory Unit of the Group Award or as a freestanding Unit.

Applying the mathematical skills of the Unit in meaningful engineering scenarios will enable the candidate to appreciate that those skills are essential tools for engineering.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Due to the essentially progressive nature of mathematics learning and teaching, every opportunity should be taken to revise and consolidate prior knowledge. For example: in Outcome 1, PC c), percentages should be linked with equivalent fractions and decimals; in Outcome 5, PC a), clarification of basic algebraic notation should precede substitution.

Delivery of the Unit can be an appropriate mixture of lecturer-led/student-centred activities; individual/group work; classroom/workshop assignments. Use of online resources could be included to support and underpin learning.

The sensible and correct use of calculators should be demonstrated and encouraged where appropriate. At the same time, candidates should be guided and encouraged to identify when working without a calculator is more appropriate.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

This Unit will develop skills in *Using Number* and *Using Graphical Information* at SCQF level 5. The emphasis of formative work should be on *Numeracy* as a tool to be used and applied efficiently in practical situations. Candidates need to demonstrate confidence and accuracy in interpreting and applying a wide range of numerical and graphical information in engineering contexts. They have to be proficient in selecting the number and order of operations which require to be carried out to solve practical problems. Candidates should be provided with formative opportunities to improve their abilities to undertake sustained complex calculations using numerical, statistical and graphic data. Accuracy in processing and presenting information could be supported by appropriate technology and resources.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Candidates will benefit from the incorporation of formative assessments into the learning and teaching process.

Achievement of this Unit requires the Evidence Requirements to be met. A candidate who does not initially achieve the specified standard can have a further opportunity, attempting only the Outcome(s) not previously achieved.

The Assessment Support Pack for this Unit provides sample assessment material and marking information. Centres wishing to develop their own assessments must refer to the Assessment Support Pack to ensure a comparable standard.

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 communications 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)*.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.