National Unit Specification: general information

UNIT Mathematics: Technician 1 (SCQF level 6)

CODE F3HX 12

SUMMARY

This Unit is intended primarily for those candidates who wish to develop their knowledge and understanding of Mathematics at SCQF level 6 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, 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 Evaluate and transpose engineering formulae.
2 Sketch and identify sine wave and cosine wave graphs and solve simple trigonometric equations.
3 Solve linear, simultaneous and quadratic equations.
4 Interpret graphical information and construct appropriate graphs from given numerical data.

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:

♦ NQ Unit *Mathematics: Craft 1* (SCQF level 5)
♦ Mathematics — Intermediate 2
♦ Standard Grade Mathematics — Credit Level

Additional copies of this Unit Specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre, telephone 0845 279 1000.

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

Achievement of this Unit gives automatic certification of the following Core Skill *Numeracy* at SCQF level 6.

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

Evaluate and transpose engineering formulae.

Performance Criteria

(a) Evaluate engineering formulae correctly, giving appropriate units with results.
(b) Transpose engineering formulae correctly.

OUTCOME 2

Sketch and identify sine wave and cosine wave graphs and solve simple trigonometric equations

Performance Criteria

(a) Convert correctly between degrees and radians
(b) Sketch and identify correctly graphical waveforms of the form $y = k\sin(px +/-q)$ and $y = k\cos(px +/- q)$ and correctly state their trigonometric functions in terms of amplitude, periodic time and phase angle.
(c) Solve correctly simple trigonometric equations, in a given interval, containing sines or cosines with phase angles in both degrees and radians.

OUTCOME 3

Solve linear, simultaneous and quadratic equations.

Performance Criteria

(a) Determine correctly the equation of a straight line from a given or constructed graph.
(b) Construct appropriate simultaneous equations from given data and solve simultaneous equations correctly.
(c) Determine correctly the roots of quadratic equations using factorisation or formula.
(d) Solve a pair of simultaneous equations, one linear and one quadratic, correctly using substitution techniques.

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Interpret graphical information and construct appropriate graphs from given numerical data.

Performance Criteria

(a) Construct a best-fit straight line graph from supplied experimental data correctly and extract and interpolate information from a straight line graph correctly.
(b) Construct the graphs of quadratic functions and hence identify their roots and turning points correctly.
(c) Solve correctly a pair of simultaneous equations, one linear and one quadratic, by the construction of an appropriately scaled graph.

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 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.

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

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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 is a mandatory Unit of the National Certificate Group Awards in Engineering at SCQF level 6, 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 free-standing 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 (a), this could build upon the work done in Outcome 5 PC (a) of the Unit, *Mathematics: Craft 1*. In Outcome 4, PC (b), this could build upon the work done in Outcome 3 PCs (a) and (c) of that Unit.

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

The Unit allows the candidate to develop the Core Skill components Using Number and Using Graphical Information at SCQF level 6. Accuracy in analytical interpretation and the ability to calculate, apply and present complex numerical and graphic data is an aspect of competence. Candidates should be provided with formative opportunities to enhance skills in recognising and processing significant numerical and graphical information using engineering examples and contexts.

They should practise sustained complex calculations and become skilled in the selection of appropriate graphic and numerical forms of communicating, using *Numeracy* as a tool to process complex information. The ability to undertake effective analysis and accurately present data could be strengthened by access to appropriate technology, on line resources and support. Analytical approaches should be encouraged which include, where appropriate, interpolation and exptrapolation.

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 for each outcome 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.

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).*

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.

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**).

History of changes:

Version	Description of change	Date
02	Outcome 4 Performance Criteria (a) has been removed. There are now only 3 Performance Criteria.	22/07/2010