National Unit Specification: general information

UNIT Mathematics: Technician 2 (SCQF level 6)

CODE F3HY 12

SUMMARY

This Unit is intended primarily for those candidates who wish to develop further 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, algebra and calculus, 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 Apply algebraic techniques to simplify mathematical expressions.
2 Sketch, evaluate and manipulate exponential and logarithmic functions.
3 Differentiate and integrate basic mathematical functions.
4 Solve problems on two dimensional vectors.

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: Technician 1* (SCQF level 6)
- Mathematics —Intermediate 2
- Standard Grade Mathematics — Credit Level

Administrative Information

Superclass: RB

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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

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

Apply algebraic techniques to simplify mathematical expressions.

Performance Criteria

(a) Expand and simplify correctly expressions involving brackets.
(b) Manipulate and simplify mathematical expressions containing fractions correctly.
(c) Apply the laws of indices correctly.

OUTCOME 2

Sketch, evaluate and manipulate exponential and logarithmic functions.

Performance Criteria

(a) Sketch graphs of exponential and logarithmic functions correctly.
(b) Evaluate mathematical expressions containing exponential and logarithmic functions correctly.
(c) Apply the appropriate laws of logarithms to mathematical expressions containing exponentials and logarithms.
(d) Convert between exponential and logarithmic form correctly.

OUTCOME 3

Differentiate and integrate basic mathematical functions.

Performance Criteria

(a) Differentiate mathematical expressions of the form ax^n and $(ax+b)^n$ correctly, including sums and differences

(b) Integrate mathematical expressions of the form ax^n and $(ax+b)^n$ (n not equal to -1) correctly, to include both indefinite and definite integrals, and including sums and differences

National Unit Specification: statement of standards (cont)

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OUTCOME 4

Solve problems on two dimensional vectors.

Performance Criteria

(a) Describe correctly the difference between a scalar quantity and a vector quantity.
(b) Express correctly a vector written in component form into a form with magnitude and direction, and vice versa.
(c) Add and subtract vectors correctly using graphical and algebraic methods.
(d) Illustrate correctly the relationship between a rotating vector (a phasor) and a sinewave.

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: 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 an optional 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 further 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 an optional Unit of the Group Award or otherwise.

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 2, PC (b), this could build upon the work done in Outcome 5 of the level 5 Unit, *Mathematics: Craft 1*.

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 further enhance the Core Skill components, Using Number and Using Graphical Information at SCQF level 6. The ability to analyse, apply and present complex numerical and graphic data accurately underpins knowledge and skills. Examples using engineering situations should be examined during formative work to allow candidates to recognise, interpret and apply information in an appropriate context. Opportunities should be provided to demonstrate understanding of complex concepts in relevant engineering scenarios which require candidates to produce and communicate solutions in industry accepted forms. The ability to critically analyse, make decisions and present data effectively could be assisted by access to appropriate technology, on line resources and support.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

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)**.