National Unit Specification: general information

UNIT Fundamental Electronics (SCQF level 5)

CODE F5DH 11

SUMMARY

This Unit introduces candidates to the functions and applications of electronic devices and systems, and to construction and testing techniques.

The Unit is suitable for candidates wishing to embark upon a career in electronic engineering. It is also relevant to candidates studying other branches of engineering, science or technology, with little or no knowledge of electronic devices and their applications, but who wish to gain this knowledge as a basis for developing their knowledge and skills in this field.

Candidates will be able to identify components and state their functions and typical applications. They will also be able to construct circuits using these components and use test instruments to check that the circuits are performing their functions correctly.

This Unit may form part of a National Qualification Group Award or may be offered on a freestanding basis.

OUTCOMES

1 Identify principal electronic devices.
2 State the function and applications of electronic devices.
3 Carry out circuit assembly techniques.
4 Use a range of electronic test equipment to test the functionality of an electronic circuit.

Administrative Information

Superclass: XL

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National Unit Specification: general information (cont)

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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 in a Technology or Science subject — General level

CREDIT VALUE

1 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

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

This Unit provides opportunities for candidates to develop aspects of the following Core Skill:

- Problem Solving (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

Identify principal electronic devices.

Performance Criteria

(a) Identify correctly, passive devices and their associated symbols.
(b) Identify correctly, active devices and their associated symbols.

OUTCOME 2

State the function and applications of electronic devices.

Performance Criteria

(a) State correctly the function of passive and active devices.
(b) State correctly applications of passive and active devices.

OUTCOME 3

Carry out circuit assembly techniques.

Performance Criteria

(a) Correctly select components for a given circuit layout diagram.
(b) Correctly mount components on a given medium.
(c) Neatly terminate components.

OUTCOME 4

Use a range of electronic test equipment to test the functionality of an electronic circuit.

Performance Criteria

(a) Correctly identify and connect power source.
(b) Correctly select and connect appropriate test equipment.
(c) Correctly test the functionality of the constructed circuit.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

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

Performance evidence supplemented with an assessor observation checklist 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 will 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:

For Outcome 1:

- correctly identify the symbols for the three principal passive devices, and correctly identify the actual devices; resistors, inductors, capacitors. The range of each device to include adjustable components.
- correctly identify the symbols for the three principal active devices, and correctly identify the actual devices; diodes, transistors, operational amplifiers. Any appropriate symbol standard may be referenced.

For Outcome 2:

- correctly state the function of each of the three principal passive devices listed in Outcome 1 and each of the three principal active devices listed in Outcome 1
- correctly states two applications for each of the three principal passive devices listed in Outcome 1 and each of the three principal active devices listed in Outcome 1

For Outcome 3:

- from a given circuit layout diagram, the candidate correctly selects the components from a standard range of devices already covered in Outcome 1
- given a prototyping board or a pre-prepared printed circuit board, the candidate correctly and neatly mounts and terminates the components

For Outcome 4:

From a range of standard electronic test equipment, the candidate correctly selects the appropriate power source and other required test equipment to correctly test the functionality of the constructed circuit against given parameters.

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

National Unit Specification: support notes

UNIT Fundamental Electronics (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 is a mandatory Unit in the National Certificate in Electronic Engineering at SCQF level 5 and an option in the National Certificate Electrical Engineering, at SCQF level 5. It may also form part of other National Certificates in Engineering. This Unit can also be delivered on a free standing Unit.

This Unit is intended as an introduction to electronic devices, construction techniques and testing. It is not intended that the candidate designs or analyses circuits.

It will be necessary to introduce candidates to a variety of electronic systems and signal conditioning functions to allow them to appreciate the context in which electronic components are used. This would also introduce the concept of 'functionality', eg 'amplification', 'filtering', 'oscillation', etc. Circuits considered should also include those which utilise inductors.

The candidate also requires practice in the application and operation of test equipment.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The teaching and learning approaches for this Unit should emphasise practical aspects of electronics, namely the recognition of components, circuit assembly techniques and functional testing of circuits. It is not expected that the student be given detail of the constructional features of the individual components, although there is a need for the student to know the variety of resistors, capacitors, transistors, etc, available.

The use of test equipment could be demonstrated and practised using pre-constructed circuits covering a range of functions, such as amplifiers, filters, summers, etc.

As this is a practical 'hands-on' Unit, it is desirable that candidates work independently in order to gain maximum exposure to the range of devices and test instruments available.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Elements of the Core Skill of *Problem Solving*, that is, Critical Thinking, Planning, and Organising, can be developed as candidates learn how to carry out measurements and tests in electronic circuits. They have to identify and connect a power source before selecting and connecting appropriate test equipment. Methods and techniques to test the functionality of the constructed circuit have to be chosen. Regulations and safety requirements need to be adhered to throughout practical work. Candidates could be given constructive feedback to encourage review and evaluation of their approaches to the process.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The assessment of Outcome 2 could be a written and/or oral test.

The assessment of Outcome 1 PC (a) and (b) could be combined with the assessment of Outcome 3 if the circuit for Outcome 3 comprises at least one of each of the six principal devices listed. Otherwise, the assessment of Outcome 1 (a) and (b) would require to be a separate exercise, albeit carried out at the same time as the assessment of Outcome 3.

The evidence for Outcome 1 (a) and (b) could be a checklist recording the correct selection of the actual device and a grid completed by the candidate to record the correct symbol identification.

The evidence for Outcome 3 would be satisfactorily completed physically constructed circuit.

The evidence for Outcome 4 could be a brief report stating the equipment used, the tests carried out and the result of the tests. This report could be on a pro forma provided to the candidate.

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).*

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**