SCOTTISH QUALIFICATIONS AUTHORITY

National Unit Specification: general information

UNIT Applied Electronics (Intermediate 2)

NUMBER D186 11

COURSE Technological Studies (Intermediate 2)

SUMMARY

This unit is designed to enable candidates to develop an understanding of d.c. networks and simple electronic systems.

OUTCOMES

1 Demonstrate knowledge and understanding of the relationship between current and voltage in simple resistive d.c. networks.

2 Design and construct a simple electronic system to meet a given specification.

3 Design and construct a simple combinational logic system to meet given specifications.

RECOMMENDED ENTRY

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

- Standard Grade Technological Studies at grade 3 or 4
- Standard Grade Physics at grade 3 or 4
- equivalent NC units.

CREDIT VALUE

1 credit at Intermediate 2.

Administrative Information

Superclass: XL

Publication date: December 1999

Source: Scottish Qualifications Authority

Version: 03

National Unit Specification: general information (cont)

UNIT Applied Electronics (Intermediate 2)

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit	Problem Solving	Int 2
	Numeracy	Int 2
	IT	Int 1
Additional core skills components for the unit	None	

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT Applied Electronics (Intermediate 2)

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 the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding of the relationship between current and voltage in simple resistive d.c. networks.

Performance criteria

(a) Calculations of the equivalent resistance of a d.c. network are carried out correctly.
(b) Using Ohm's law, calculations of currents, voltages and voltage drops are carried out correctly.
(c) A d.c. network is constructed to meet a given specification.

Note on range for the outcome

Resistive d.c. networks: series, parallel, combined series and parallel.

Given specification (for construction): 2 parallel resistors in series with 2 other resistors.

Evidence requirements

Written and graphical evidence for PCs (a) and (b). Performance evidence for PC (c).

OUTCOME 2

Design and construct a simple electronic system to meet a given specification.

Performance criteria

(a) Data sheets are interpreted correctly in the selection of electronic components.
(b) The selection of electronic components is justified in terms of their operational characteristics.
(c) Calculations related to voltage divider circuits and transistor gain are carried out correctly.
(d) The need for component protection is explained clearly.
(e) A simple electronic system is evaluated correctly against a given specification, using computer simulation.
(f) A simple electronic system is constructed to meet a given specification.

Note on range for the outcome

Simple system: input – voltage divider
process – npn transistor

Evidence requirements

Written and graphical evidence for PCs (a) to (d). Performance evidence for PCs (e) and (f).

National Unit Specification: statement of standards (cont)

UNIT Applied Electronics (Intermediate 2)

OUTCOME 3

Design and construct a simple combinational logic system to meet given specifications.

Performance criteria

(a) The basic operational characteristics of common integrated circuit logic families are described clearly.
(b) Data sheets are interpreted correctly in the selection of integrated circuits.
(c) Combinational logic systems are analysed correctly using truth tables and Boolean expressions.
(d) The graphical representation of logic systems is in accordance with the data booklet.
(e) A simple logic circuit is evaluated correctly against a given specification, using computer simulation.
(f) A simple logic circuit is constructed to meet a given specification.

Evidence requirements

Written and graphical evidence for PCs (a) to (d). Performance evidence for PCs (e) and (f).

National Unit Specification: support notes

UNIT Applied Electronics (Intermediate 2)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the 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

A data booklet will be issued by SQA in connection with this unit.
Guidance for each outcome is given below.

Outcome 1

Combined series-parallel resistive networks: consisting of not more than two parallel resistors in series with two other resistors.

Outcome 2

Principles of the voltage divider. Fixed voltage divider. Use of variable resistors and analogue input transducers in voltage dividers.
Electronic components: simple switches, LDR, thermistor, resistor, variable resistor, bipolar transistor, diode, LED, relay.
Use input transducer characteristics from the data booklet to design a voltage divider to meet a given specification.
The n-p-n transistor as a switch (common emitter mode); switching circuits using transistors and voltage dividers. The need for circuit protection and associated techniques.
Current gain of an n-p-n transistor.
Operational characteristics: resistance change of sensors, saturation conditions for transistors.
Test equipment: multi-meter.
Simple calculations: applying voltage proportion rules to voltage divider circuits; find input voltage; transistor current gain based on the load being connected to the collector. All calculations assume that the transistor is at the point of 'saturation' (assume $I_e \simeq I_c$).
Use of a relay in a transistor circuit to switch a separate (high voltage or high current) circuit.
Use of computer simulation and construction to evaluate a simple electronic control system.

Outcome 3

Construction of truth tables for combinational logic diagrams. Production of combinational logic diagrams from truth tables.
Logic functions and their associated truth tables: AND, OR, NOT, NAND, NOR
Construction of truth tables and logic diagrams from written specifications for a simple system.
Use of data sheets in selecting logic ICs. Graphical representation of solutions to combinational logic problems.
Use of logic ICs and pin-out diagrams. Comparison of TTL and CMOS families of ICs (in terms of operational characteristics).
Use of computer simulation and construction to evaluate simple combinational logic systems.
Truth tables – maximum of three inputs. Development of simple Boolean expressions from truth tables or circuit specifications

National Unit Specification: support notes (cont)

UNIT Applied Electronics (Intermediate 2)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The purpose of this unit is to develop further the systems approach to electronics established at Standard Grade to a component-based level. The ability to handle Ohm's law and resistor networks is reviewed. The voltage divider circuit and transistor driver are introduced at a component-based level. Combinational logic systems are developed in a more formal manner. In addition to developing a component-based understanding of the operation of electronic devices, practical capabilities are developed by using electronic components.

Where appropriate, opportunities should be taken to ensure that learning and teaching is contextualised in industrial/commercial applications. Candidates are expected to design and construct systems to meet given specifications. Such systems should be based on transistor control and combinational logic applications.

This unit deals with concepts which are applied in other units and thus offers opportunities for integration of content. In presenting this unit, teachers and lecturers should ensure that there is a balance between direct teaching and practical activities.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank materials have been created specifically to assess knowledge and understanding for each outcome. Assessments can take place either at the completion of an outcome or as an end of unit test. Centres must ensure that tests are conducted under appropriate conditions. Candidates should be allowed to use the Technological Studies data booklet. Candidates should be issued with clean copies of this booklet for use during tests.

Outcome 1 requires candidates to construct resistive d.c. networks. Outcomes 2 and 3 require candidates to simulate, construct and evaluate electronic systems to given specifications. It is the responsibility of the centre to ensure that evidence of candidate performance is recorded in an appropriate way. All evidence of performance must be retained by the centre. The assessment of this unit is subject to central moderation by the SQA.

Candidates generate evidence by means of their response to written tests, proficiency in practical activities and systems evaluation.

In order to gain success in the written test for an outcome, each candidate must achieve at least the cut-off score for that outcome. In order to succeed in practical activities, the candidate must simulate, construct and evaluate a system to meet a given specification. Evidence of performance must be recorded in an appropriate manner. Simulation and construction performance must be observed directly. Candidates' evaluation of a system can be in the form of either a written or oral report. Details should be recorded of the particular system(s) dealt with by each candidate.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into acount when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).