

Title	Demonstrate and apply introductory knowledge of electronic engineering		
Level	4	Credits	15

Purpose	<p>This unit standard covers the fundamental principles of electronics.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> – demonstrate basic knowledge of various semiconductor devices; – demonstrate and apply knowledge of BJTs and enhancement mode MOSFETs in switching circuits; – describe the function of a general-purpose operational amplifier and define its main parameters; – describe the operation of linear d.c. power supplies; – use common test equipment to take measurements and locate faults in electronic circuits; and – design and prototype a combinatorial logic circuit to solve electrotechnology problems.
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Classification	Electronic Engineering > Core Electronics
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Available grade	Achieved
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Guidance Information

- 1 This unit standard is intended for use in engineering courses at diploma level.
- 2 This unit standard is one of three designed to cover knowledge of electronic engineering, the others being Unit 16968, *Demonstrate and apply intermediate knowledge of electronic engineering*, and Unit 11572, *Demonstrate and apply knowledge of electronic signal technology engineering*. It is recommended that competency in this unit standard be achieved before assessment against unit standard 16968 is attempted.
- 3 Reference
Health and Safety in Employment Act 1992;
and all subsequent amendments and replacements.
- 4 Definitions
BJT – bipolar junction transistor.
d.c. – direct current.
Industry practice – practice used and recommended by organisations involved in the electrotechnology industry.

Introductory knowledge – means employing a broad knowledge of the subject matter, incorporating some theoretical concepts, to make an informed judgement.

LED – light emitting diode.

MOSFET – metal-oxide semiconductor field-effect transistor.

- 5 All measurements are to be expressed in Système International (SI) units, and, where required, converted from Imperial units into SI units.
- 6 All activities must comply with: any policies, procedures, and requirements of the organisations involved; the standards of relevant professional bodies; and any relevant legislative and/or regulatory requirements.
- 7 Range
 - a performance in relation to the elements of this unit standard must comply with the Health and Safety in Employment Act 1992;
 - b laboratory and workshop safety practices are to be observed at all times.

Outcomes and performance criteria

Outcome 1

Demonstrate basic knowledge of various semiconductor devices.

Performance criteria

- 1.1 The basic operation, characteristics, and application of various two terminal semiconductor devices are described.

Range may include but is not limited to – rectifier diodes, Schottky diodes, Zener diodes, LEDs; evidence of three is required.

Outcome 2

Demonstrate and apply knowledge of BJTs and enhancement mode MOSFETs in switching circuits.

Performance criteria

- 2.1 Operation and characteristics of BJTs and MOSFETs are described in accordance with industry practice.

Range NPN, PNP and N-channel.

- 2.2 A BJT or MOSFET is used and evaluated for being used as a switch in accordance with industry practice.

Range device power dissipation during switching and ON state is described in accordance with industry practice.

- 2.3 Use of flywheel diodes is described in accordance with industry practice.

Outcome 3

Describe the function of a general-purpose operational amplifier and define its main parameters.

Performance criteria

- 3.1 The function of a general purpose operational amplifier is described in accordance with industry practice.
- 3.2 Operational amplifier parameters are interpreted from data sheets in accordance with industry practice.
- 3.3 External components are calculated and verified experimentally for various operational amplifier configurations.
- Range inverting, non-inverting and unity gain buffer.

Outcome 4

Describe the operation of linear d.c. power supplies.

Performance criteria

- 4.1 The operation of half-wave and full-wave rectification for d.c. power supplies is explained in accordance with industry practice in terms of characteristics, efficiency, and application.
- Range single and bridge, simple capacitor filter.
- 4.2 The use of a Zener diode as a shunt regulator is described and evaluated in accordance with industry practice in terms of characteristics, efficiency, and application.
- Range calculation of series resistor for varying loads only.
- 4.3 Three terminal regulators are explained, and typical circuits are analysed and experimentally evaluated.
- Range compare regulation with Zener shunt regulator.

Outcome 5

Use common test equipment to take measurements and locate faults in electronic circuits.

Range evidence of five faults is required.

Performance criteria

- 5.1 Test equipment is set and connected in accordance with manufacturers' specifications and in a manner that causes no danger to persons or damage to the instruments or equipment under test.
- 5.2 Measurements or indications are observed as appropriate and recorded in accordance with industry practice.
- 5.3 Faults are located using logical and methodical techniques in accordance with industry practice.

Outcome 6

Design and prototype a combinatorial logic circuit to solve electrotechnology problems.

Range minimum of three problems.

Performance criteria

- 6.1 Gates are selected and circuit performs to given specification.

Range a maximum of 10 gates selected from NOT, AND, OR, XOR, NAND, NOR.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	18 December 2006	31 December 2024
Review	2	25 May 2023	31 December 2024

Consent and Moderation Requirements (CMR) reference

0003

This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.