

Title	Demonstrate and apply knowledge of electronic signal technology engineering		
Level	6	Credits	15

Purpose	<p>This unit standard covers electronic devices and signals.</p> <p>People credited with this unit standard are able to:</p> <ul style="list-style-type: none"> - demonstrate and apply knowledge of small signal transistor amplifier design; - demonstrate knowledge of power semiconductor devices as applied to power amplifiers; - demonstrate knowledge of operational amplifier circuits; - demonstrate knowledge of waveform generation; - describe Fourier analysis; - describe DSP systems; and - demonstrate knowledge of digital and analogue modulation.
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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 22726, *Demonstrate and apply introductory knowledge of electronic engineering*; and Unit 16968, *Demonstrate and apply intermediate knowledge of electronic engineering*. It is recommended that competency in this unit standard should be assessed only after competency in unit standard 16968 has been achieved, or equivalent knowledge and skills demonstrated.
- 3 Reference
Health and Safety in Employment Act 1992;
and all subsequent amendments and replacements.
- 4 Definitions
a.c. – alternating current;
d.c. – direct current;
DSP – digital signal processor;
Industry practice – practice used and recommended by organisations involved in the electrotechnology industry.
SOA – safe operating area.

- 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 and apply knowledge of small signal transistor amplifier design.

Performance criteria

- 1.1 Loads in d.c. and a.c. circuits are identified, load lines are drawn, and maximum signal swing and distortion are explained in accordance with industry practice.
- 1.2 Small signal amplifier gains, frequency responses, and impedances using transistor models are calculated in accordance with industry practice.

Outcome 2

Demonstrate knowledge of power semiconductor devices as applied to power amplifiers.

Performance criteria

- 2.1 Power semiconductor devices are described in accordance with industry practice.
- 2.2 Power amplifier classes, circuits and their applications are described in accordance with industry practice.
- 2.3 Power and efficiencies are calculated and explained in accordance with industry practice.
- 2.4 An example of an SOA is drawn and explained in accordance with industry practice.
- 2.5 The purpose of heat sinks is explained and their requirements are calculated in accordance with industry practice.

Outcome 3

Demonstrate knowledge of operational amplifier circuits.

Performance criteria

- 3.1 Operational amplifier circuits are designed, drawn, and analysed in accordance with industry practice.
- Range evidence of at least six circuits is required.
- 3.2 Special operational amplifier types are described in accordance with industry practice.
- Range evidence of at least three types is required.
- 3.3 Types of noise associated with an operational amplifier circuit are explained and the noise equivalent circuits are drawn in accordance with industry practice.
- Range evidence of at least three types is required.

Outcome 4

Demonstrate knowledge of waveform generation.

Range low frequency.

Performance criteria

- 4.1 The function and application of oscillators is described in accordance with industry practice.
- 4.2 Oscillator circuits are sketched and explained in accordance with industry practice.
- Range evidence of at least two circuits is required.
- 4.3 Oscillation frequencies are calculated in accordance with industry practice.
- Range evidence of at least two circuits is required.

Outcome 5

Describe Fourier analysis.

Performance criteria

- 5.1 Fourier analysis is described for electronic signal technology in accordance with industry practice.
- Range may include but is not limited to – rectangular waves, triangular waves, sine waves, rectified sine waves.
Evidence of three required.

Outcome 6

Describe DSP systems.

Range signal conditioning to reconstruction.

Performance criteria

- 6.1 Digital signalling systems are described in terms of operation and application in accordance with industry practice.

Outcome 7

Demonstrate knowledge of digital and analogue modulation.

Performance criteria

- 7.1 Digital modulation is described in terms of application and methods in accordance with industry practice.
- 7.2 Analogue modulation is described in terms of application and methods in accordance with industry practice.
- 7.3 Digital and analogue modulation are compared in accordance with industry practice.

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	24 February 1998	31 December 2024
Revision	2	12 December 2000	31 December 2024
Review	3	18 December 2006	31 December 2024
Review	4	24 August 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>.