Title	Demonstrate knowledge of capacitors and semiconductor diodes		
Level	2	Credits	3

Purpose	This unit standard provides a basic appreciation of capacitors, and semiconductor diodes for trainees in the electrical industry.
	People credited with this unit standard are able to:
	– demonstrate knowledge of capacitors
	– demonstrate knowledge of semiconductor diodes
	– test semiconductor diodes.

Classification	Electrical Engineering > Core Electrical

Available grade	Achieved

Guidance Information

1   This unit standard has been developed for learning and assessment off-job.

2   References
Electricity (Safety) Regulations 2010
AS/NZS 3000 (version as cited in the Electricity (Safety) Regulations), *Electrical installations (known as the Australian/New Zealand Wiring Rules),* including Amendment 1
and all subsequent amendments and replacements.

3   Definition
The term *current regulations and standards* is used in this unit standard to refer to the requirements of the above references.

4   For assessment purposes
a Candidates shall be supplied with formulae involving more than three quantities.
b Use of a calculator during assessment is permitted.
c Candidates are expected to express calculated values in the relevant Système International (SI) units, including multiples and sub-multiples (pico, nano, micro, milli, kilo, mega, etc) and be able to convert between them.

5   Formulae quoted in this unit standard use internationally recognised symbols and units.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of capacitors.

Performance criteria

1.1   Capacitor types are described in terms of their physical construction.

           Range   stacked-plate, rolled, electrolytic, variable, ceramic.

1.2   Capacitance is defined in terms of voltage and charge, and its symbol and units are stated.

1.3   The factors influencing capacitance are stated, together with the effect of each when it is increased and decreased.

           Range   factors – area, distance between plates, dielectric permittivity.

1.4   Charge is calculated from given values of capacitance, applied voltage, current, and time.

           Range   simple calculations using formulae $Q = CV$ and $Q = It$.

1.5   Charge/discharge curves are sketched or observed for current and voltage.

1.6   Practical applications are stated for air, paper, mica ceramic, electrolytic, and solid dielectric capacitors, according to industry practice.

1.7   Capacitance and voltage rating are identified from capacitor markings according to current practice.

1.8   Combined capacitance of series and parallel connected capacitors are calculated.

1.9   The regulatory requirements relating to capacitors used for radio and television interference suppression are stated with reasons, according to current regulations and standards.

1.10   The safety precautions necessary to prevent electric shock from charged capacitors are stated.

Outcome 2

Demonstrate knowledge of semiconductor diodes.

Performance criteria

2.1   Diode types are named and their terminals are identified.

           Range   types – small signal diode, zener diode, power diode; terminals: anode and cathode.

2.2 Diode behaviour under forward and reverse bias conditions is explained with the aid of sketches of the voltage versus current characteristics.

Range   small signal diode, zener diode, power diode.

2.3 Diode terms are defined, and typical values during normal and abnormal operation are stated.

Range   forward bias, voltage drop, reverse breakdown, peak inverse voltage (PIV, Vrrm), average forward current, power dissipation, junction temperature, leakage current.

2.4 The operation of single-phase rectifier circuits is explained with the aid of diagrams, in terms of input and output waveforms, currents, and voltages.

Range   half-wave, centre-tapped transformer full-wave, bridge full-wave.

2.5 Examples of applications other than rectification are stated.

Range   examples of applications – free wheeling diodes on solenoids, diode matrices in lamp test circuits, voltage reference evidence of three uses is required.

Outcome 3

Test semiconductor diodes.

Range   small signal diode, zener diode, power diode.

Performance criteria

3.1 Diode is tested in accordance with industry practice and results are documented.

Range   diode tests include – forward resistance, reverse mode resistance; in-circuit testing of forward voltage drop and reverse leakage current.

3.2 Test results are interpreted to determine serviceability in terms of measured versus expected values.

3.3 The potential for damage to diodes when carrying out insulation resistance tests, and the procedures employed to prevent such damage, are described.

Replacement information	This unit standard replaced unit standard 751.

Planned review date	31 December 2028

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	10 February 1999	31 December 2013
Revision	2	3 April 2001	31 December 2013
Review	3	26 May 2005	31 December 2025
Rollover and Revision	4	15 March 2012	31 December 2025
Revision	5	15 January 2014	31 December 2025
Rollover and Revision	6	28 January 2021	31 December 2025
Review	7	28 March 2024	N/A

Consent and Moderation Requirements (CMR) reference	0003

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

Comments on this unit standard

Please contact Waihanga Ara Rau Construction and Infrastructure Workforce Development Council qualifications@WaihangaAraRau.nz if you wish to suggest changes to the content of this unit standard.