

## Achievement Standard

|                            |  |                               |                  |
|----------------------------|--|-------------------------------|------------------|
| <b>Subject Reference</b>   | Digital Technologies 2.47  |                               |                  |
| <b>Title</b>               | Demonstrate understanding of advanced concepts used in the construction of electronic environments |                               |                  |
| <b>Level</b>               | 2  | <b>Credits</b>                | 3                |
|                            |  | <b>Assessment</b>             | Internal         |
| <b>Subfield</b>            | Technology   |                               |                  |
| <b>Domain</b>              | Digital Technologies   |                               |                  |
| <b>Status</b>              | Registered   | <b>Status date</b>            | 17 November 2011 |
| <b>Planned review date</b> | 31 December 2019   | <b>Date version published</b> | 17 November 2016 |

This achievement standard involves demonstrating understanding of advanced concepts used in the construction of electronic environments.

### Achievement Criteria

| Achievement   | Achievement with Merit   | Achievement with Excellence   |
|---|--|---|
| <ul style="list-style-type: none"> <li>Demonstrate understanding of advanced concepts used in the construction of electronic environments.</li> </ul> | <ul style="list-style-type: none"> <li>Demonstrate in-depth understanding of advanced concepts used in the construction of electronic environments.</li> </ul> | <ul style="list-style-type: none"> <li>Demonstrate comprehensive understanding of advanced concepts used in the construction of electronic environments.</li> </ul> |

### Explanatory Notes

- This achievement standard is derived from Level 7 of the Technology learning area in *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007; and is related to the material in the *Teaching and Learning Guide for Technology*, Ministry of Education at <http://seniorsecondary.tki.org.nz>.

Further information can be found at <http://www.technology.tki.org.nz/>.

Appropriate reference information is available in *Safety and Technology Education: A Guidance Manual for New Zealand Schools*, Ministry of Education at <http://technology.tki.org.nz/Curriculum-support/Safety-and-Technology-Education>, and the Health and Safety at Work Act 2015.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* achievement objectives to which this standard relates, see the [Papa Whakaako](#) for the relevant learning area.

2 *Demonstrate understanding of advanced concepts used in the construction of electronic environments* involves:

- describing advanced concepts of electronics (e.g.power: describing the likely consequences of using a resistor to reduce the voltage from a 12V power supply so it can run a 1.5V wall clock)
- describing the advanced operational function of electronic components (e.g.roles of transistors as switches, and resistors and capacitors as timers in a transistor astable multivibrator circuit).

*Demonstrate in-depth understanding of advanced concepts used in the construction of electronic environments* involves:

- using advanced concepts of electronics to explain electronic environments (e.g.power: explaining how to determine the appropriate value and power rating of a series resistor supplying 25 LEDs in parallel on a Christmas tree)
- explaining the advanced operational function of electronic components (e.g.explaining how the values of the timing resistor and capacitor affect the frequency of an astable multivibrator [calculation of time constant]).

*Demonstrate comprehensive understanding of advanced concepts used in the construction of electronic environments* involves:

- using advanced concepts of electronics to discuss the implications of multiple variables on the performance of electronic environments (e.g.power: discussing the effect on the performance of a DC motor in a robotic vehicle when a series resistor is used to manage the voltage applied by the power supply to the motor. At excellence level the student would be taking into account the temperature dependence of resistance and also the way in which this affects the performance of the motor)
- discussing the advantages and disadvantages of different electronic components to achieve desired advanced operational functions (e.g.comparing the use of a 555 timer with a microcontroller in timing applications to determine which would be best to use in different electronic environments).

3 *Electronic environments* refer to functional combinations of hardware and embedded software.

4 *Understanding of advanced concepts* involves a selection from:

- power and heat dissipation
- analogue and digital signals
- bit, bytes and words (binary notation)
- logical AND and OR statements in programming
- structuring programmes logically
- subroutines and variables
- component function varying depending how and where it is used in a circuit (for example, resistors can do several different jobs).

- 5 Components include microcontrollers (variations and types) and a selection from:
- diodes (pn-junction and zener)
  - capacitors (various types)
  - voltage regulators
  - npn transistors
  - sensors (LDR, photodiode, thermistor, microphone)
  - actuators (relay, DC motor, solenoid, servo).
- 6 Conditions of Assessment related to this achievement standard can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>.
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### Quality Assurance

- 1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.
- 2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference

0233