Achievement Standard

Subject Reference	Digital Technologies 2.49
Title	Implement advanced techniques in constructing a specified advanced electronic and embedded system

Level	2	**Credits**	3	**Assessment**	Internal
Subfield	Technology				
Domain	Digital Technologies				

Status	Registered	**Status date**	17 November 2011
Planned review date	31 December 2019	**Date version published**	17 November 2016

This achievement standard involves implementing advanced techniques in constructing a specified advanced electronic and embedded system.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Implement advanced techniques in constructing a specified advanced electronic and embedded system.	• Skilfully implement advanced techniques in constructing a specified advanced electronic and embedded system.	• Efficiently implement advanced techniques in constructing a specified advanced electronic and embedded system.

Explanatory Notes

1 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.

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2 *Implement advanced techniques in constructing a specified advanced electronic and embedded system* requires:

- developing and producing a printed circuit board (PCB) using PCB CAD software
- constructing and testing functional circuits on PCBs
- writing and debugging software that can manage an advanced electronic and embedded system.

Skilfully implement advanced techniques in constructing a specified advanced electronic and embedded system requires:

- constructing and testing reliable circuits on PCB, with improved track layout and soldering
- writing, debugging and annotating readily understandable software that can manage an advanced electronic and embedded system.

Efficiently implement advanced techniques in constructing a specified advanced electronic and embedded system requires:

- constructing and testing reliable functional circuits on PCB, with substantially improved track layout and soldering
- writing and debugging well-structured, clearly annotated, and readily understandable embedded software which uses extended features and specialised commands (e.g. labels, macros, and noise reduction techniques such as switch debouncing).

3 *Electronic and embedded system* describes hardware (components and combinations of components) and software contained within physical components, and therefore subject to reactive, real-time and physical size constraints.

4 *Specified advanced electronic and embedded system* refers to an electronic and embedded system with specifications that define the functional qualities required of the system. The specifications must be of sufficient rigour to allow the student to meet the standard. They may be teacher-given or developed in negotiation with the student. Specifications for this achievement standard will require sophisticated data-processing and relate to the development of a system consisting of several subsystems.

5 *Advanced techniques* may include but are not limited to:

- laying out and constructing functional circuits on PCBs which reflect good practice, using CAD software and manufacturing systems (eg photo resist or engraving machines)
- soldering of high-quality joints on closely spaced pads
- calculations using Ohms Law, $P = I^2R$ or $\tau = RC$
- fault finding using visual inspection and multimeters to test for voltage and continuity
- writing of embedded software which reflects good practice
- developing testing and debugging strategies for electronic and embedded systems to ensure they work properly
- employing safe workshop practice.

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6 Practical contexts suitable for this achievement standard may include but are not limited to:
- wind-turbine with wind speed and direction sensors
- elevator with two floors and call buttons
- barrier arm system with position sensors and vehicle detection sensors.

7 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

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

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