



**Australian Government**

# **UEENEEH184A Modify digital signal processing (DSP) based sub-systems**

**Release 2**

# UEENEEH184A Modify digital signal processing (DSP) based sub-systems

## Modification History

Not applicable.

## Unit Descriptor

**Unit Descriptor**                    **1) Scope:**

### **1.1) Descriptor**

This unit covers modifying electronic DSP based sub-systems. It encompasses working safely, following design brief, apply knowledge of digital and analogue devices, interpreting device specifications, constructing prototypes, testing developed system prototype operation and documenting design and development work.

## Application of the Unit

**Application of the Unit**    **2)**

This unit is intended for competency development entry-level employment based programs incorporated in approved contracts of training or approved training programs. It is intended to apply to any formal recognition for this standard at the aligned AQF 6 level.

## Licensing/Regulatory Information

**License to practice**            **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

## Pre-Requisites

**Prerequisite Unit(s)** 4)

**Competencies** 4.1)

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEE1 01A Apply Occupational Health and Safety regulations, codes and practices in the workplace

**Literacy and numeracy skills** 4.2)

Reading 5 Writing 5 Numeracy 5

## Employability Skills Information

**Employability Skills** 5)

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

## Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

## Elements and Performance Criteria

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
1 Prepare to modify DSP based systems	1.1 OHS processes and procedures for a given work area are obtained and understood.
	1.2 Established OHS risk control measures and procedures are followed in preparation for the work.
	1.3 The extent of the proposed electronic DSP based system is determined from the design brief or in consultations with appropriate person(s)
	1.4 Design development work is planned to meet scheduled timelines in consultation with others involved on the work site
	1.5 Materials and devices/components required for the work are determined on compatibility of their specifications with DSP based system requirements and project budget constraints.
2 Modify DSP based systems	2.1 OHS risk control measures and procedures are followed.
	2.2 Knowledge of digital and analogue elements used in DSP based systems and compliance standards are applied to the design
	2.3 Alternative arrangements for the modification are considered based on the requirements outlined in the design brief.
	2.4 Safety, functional and budget considerations are incorporated in the design.
	2.5 Prototype devices and circuits are constructed, programmed and tested for compliance with the design brief and regulatory requirements.
	2.6 Prototype malfunctions are rectified and retested to ensure effective operation of design.
	2.7 DSP based system modification is documented for submission to appropriate person(s) for approval

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	2.8 Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for electronic DSP based systems modification	3.1 DSP based system modification is presented and explained to client representative and/or other relevant person(s).
	3.2 Requests for alterations to the design are negotiated with relevant person(s) within the constraints of organisation policy.
	3.3 Final design is documented and approval obtained from appropriate person(s).
	3.4 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and modifying DSP based systems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

#### KS01-EH184A

#### Digital Signal Processing

Evidence shall show an understanding of digital signal processing, applying safe working practices and relevant Standards, Codes and Regulations to an extent indicated by the following aspects:

T1. DSP development technologies

T2. Infinite Impulse Response (IIR) filter encompassing:

- pole-zero placement method to obtain coefficients for a simple first-order and second-order low-pass and band-pass IIR filter.
- direct-form realisation of a simple IIR filter suitable for  $\sin(x)/x$  compensation.
- DSP system

T3 High-order IIR filter encompassing:

- filter design package to obtain the coefficients for a high-order IIR filter
- high-order IIR filter would be realised using a cascade or a parallel combination of first-order or second-order IIR filter blocks.
- effect of coefficient quantisation errors and calculation rounding-off errors on filter performance.
- IR filters and symmetrical FIR filters

T4 Discrete Fourier Transform (DFT) to a signal encompassing:

- discrete correlation.
- signal-detection.
- correlation used to generate DFT.
- window-function when generating the DFT.

T5 Concept of complex signals encompassing:

- positive-frequency and a negative frequency signal.
- exponential and polar form of sinusoidal signal and a complex sinusoidal signal.
- spectra of a general signal having equal real and imaginary components. (An “analytic” or “quadrature” signal).
- analytic signals simplification filtering operations

T6 Fast Fourier Transform (FFT) encompassing:

- Decimation in Time FFT, and the “twiddle factor”.

## REQUIRED SKILLS AND KNOWLEDGE

- sample-frequency and number of signal samples needed for a FFT.
- FFT routine.

T7 FIR filtering using FFT encompassing:

- overlap, save method of implementing a long FIR filter using the FFT and the inverse FFT.
- limitations on the stored frequency-response coefficients and the resulting impulse-response.

T8 Data-rate conversion encompassing:

- data-rate conversion (decimation) simplification of the anti-alias filter requirement
- data-rate conversion (interpolation) of the DSP system simplification the reconstruction-filter requirement and reduces the need for  $\sin(x)/x$  compensation.

T9 Modulation and de-modulation techniques encompassing:

- Spectra where real signals and analytic (quadrature) signals are modulated by a sinusoidal function.
- amplitude-modulated signal
- single-sideband signal

T10 Digital processing steps in practical DSP applications

T11 Currently available DSP support chips

## Evidence Guide

### EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package. .

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

### Overview of Assessment 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the Industry-preferred model for apprenticeships.

However, where summative (or final) assessment is used it must include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accord with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work influence decisions about how/how much the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

**Critical aspects of evidence required to demonstrate competency in this unit 9.2)**

Before the critical aspects of evidence are considered all prerequisites shall be met.

Evidence for competence in this unit shall be considered holistically. Each Element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:



- Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
- Apply sustainable energy principles and practices as specified in the performance criteria and range statement
- Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Modify DSP based systems as described in 8) and including:
    - a. Developing the design modification within the safety and functional requirements and budget limitations.
    - b. Documenting and presenting design effectively.
    - c. Successfully negotiating design alteration requests.
    - d. Obtaining approval for final modification.
    - e. Documenting justification of actions to be implemented in accordance with professional standards.
    - f. Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

**Context of and  
specific  
resources for  
assessment**      **9.3)**

This unit should be assessed as it relates to normal work practice

using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to modifying DSP based systems.

#### **Method of assessment**

#### **9.4)**

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the industry to which this unit applies. This requires that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

#### **Concurrent assessment and relationship with other units**

#### **9.5)**

There are no concurrent assessment recommendations for this unit.

## Range Statement

### RANGE STATEMENT

**10)** This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated using a representative range of DSP based systems in relation to modifying an electronic DSP based system.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

## Unit Sector(s)

Not applicable.

## Competency Field

<b>Competency Field</b>	<b>11)</b>
	Electronics