



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEH148A Design and develop advanced digital systems

Release: 1

UEENEEH148A Design and develop advanced digital systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers the design and development of advanced digital systems. It encompasses working safely, following design brief, applying knowledge of digital components/devices, interpreting device/component specifications, constructing prototype devices, applying programming techniques to programmable devices, testing developed system prototype operation, verifying compliance of the design against the final brief, 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 5 level or higher.

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

License to practice**3)**

applicable contracts of training such as apprenticeships.

Pre-Requisites**Prerequisite Unit(s)****4)****Competencies****4.1)**

There are no prerequisite competencies for this unit.

Literacy and numeracy skills**4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

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

ELEMENT	PERFORMANCE CRITERIA
1 Prepare to design and develop advanced digital systems.	1.1 OHS processes and procedures for a given work area are identified, 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 digital system development 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 selected on compatibility of their specifications with digital system requirements and project budget constraints.
	1.6 Tools, equipment and testing devices needed to carry out the work are obtained and checked for correct operation and safety.
2 Design and develop advanced digital systems.	2.1 OHS risk control work measures and procedures are followed.
	2.2 Knowledge of digital devices and systems and compliance standards are applied to the design
	2.3 Alternative arrangements for the design are considered based on the requirements outlined in the design brief.
	2.4 Safety, functional and budget considerations are

ELEMENT	PERFORMANCE CRITERIA
	incorporated in the design. 2.5 Prototype devices and circuits are constructed 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 Digital system design is documented for submission to appropriate person(s) for approval. 2.8 Solutions to unplanned situation are provided consistent with organisation policy.
3 Obtain approval for the design.	3.1 The design is presented and explained to client representative and/or other relevant person(s). 3.2 Requests for modifications 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 designing and developing advanced digital systems.

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

KS01-EH148A

Advanced digital systems design and development

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

T1. Design techniques for combinational and sequential logic circuits (as a minimum a three levels, four input circuit).

- equation writing, reduction
- propagation delay calculation

T2. Design of complex sequential logic circuits (as a minimum a three levels sequential circuit) using current techniques - equation writing, reduction, propagation delay calculation, etc.

T3. Selection of current types of oscillators based on their characteristics and operation.

T4. Selection of current memory and storage devices based on their characteristics and operation - (eg flash, I2C)

T5. Connection of test/measuring devices into a circuit encompassing:

- safety procedures
- circuit arrangement using test/measuring devices(eg multimeters, voltage and digital testers, signal generators and oscilloscopes)
- Taking readings
- Storage, maintenance and care of test/measuring devices

T6. Electronic Safe working practices

- Application of risk management principles
- Control measures for dealing with
 - non-electrical hazards
 - extra-low voltage hazards
 - low-voltage hazards
 - high-voltage hazards
 - high-current hazards

REQUIRED SKILLS AND KNOWLEDGE

T7. Digital to analogue conversion

- Applications of D/A converters
 - Summing D/A converters
 - R-2R D/A converters
 - Verification of circuit operation of an IC D/A converter
 - Selection of an D to A for use in a digital application based on their characteristics and operation.

T8. Analogue to digital conversion

- Applications of A/D converters
- Digital ramp, dual slope, successive approximation and simultaneous (flash) A/D converters.
- Verification of circuit operation of an IC A/D converter
- Selection of an A to D for use in a digital application based on their characteristics and operation.

T9. Programmable logic devices

- Types of programmable logic devices
- Comparison between different programmable logic devices
- Programmable Logic Devices (PLD) and CPLDs
- Field Programmable Gate Arrays (FPGA)
- Programming and verifying correct operation

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:
 - Design and develop advanced digital systems as described in 8) and including:

- A Developing outlines of alternative designs.
- B Developing the design within the safety and functional requirements and budget limitations.
- C Constructing and testing prototype devices and circuits according to design brief and regulatory requirements.
- D Documenting and presenting design effectively.
- E Successfully negotiating design alteration requests.
- F Obtaining approval for final design.
- G Verifying compliance of the design against the final brief.
- H 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 designing and developing advanced digital 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.

The critical aspects of occupational health and safety covered in unit UEENEEE101A and other discipline specific occupational health and safety units shall be incorporated in relation to 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 in relation to designing and developing an advanced digital system with at least five variables and a mixture of sequential and combinatorial functions.

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**Competency Field** **11)**

Electronics