



Australian Government

Department of Education, Employment and Workplace Relations

UEENEEH115A Develop software solutions for microcontroller based systems

Release: 1

UEENEEH115A Develop software solutions for microcontroller based systems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor

1) Scope:

1.1) Descriptor

This unit covers developing, implementing and testing programming solutions in microcontroller based systems. It encompasses following development brief, using appropriate development software, writing code, applying problem solving procedures, testing and modifying of programs.

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 may also used to augment formally acquired competencies.

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 3 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 provided

License to practice**3)**

equipment is not connected to installation wiring at voltage above 50 V a.c. or 120 V d.c. However other conditions may apply in some States/Territories subject to regulations related to electrical work.

Practice in the workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Note:

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control, lifting equipment and the like. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.

2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

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)**

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 develop code. | 1.1 OHS processes and procedures for a given work area are obtained and understood. |
| | 1.2 Established OHS risk control measures and procedures in preparation for the work are followed. |
| | 1.3 The extent of code development work is determined from job performance specifications and in consultations with relevant persons. |
| | 1.4 Activities are planned to meet scheduled timelines in consultation with others involved on the work. |

ELEMENT	PERFORMANCE CRITERIA
	1.5 Appropriate development kit and software are selected based on specified requirements and performance standard.
	1.6 Strategies are implemented to ensure programming is carried out efficiently.
2 Develop code.	2.1 OHS risk control measures and procedures for carrying out the work are followed.
	2.2 Correct syntax is applied when developing code.
	2.3 Key features of the programming language used are applied to develop and test solutions. Note: Key features may include use of registers, addressing modes, assembler instructions, subroutines and flags.
	2.4 Approaches to issues/problems are analysed to provide most effective solutions.
	2.5 Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test and document the development of code.	3.1 Testing procedures are developed to analyse code.
	3.2 Problems and bugs in code are rectified to ensure specifications are met.
	3.3 Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

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 developing software for microcontroller based systems.

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

KS01-EH115A Software programming fundamentals

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

T1. Semiconductor memory

- memory cell
- antistatic precautions
- memory organization
- storage capacity and density

T2. Overview of Address decoding

T3. Microprocessor/ Microcontroller architecture

- internal architecture of a microprocessor
- single chip microcontroller architecture
- programming model of microprocessor/ microcontroller

T4. Programming

- programming concepts
- instruction set
- machine code and assembly language high level and low level language

T5. Addressing modes

- types of addressing modes
- applications for each addressing mode
- programming using different addressing modes

T6. Arithmetic and logic instructions

- types of arithmetic and logic instructions.
- applications for each type of arithmetic and logic instruction.
- programming using arithmetic and logic instructions.

T7. Branch instructions and flowcharts

- types of branching instructions
- applications for each type of branching instruction.
- programming using branching instructions.

T8. Subroutines

REQUIRED SKILLS AND KNOWLEDGE

- purpose and applications
- stack memory

T9. Timing loops

- concept
- timing calculations
- nested timing loops
- programming using timing loops

T10. Input/Output ports

- input/output port devices and interfacing
- programmable input/ output port ICs

T11. Implementing a program for a specific task

- purpose of program
- writing the program
- debugging and implementing the program

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:
 - Develop software solutions in microcontroller based systems as described in 8) and including:

- A Using methodical problem solving methods.
- B Providing solution to micro software problems.
- C Providing written justification for the solutions to problems.
- D 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 developing software solutions in microcontroller 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)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with 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 by developing software solutions in any microcontrollers/microprocessors using the following techniques:

- Modifying an existing micro program to comply with specified operating parameters
- Developing micro software to comply with a specified function and operating parameters
- Debugging software

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