Australian Government

Department of Education, Employment and Workplace Relations

UEENEEI156A Develop and test code for microcontroller devices

Release: 1

UEENEEI156A Develop and test code for microcontroller devices

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	**1) Scope:**
	1.1) Descriptor
	This competency standard unit covers structured programming instructions for micro devices at a fundamental level. The unit encompasses working safely, applying knowledge device architecture and programming fundamentals, writing and testing specified instructions and documenting development activities.
	Note.
	In this unit the term 'micro' refers to microcontrollers however competency in the unit can be achieved using microprocessors.

Application of the Unit

Application of the Unit	**2)**
	This competency standard unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 5 or higher.

Licensing/Regulatory Information

License to practice	**3)**
	The skills and knowledge described in this unit do not require a licence 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

License to practice	3)
	and the like.

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 Safety regulations, codes and practices in the workplace

For the full prerequisite chain details for this unit please refer to Table 2 in Volume 1, Part 2

Literacy and numeracy skills	4.2)

Participants are best equipped to achieve 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)

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 and test basic specifications.	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 specifications to be developed is determined from job performance requirements and in consultations with relevant persons.
		1.4	Activities are planned to meet scheduled timelines in consultation with others involved on the work.
		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 basic specification.	2.1	OHS risk control measures and procedures for carrying out the work are followed.
		2.2	Knowledge of micro controller functions and features are applied to developing specifications.
		2.3	Correct structure and syntax is applied to developing program specification for target micro controller function.
		2.4	Key features of the assembler programming language are applied to develop and test

     EE-Oz Training Standards

ELEMENT		PERFORMANCE CRITERIA
		solutions.
	2.5	Approaches to issues/problems are analysed to provide most effective solutions.
	2.6	Quality of work is monitored against personal performance agreement and/or established organizational or professional standards.
3 Test and document the basic specification.	3.1	Testing procedures are developed to analyse code developed.
	3.2	Problems and bugs are rectified to ensure specification the creation of the code is met.
	3.3	Intermediate and final work reports are written in accordance with professional standards and presented to appropriate person or persons.

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Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) 7) 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 and testing code for microcontroller devices.

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

KS01-EI156A   Microcontroller programming

Evidence shall show an understanding of microcontroller control system programming methods to an extent indicated by the following aspects:

Microcontroller architecture encompassing:

Program storage types

Data storage types

I/O Ports: analogue/ digital

Integrated Peripherals: timers, interrupts etc

Control circuitry: system clock, reset etc

Industry standard programming environment

Programming terms encompassing:

Language levels and their features

Language simulators and emulators

Language programming basics encompassing:

Programming input/output functions

Timing loops

Memory organisation, operation and addressing methods encompassing:

Programmer's model   encompassing:

- register structure
- instruction register/decoder
- arithmetic logic unit (ALU)
- accumulator and flags
- instruction cycle timing
- control lines
- stack pointer
- index register

System clock circuits fetch and execute encompassing:

- timing cycle

REQUIRED SKILLS AND KNOWLEDGE

- timing relationship to system clock
- logic levels of system buses for each clock period of an instruction cycle

Input/output port programming

Structured assembly programming

Evidence Guide

EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit of competency and must be read in conjunction with the performance criteria and the range statement of the unit of competency and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this Competency Standard Unit and shall be used in conjunction with all components parts of this 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's preferred model for apprenticeships. However, where summative (or final) assessment is used it is to 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 in this regard.
	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. Hence, sources of evidence

need to be 'rich' in nature so as to minimise error in judgment.

Activities associated with normal every day work have a bearing on the decision as to how much and how detailed 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 practiced. 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; and

    - Apply sustainable energy principles and practices as specified in the performance criteria and range; and

    - 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.; and

    - Demonstrate an appropriate level of skills enabling employment; and

    - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures;

and

- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Develop and test code for microcontroller devices as described in 8) and including:

A	Using all key features of an appropriate assembler language.
B	Developing testing procedures.
C	Identifying problem and bugs in program.
D	Rectifying problem and bugs in program.
E	Writing and presenting work reports to an acceptable standard.
F	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in the holistic assessment with the above listed items.

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 competency standard unit.

Resources required to assess this unit are listed above in context of assessment', which should also be used in the formal learning/assessment environment.

Note:

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

The resources used for assessment should reflect current industry

practices in relation to developing and testing code for microcontroller devices.

| **Method of assessment** | **9.4)** |

This competency standard 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 competency standard 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 of competency 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 competency standard unit shall be demonstrated in relation to developing and testing code for microcontroller devices including at least three of the following:

- Selecting an appropriate micro for a given task
- Setting up and using basic input/output functions
- Using assembler/simulator software packages to debug program
- Finding system faults.

Generic terms are used throughout this Vocational Standard shall be regarded as part of the Range of Variables 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)

Instrumentation and Control