



Australian Government

MEM234010 Design microcontroller applications

Release: 1

MEM234010 Design microcontroller applications

Modification History

Release 1. Supersedes and is equivalent to MEM234010A Design microcontroller applications.

Application

This unit of competency defines the skills and knowledge required to design an automated device for a machine or piece of equipment using a microcontroller. The automated device can use digital or analog input/output (I/O) and can involve feedback control. The microcontroller application can be an autonomous device or it can be integrated into a local area network (LAN) or distributed control system (DCS) using wired or wireless communications. It includes consideration of sustainability implications, work health and safety (WHS) and automation safety.

The unit applies to the design of automated devices using microcontrollers, and design activities can also include reverse engineering and design rectification or modifications of an existing design. The unit is suitable for automated device or systems designers and maintenance personnel across all forms of manufacturing and engineering, and for those pursuing engineering or related qualifications and careers.

Individuals completing this work either already have or are developing skills and experience in the application of basic computing, controllers, mathematics, electrical and electronic systems, and evaluation of microprocessor systems and safety procedures. Mechanical, fluid power, thermodynamic, manufacturing methods and processes experience may also be required by particular system designs.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil

Competency Field

Engineering science

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Clarify client brief or	1.1 Establish the required features and functions of the microcontroller

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
contract requirements	application in consultation with the client 1.2 Determine technical, commercial and environmental parameters of the brief or contract 1.3 Determine stakeholders to be consulted in design process 1.4 Provide initial advice to client on the feasibility of the project
2. Prepare concept proposal	2.1 Carry out initial investigations and measurements 2.2 Carry out required modelling and calculations 2.3 Consider need for continuous improvement, constraints and contingency management, as part of concept proposal based on parameters of the brief 2.4 Generate microcontroller application design options that respond to the brief 2.5 Check feasibility and evaluate solutions against design criteria ensuring conformity to WHS, regulatory, sustainability and environmental requirements 2.6 Prepare a device design proposal that includes appropriate consideration of results of feasibility study, required modelling and calculations, and any required expert opinions 2.7 Review concept proposal with client and select preferred solution
3. Design micro-controlled device	3.1 Finalise selected device design 3.2 Provide documentation, drawings, specifications and instructions 3.3 Consult with client and stakeholders to obtain sign-off on design 3.4 Monitor installation and commissioning with stakeholders, and make any necessary modifications

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

There is no Range of Conditions information for this unit of competency.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234010A Design microcontroller applications.

Links

Companion Volume Implementation Guides are available on VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM234010 Design microcontroller applications

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- interpreting features and functions of the application and parameters of the brief or contract
- determining sustainability, automation safety, work health and safety (WHS), regulatory and risk management requirements
- researching latest trends and techniques in application of controllers and in reverse engineering
- investigating, measuring, modelling and calculating for options
- investigating faults in existing designs and produce solutions
- generating and evaluating solutions
- designing microcontroller system solutions on at least two occasions
- considering any required continuous improvement, constraint and contingency management requirements in design options
- prototyping and systematically programming and testing actuators and interfaces, input sensor and/or transducers, communications and network connections, human machine interfaces (HMIs) and graphical user interfaces (GUIs)
- selecting actuators, interfaces, microcontroller, sensors and/or transducers, signal conditioning, HMIs, communication and network software and connections, on at least two occasions
- ensuring automation safety using appropriate licensed technical and professional assistance
- communicating, negotiating and reviewing with stakeholders and client throughout the process to obtain agreement on proposal and sign-off on design
- documenting design with drawings, specifications and instructions.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- contemporary engineering microcontroller application design methods
- brief parameters
- research and investigation methods
- techniques for:
 - continuous improvement
 - problem-solving and decision-making
 - root cause analysis (RCA) or failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM), and Pareto analysis
- engineering design software options
- software simulation and validation processes
- documentation, drawings, specifications and instructions
- WHS and regulatory requirements, codes of practice, standards, risk minimisation and registration requirements
- microcontroller software programming techniques
- control options
- device component options for different applications including microcontroller, user interfaces, HMIs and GUIs, software, data communications, telemetry, modems and networking topology
- specifications for input/output (I/O) and I/O channels.

Assessment Conditions

- Assessors must:
 - have vocational competency in designing microcontroller applications at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
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