



**Australian Government**

# **MEM234014 Design a robotic system**

**Release: 1**

# MEM234014 Design a robotic system

## Modification History

Release 1. Supersedes and is equivalent to MEM234014A Design a robotic system.

## Application

This unit of competency defines the skills and knowledge required to design an engineering application that employs a robot and to integrate the robotic application with other equipment and systems. It includes the use and integration of actuators, sensors, end effectors, including tactile effectors, dynamic analysis of strength and stability, programming and protocols for communications and networking, as appropriate.

The client may be internal or external to the designer's organisation.

The unit applies to the design of a robotic system across all forms of manufacturing and engineering, and design activities can also include reverse engineering, design rectification, integration of off-the-shelf components, or modifications of an existing design. It is suitable for robotic system designers or maintenance technologists, and for those pursuing qualifications and careers in engineering design involving robotics and automation.

Individuals completing this work either already have or are developing skills and experience in the application of computing technology, mathematics, scientific principles and techniques, kinematics and kinetics, electrical and fluid power principles, programming of computers and controllers, robotic systems evaluation and mechanical construction techniques.

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 contract requirements | 1.1 Consult with client to determine the required features and functions of the application and establish control requirements<br>1.2 Determine technical, commercial and environmental parameters of |

| Elements                                         | Performance Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i> | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                  | <p>the brief or contract</p> <p>1.3 Determine stakeholders to be consulted in the design and application process</p> <p>1.4 Provide initial advice to client on the feasibility of the project</p>                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2. Prepare concept proposal                      | <p>2.1 Investigate and take initial measurements to define robotic system performance parameters</p> <p>2.2 Carry out required modelling, simulations and calculations using appropriate techniques, software and validation techniques</p> <p>2.3 Generate robotic system solutions that respond to the brief or contract</p> <p>2.4 Check feasibility and evaluate solutions against design criteria, ensuring conformity to work health and safety (WHS), regulatory, sustainability and environmental requirements</p> <p>2.5 Review concept proposals with clients and select preferred solution</p> |
| 3. Design robotic device or system               | <p>3.1 Finalise design of robotic system according to preferred solution</p> <p>3.2 Provide documentation, drawings, specifications and instructions that reflect the design</p> <p>3.3 Consult and negotiate with clients and stakeholders to obtain sign-off on design</p> <p>3.4 Monitor installation and commissioning with stakeholders, and make any necessary modifications</p>                                                                                                                                                                                                                    |

## 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.

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| Parameters of the design brief includes one or more of the following: | <ul style="list-style-type: none"> <li>the design of new equipment or fault analysis, rectification or modification to an existing design</li> <li>determination of the degree of innovation and creativity expected by the client</li> <li>design process limits and budgets</li> <li>product cost limits and budgets</li> <li>performance specifications</li> <li>equipment availability, capacities and restrictions</li> <li>specified administrative, communication and approval procedures</li> <li>use and integration of off-the-shelf components</li> <li>other special features and limits in the design brief.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Robotic systems include:                                              | <ul style="list-style-type: none"> <li>a self-controlling machine (robot) that can perform functions automatically without human initiation and assistance after initial programming and other components to allow integration with other equipment and systems within the workplace</li> <li>sensory elements, electrical, hydraulic or pneumatic actuators for linear or rotary motion and components to perform functions including grasping hands, lifting magnets and heating pads</li> <li>networking capabilities to serve an automated environment</li> <li>programming capability to perform repetitive tasks or tasks unsuitable for humans.</li> <li>consideration of: <ul style="list-style-type: none"> <li>motions</li> <li>loads</li> <li>accuracy</li> <li>precision and repeatability</li> <li>kinematics, kinetics and dynamic stability</li> <li>sensing</li> <li>control</li> <li>end effectors</li> <li>data requirements</li> <li>hardware requirements</li> <li>system integration</li> <li>network topology and communication protocol.</li> </ul> </li> </ul> |
| WHS, regulatory, sustainability and environmental issues include:     | <ul style="list-style-type: none"> <li>WHS acts, regulations and relevant standards</li> <li>industry codes of practice</li> <li>risk assessments</li> <li>registration requirements</li> <li>safe work practices</li> <li>minimising ecological and environmental footprint of process, plant and product</li> <li>maximising economic benefit of process plant and product to the organisation and the community</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

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|  | <ul style="list-style-type: none"><li>• minimising the negative WHS impact on employees, community and customer</li><li>• state and territory regulatory requirements.</li></ul> |
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## Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234014A Design a robotic system.

## Links

Companion Volume Implementation Guides are available on VETNet -

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