



Australian Government

MEM09156 Prepare mechatronic models for computer-aided engineering (CAE)

Release: 1

MEM09156 Prepare mechatronic models for computer-aided engineering (CAE)

Modification History

Release 1. Supersedes and is equivalent to MEM09156A Prepare mechatronic models for computer-aided engineering (CAE).

Application

This unit of competency defines the skills and knowledge required to apply mechatronic modelling techniques using computer-aided engineering (CAE). It includes model creation for automated mechanisms, robots or system control and data acquisition (SCADA) environments, printed circuit board manufacture and assembly, and as a basis for generating orthogonal drawings. Models covered by this unit include mechanical, maintenance, manufactured engineering products, plant and systems.

This unit is suitable for people working in design drafting and those pursuing careers and qualifications in mechatronics, automated systems or systems maintenance at engineering technician level.

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

Pre-requisite Unit

MEM23004 Apply technical mathematics

MEM23109 Apply engineering mechanics principles

MEM23111 Select electrical equipment and components for engineering applications

MEM23112 Investigate electrical and electronic controllers in engineering applications

Competency Field

Drawing, drafting and design

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. Determine job requirements	1.1 Follow standard operating procedures (SOPs) 1.2 Comply with work health and safety (WHS) requirements at all times

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	1.3 Identify job requirements from specifications
2. Identify model parameters	2.1 Investigate applications for modelling in mechatronics from job requirements 2.2 Determine the virtual parameters, form, function and features 2.3 Determine the required model generation processes, and required graphics generation and post-processing 2.4 Identify licensed technical and professional assistance for advice required
3. Develop model	3.1 Generate initial graphical model using identified processes 3.2 Consult with model stakeholders and make agreed adjustments 3.3 Prepare and trial model for intended purpose 3.4 Evaluate model against design criteria in consultation with stakeholders and make agreed adjustments 3.5 Engage appropriate licensed technical and professional assistance for advice
4. Finalise model	4.1 Prepare final model as agreed 4.2 Report and demonstrate results 4.3 Provide documentation, instructions, models and files, and obtain sign-off in accordance with SOPs

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.

Specifications include one or more of the following:	• job sheets • work instructions.
Stakeholders include one or more of the following:	• team members • cross-function support groups • experts • appropriate licensed technicians and professionals.
Mechatronic components, assemblies and layouts include one or more of the following:	• electrical motors and fluid power actuators • printed circuit boards • electrical, electronic and electro fluid controls • chain drives, gear sets, pulley and belt drives • structural sections • mechatronic assembly models, including robots, automated mechanisms and machines • materials handling equipment, including belt conveyors, augers and pneumatic conveyors • manufacturing plant and process layouts • manufactured product with embedded controller.
Model creation techniques include:	• creating dimensioned orthographic projections from models Plus one or more of the following: • using and manipulating coordinate systems • creating 3D entities • ruled and revolved surfaces • creating solids • editing and combining solids • manipulating entities and solids • manipulating solids and library files • creating 3D graphics from models, including rotated views and sections.
Virtual model options include one or more of the following:	• automated systems simulation of motions • post-processing to create numeric control (NC) data files to computer numeric control (CNC) circuit board assembly • gantry robot assembly of boards • rapid prototyping options • finite element analysis (FEA).
Appropriate licensed technical and professional assistance includes one or more of the following:	• technical support and advice relating to elements which have intrinsic dangers • professional support for technologies.
Modelling and related software includes one or	• lumped parameter model • empirical, random data tested model

more of the following:	• FEA software • model-based design.
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Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM09156A Prepare mechatronic models for computer-aided engineering (CAE).

Links

Companion Volume implementation guides are found in VETNet -

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

Assessment Requirements for MEM09156 Prepare mechatronic models for computer-aided engineering (CAE)

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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:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- producing mechatronic-related models including virtual computer-generated solid models and physical models developed from the virtual model data, that are consistent with design information and relevant standards and conventions on at least two occasions
- applying modelling techniques
- communicating, participating and negotiating with stakeholders, appropriate licensed technicians and professionals
- reviewing and comparing available software, features, functions and context of mechatronic modelling
- creating and manipulating 3D entities using library files and adaptations and accessing supplier catalogues and data bases on at least two occasions
- creating dimensioned orthographic projections from models on at least two occasions
- extracting dimensional properties from model
- post-processing model for analysis or physical modelling
- commissioning, gaining approval, completing work, documenting, reporting and obtaining sign-off.

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:

- safe work practices and procedures
- advantages and disadvantages of computer-aided manufacturing (CAM) using modelling compared to traditional manufacturing methods
- sustainability implications to be taken into account when modelling
- methods used to produce models of:
 - mechanical products

- maintenance products
- manufactured engineering products
- plant
- systems
- mechatronic components, assemblies and layouts suitable for modelling
- modelling and related software functions and features
- model creation techniques
- modelling processes including computer modelling and post-processing
- virtual modelling options
- stakeholders in the model creation
- job requirements that may create a need for licensed technical and professional services
- comparisons of modelling to traditional representation methods including:
 - pen and pencil graphics compared to wire frame, surface and solid models
 - computer animations compared to transparent overlay mobiles to test clearances and motions
 - solid models compared to isometric projections
 - computer library files compared to the use of reference charts and catalogue information
- where to access Australian and international standards and codes.

Assessment Conditions

- Assessors must:
 - have vocational competency in preparing mechatronic models for computer-aided engineering (CAE) 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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