



Australian Government

MEM234013 Plan and design engineering-related manufacturing processes

Release: 1

MEM234013 Plan and design engineering-related manufacturing processes

Modification History

Release 1. Supersedes and is equivalent to MEM234013A Plan and design engineering-related manufacturing processes.

Application

This unit of competency defines the skills and knowledge required to plan and design engineering-related manufacturing processes. It includes consideration of client requirements, process control, sustainability, lean systems, product manufacturability, system maintainability, facilities, services, plant and tooling requirements, supply chains, material and product flow, continuous improvement and constraint and contingency management, work health and safety (WHS) and regulatory requirements.

It applies to the design of manufacturing processes across all forms of manufacturing and engineering and design activities can also include design rectification or modifications of an existing engineering-related manufacturing process. It is suitable for manufacturing system designers or manufacturing operations personnel, and for those pursuing engineering or related qualifications and careers.

Individuals completing this work either already have or are developing skills and experience in production control techniques, product and process improvement techniques, manufacturing plant and processes and evaluation of business performance, computing technology and mathematics.

The unit does not apply to technical leadership in project, operational or engineering management. Where these skills are required see unit MEM234001 Plan and manage engineering-related projects or operations.

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 Clarify product performance objectives and specifications with client 1.2 Determine and research planning and design parameters of the brief or contract 1.3 Determine WHS, regulatory, sustainability and environmental issues relevant to the proposed manufacturing process 1.4 Established required technical and professional assistance based on project scope 1.5 Confirm client's production system capability and provide initial advice on feasibility 1.6 Discuss 'time to market' issues with the client and establish timelines 1.7 Decide, in conjunction with client, whether the proposed project should fit with an existing production system or a new or redesigned process to be established for the product 1.8 Prepare a product development flow chart that provides sufficient information to guide the planning and design process
2. Develop manufacturing process design options and prepare concept proposals	2.1 Identify and analyse relevant production systems 2.2 Generate and validate manufacturing process design solutions using current design methodologies and automated design tools 2.3 Evaluate and rank options against client criteria for quality, cost, and application of automation, maintainability and regulatory requirements 2.4 Determine social and sustainability implications of solutions 2.5 Document and present concept proposals to client 2.6 Provide feedback on product manufacturability 2.7 Evaluate concept proposals with client and select preferred process
3. Design manufacturing process	3.1 Determine manufacturing process control, maintenance management, human resources and continuous improvement systems implications for final design 3.2 Finalise manufacturing process design, including material and product flow, logistics, transfers, new or modified facilities, services, plant and tooling layout 3.3 Ensure preparation of all required documentation, drawings, specifications and instructions 3.4 Consult with client and stakeholders to obtain sign-off on design. 3.5 Monitor installation and commissioning of manufacturing process

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	with stakeholders and make any necessary adjustments to design

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.

Appropriate technical and professional assistance includes:	- technical support and advice relating to elements which have intrinsic dangers related to: - high pressure - energised fluid vessels - high temperatures and heat energy capacity - wiring or devices with high current or voltages above extra low voltage - professional support for technologies related to: - specialist electric motor drives and controllers - specialist materials, plastics, metal alloys and nano materials - special processes, foundry, alloy welding, heat treatment, sealing and fastening - professional services for: - finance, accounts and tax - insurance and legal - training and human resources (HR).
Parameters of the brief include:	- the design of new manufacturing processes or fault analysis, rectification or modification to an existing design - daily and seasonal production rates - requirements for shift work - provisions for increasing or reducing production rates - expected quality levels

	• other special features and limits in the design brief.
WHS, regulatory, sustainability and environmental issues include:	• WHS acts, regulations and relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • minimising ecological and environmental footprint of process, plant and product • maximising economic benefit of process plant and product to the organisation and the community • minimising the negative WHS impact on employees, community and customer • state and territory regulatory requirements.
Production systems include:	• suppliers • materials handling systems • manufacturing processes • labour force capability • distribution systems.
Design methodologies include:	• design for assembly and automated assembly • design for manufacturability • design for quality and maintainability • concurrent engineering.
Automated design tools include:	• computer-aided design (CAD) • computer-aided engineering (CAE) • solid modelling • finite element analysis • group technology (GT) • computer-aided process planning (CAPP) • expert system tools • cost analysis and financial modelling tools.
Design for product manufacturability includes:	• enhancement by concurrent product and process design • consideration of manufacturing processes and plant in the product design process including the use of group technologies.
Continuous improvement implementation includes:	• changes to plant, products, processes, systems or services, including design, development, implementation or manufacture, commissioning, operation or delivery and maintenance Plus one or more of the following techniques: • balanced scorecard • current and future state mapping • measuring performance against benchmarks • process improvement, problem solving and decision making

	• data management, generation, recording, analysing, storing and use of software • training for improvement systems participation • technical training.
Planning and design parameters include:	• facilities • services • plant • tooling and process • process control system.
Planning and design parameters requiring research include:	• manufacturing process design techniques • product manufacturability • process design • layout and automation options • lean systems • supply chain value analysis.
Engineering manufacturing process design requirements include one or more of the following:	• software options • facilities and services • plant and tooling requirements of products • stock control • warehousing • buffer and emergency stock • material and product flow • transfer operations • information flow and manufacturing process control • process maintenance management • labour requirements and skills distribution.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234013A Plan and design engineering-related manufacturing processes.

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 MEM234013 Plan and design engineering-related manufacturing processes

Modification History

Release 1. Supersedes and is equivalent to MEM234013A Plan and design engineering-related manufacturing processes.

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 of product and processing options and parameters of the brief or contract
- planning and designing engineering-related manufacturing processes
- advising client, based on discipline knowledge and work health and safety (WHS) and regulatory standards
- establishing budget and control measures and designing schedule within design project control plan
- researching planning and design parameters on at least two occasions
- determining sustainability, WHS, regulatory and risk management requirements
- investigating faults in existing manufacturing process designs and proposing solutions
- reviewing engineering manufacturing process requirements on at least two occasions
- modelling and calculating using appropriate software and validation techniques
- generating solutions and evaluating feasibility against design criteria
- incorporating maintenance management, human resources (HR), information management and continuous improvement systems
- implementing systems thinking, continuous improvement, and constraint and contingency management options
- communicating, negotiating and reviewing with stakeholders and client throughout the process to obtain agreement on proposal and sign-off on design
- documenting design with required 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:

- advanced and current manufacturing process design methodologies
- appropriate technical and professional assistance
- brief parameters

- standardisation techniques
- economic, social and sustainability implications
- market competitiveness factors
- lean manufacturing principles
- automated design tools
- project planning, scheduling and control techniques including budgeting and costing
- characteristics of, and differences between, jobbing, flexible and mass production, and continuous process
- implications of maintenance management and human resource systems for engineering-related planning processes
- production information flow required for and from a manufacturing process
- regulatory environment requirements, applicable standards and codes of practice
- WHS and regulatory requirements, codes of practice, standards and registration requirements
- process design documentation, drawings, specifications and instructions
- 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.

Assessment Conditions

- Assessors must:
 - have vocational competency in planning and designing engineering-related manufacturing processes 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.
-

Links

Companion Volume Implementation Guides are available on VETNet -

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