Australian Government

MEM234008 Design plant using computer simulations

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MEM234008A Design plant using computer simulations.

Application

This unit of competency defines the skills and knowledge required to use computer simulations to develop engineering solutions for the design of plant, equipment and manufacturing processes. This includes mathematical models and computer simulation models, sensitivity estimation and optimisation to ensure reliability, validity and robustness of simulations.

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

It is suitable for plant and process 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 evaluation of plant and processes, application of scientific principles, analysis of loads on machine elements, selection of components and materials, use of manufacturing processes and computer-aided design (CAD), and use of mathematics, including calculus and differential equations.

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**
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
1. Clarify the simulation task and elaborate the specification	1.1 Establish required features of the computer simulations in consultation with client 1.2 Determine parameters of the brief or contract

Elements	**Performance Criteria**
Elements describe the essential *outcomes.*	*Performance criteria describe the performance needed to demonstrate achievement of the element.*
	1.3 Determine stakeholders to be consulted in design process 1.4 Assess work health and safety (WHS), regulatory, sustainability or environmental issues relevant to design task 1.5 Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility
2. Research and test computer simulation options	2.1 Analyse computer simulations software for reliability, validity and robustness 2.2 Assess process simulation software for applications in commercial plant and processes 2.3 Test computer simulation software with known solutions 2.4 Select the most appropriate simulation option for the application
3. Prepare concept proposal	3.1 Prepare computer simulation design 3.2 Complete required modelling, optimisation and sensitivity analysis 3.3 Generate design solutions in response to brief 3.4 Check feasibility and evaluate solutions against design criteria, standards and codes, ensuring conformity to WHS requirements 3.5 Prepare a proposal that includes results of feasibility study, consideration of expert opinion, initial calculations, modelling and the use of judgment and discretion 3.6 Review concept proposal with client to improve outcomes and overcome possible problems 3.7 Negotiate adjustments to brief or contract parameters if required
4. Design plant, equipment or manufacturing process	4.1 Design plant, equipment or process using chosen simulation methods 4.2 Optimise simulation and analyse sensitivity 4.3 Provide documentation, graphics, specifications and instructions 4.4 Consult with client and stakeholders to obtain sign-off on design simulation

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.	
Computer simulations include:	• process simulations • performance analysis and optimisation • fault simulations • machine simulations, stress, deflection and heating • environmental modelling • mathematical design modelling • hydraulic system modelling • virtual engineering.
Parameters of the design brief include:	• design of new equipment or fault analysis, rectification or modification to an existing design • determination of the degree of innovation and creativity expected by the client • design process limits and budgets • product cost limits and budgets • performance specifications • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures • 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 • conforming to all industry covenants, protocols and best practice guides • 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.

Sensitivity estimation, optimisation and validation includes:	• software employed for estimation, optimisation and validation
	• sensitivity as a measure of impacts of changes to parameter values and assumptions on the output or conclusions from the model
	• sensitivity analysis that can be used as a measure of robustness and validity
	• optimisation as the adjustment of variables and parameters to fine-tune the output to closer match expected system outputs
	• validation techniques:
	  • comparison of traditional solutions for simple design problems with software solutions to the same design problems
	  • review of previously implemented design challenges which were completed using the software
	  • robustness relates to the ability of a simulation model to respond to inputs in a stable manner.

Unit Mapping Information

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Links

Companion Volume Implementation Guides are available on VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2