Australian Government

MEM234019 Apply finite element analysis in engineering design

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MEM234019A Apply finite element analysis in engineering design.

Application

This unit of competency defines the skills and knowledge required to apply finite element analysis (FEA) for engineering design and modification analyses, including stress analysis, displacements and natural frequencies, and temperature and heat distributions in engineering or related applications.

FEA uses numerical techniques to find approximate solutions for engineering problems including:

- load, stiffness and deflection analysis and animations for vehicle crash simulations
- hopper and bin designs
- piping systems
- heat flow including in cavity moulds, load distribution, stiffness and strength in structures.

The client may be internal or external to the organisation.

It applies to engineering or related applications across all forms of manufacturing and engineering and is suitable for people with structural, plant or equipment design or maintenance responsibilities, and for those pursuing engineering or related qualifications and careers.

Individuals completing this work either already have or are developing skills and experience in mechanics, mathematics and computing techniques and computer-aided design (CAD) and potentially expertise in thermodynamics or structures, depending on the application of the FEA.

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. Integrate requirement for FEA into an engineering design application	1.1 Establish functions, features and performance parameters of plant, structure or equipment to be analysed 1.2 Determine parameters of the brief or contract 1.3 Determine work health and safety (WHS), regulatory, sustainability and environmental requirements of the application 1.4 Provide initial advice based on discipline knowledge, WHS and regulatory standards relating to the suitability of using FEA as an analytical technique
2. Apply FEA solution techniques	2.1 Set up a finite element model including internal and external parameters, element mesh and nodes 2.2 Select appropriate solver and adjust parameters for optimum solution 2.3 Generate and assess solution file for warnings or errors 2.4 Interpret results and generate graphics 2.5 Identify areas of excessive stress, deformation, instability and excessive temperatures 2.6 Verify results to the required certainty level 2.7 Apply systems or holistic thinking, contingency and constraint management, problem-solving and decision-making techniques in making recommendations to achieve satisfactory functions, features and performance parameters 2.8 Review initial results with client 2.9 Negotiate adjustments to brief or contract parameters if required
3. Embed FEA results in design application	3.1 Report and recommend design improvements or modifications as a result of the FEA analysis 3.2 Document results of investigations, analysis and recommendations 3.3 Obtain sign-off in accordance with workplace procedures

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.	
Parameters of the brief include:	• the 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 requirements 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.
Appropriate solver includes:	• sparse • preconditioned conjugate gradient (PCG) • incomplete Cholesky conjugate gradient • frontal • linear static • linear buckling • non-linear static • natural frequency • steady state and heat.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM234019A Apply finite element analysis in engineering design.

Links

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