Australian Government

MEM14089A Integrate mechanical fundamentals into an engineering task

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM14089A Integrate mechanical fundamentals into an engineering task

Modification History

Release 1 - New unit. Replaces MEM14081A and MEM23071A, but not equivalent.

Unit Descriptor

This unit of competency covers the integration of mechanical fundamentals to achieve an engineering or related task. It includes identifying task parameters, personal and team functions, chain of responsibility and work health and safety (WHS) guidelines. It includes investigation of machines, mechanisms and mechanical systems, and mechanical fundamentals, such as mechanical methods and processes, workshop techniques, materials, scientific and mathematical principles and computer software. It requires completion of the task in cooperation with the team and documentation of the process and outcomes.

Application of the Unit

The unit applies to engineering or related projects requiring mechanical engineering skills and covers the identification, application and integration of mechanical fundamentals. It is suitable for people working as mechanical designers and draftspersons and those pursuing careers and qualifications in mechanical engineering.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A	Apply technical mathematics
MEM23109A	Apply engineering mechanics principles

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element.

Elements and Performance Criteria

1	Investigate scope of engineering task	1.1	Identify mechanical and related fundamentals to be integrated into engineering task
		1.2	Identify stakeholders to be consulted
		1.3	Confirm WHS, regulatory requirements, risk management and organisational procedures
		1.4	Review functions and features of machines, mechanisms and mechanical systems required by the task
		1.5	Review software techniques required for task analysis and graphics
2	Integrate mechanical fundamentals	2.1	Use systems thinking to address contingencies and constraints, problem solving and decision making, and continuous improvement to achieve integration task
		2.2	Integrate mechanical fundamentals to achieve task objectives
		2.3	Seek technical and professional assistance or clarification of design information, as required
3	Report results	3.1	Record results of investigation, evaluation and integration
		3.2	Provide documentation, such as diagrams and calculations, programs and files

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- communicating, cooperating and negotiating with stakeholders
- identifying parameters and context, WHS and regulatory requirements, risk management and organisational procedures
- evaluating requirements, principles, techniques, and typical applications related to task
- selecting software for required analysis and graphics
- planning the task
- solving problems and making decisions using systems thinking and continuous improvement to address contingencies and constraints
- reporting and documenting results of investigation, evaluation and integration, diagrams and calculations
- reviewing sustainability implications, functions and features for the engineering task

Required knowledge

Required knowledge includes:

- WHS and regulatory requirements, codes of practice, and risk minimisation and registration requirements
- mechanical and related fundamentals, including:
  - materials properties
  - mechanics
  - chemistry
  - thermodynamics
  - fluid mechanics
  - fluid power
  - electrical fundamentals
  - and may also include depending on the application:
    - light, sound and electromagnetic effects
- methods and processes for shaping, cutting, joining and coating of metal and other materials
- functions and features of machines, mechanisms and mechanical systems
- current options and tends in software, including system layout and simulation

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	A person who demonstrates competency in this unit must be able to undertake investigation of an engineering task to determine the mechanical fundamentals required by the task and integrating them into a task plan and report the plan and any investigations undertaken.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: • determine task parameters and context and identify and investigate required mechanical fundamentals • evaluate task requirements, principles, techniques, typical applications and software • plan the task • integrate mechanical fundamentals to achieve task objectives • communicate, cooperate and negotiate with stakeholders to achieve integration task • report and document results.
Context of and specific resources for assessment	• This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, then a simulated working environment must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. • Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. • Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
Method of assessment	• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment must cover the integration of two or more mechanical fundamentals to achieve the engineering task.

	• Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure correct interpretation and application. • Assessment may be applied under project related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Mechanical and related fundamentals	Mechanical and related fundamentals include fundamentals of: • materials properties • mechanics • chemistry • thermodynamics • fluid mechanics • fluid power • electrical fundamentals and may also include depending on the application: • light, sound and electromagnetic effects
Machines, mechanisms and mechanical systems	Machines, mechanisms and mechanical systems may include:

	• piston and rotary displacement engines • liquid, gas and steam turbines • pumps and pumping systems • compressors and pneumatic distribution systems • hydraulic systems • fans and ducting systems • heating, ventilation, air conditioning and refrigeration (HVAC/R) systems • mechanical drive systems and transmissions • brakes and clutches • conveyors, elevators, cranes and materials handling plant • boilers and piping systems

Appropriate licensed technical and professional assistance	Appropriate licensed technical and professional assistance may include:
	• technical support and advice relating to elements which have intrinsic dangers, such as:
	  • high pressure
	  • energised fluid vessels
	  • high temperatures and heat energy capacity
	  • wiring with high current control voltages above extra low voltage
	• professional support for technologies, such as:
	  • specialist electric motor drives and controllers
	  • specialist materials, plastics, metal alloys and nano materials
	  • special processes, foundry, alloy welding, heat treatment, sealing and fastening

WHS, regulatory requirements and enterprise procedures	WHS, regulatory requirements and enterprise procedures may include: • WHS Acts and regulations • relevant standards • codes of practice • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements
Systems thinking	Systems thinking refers to the conduct of engineering work in a manner that demonstrates knowledge of how the interaction of different technical systems on equipment, machinery or structures, as well as the skills and techniques of personnel, combine to perform or support engineering-related operations, processes or

	projects. It embraces determining or establishing how the function of each technical system or component, as well as the skills and techniques of personnel, effects or potentially may effect, outcomes. Systems should be interpreted broadly within the context of the organisation and depending on the project or operation can include equipment, related facilities, material, software, internal services and personnel, and other organisations in the value chain
Continuous improvement implementation	Continuous improvement implementation may relate to plant, products, processes, systems or services, including design, development, implementation or manufacture, commissioning, operation or delivery and maintenance. Improvement processes may include techniques, such as: • 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
Constraints and contingencies	Constraints and contingencies may include: • financial • organisation procedural or culture • physical constraints, such as limits to resources, limits to site access or logistical limitations
Sustainability	Sustainability is used to mean the entire sustainable performance of the organisation/plant, including: • meeting all regulatory requirements • 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

Unit Sector(s)

Competency field

Unit sector Planning

Custom Content Section

Not applicable.