Australian Government

Department of Education, Employment and Workplace Relations

MEM234002A Integrate engineering technologies

Release: 1

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Modification History

New unit

Unit Descriptor

This unit of competency covers the skills required to integrate technologies, processes, components or equipment for projects or operations. Apart from engineering considerations the unit encompasses sustainability, occupational health and safety (OHS) and regulatory requirements and implications of the project.

Application of the Unit

This unit applies to individuals working as a Principal Technical Officer or in an equivalent engineering-related position who are required to integrate different technologies, processes, components or equipment. The unit applies to all forms of manufacturing and engineering operations. It is suitable for persons with system design, installation, commissioning and project or operational management responsibilities who have to integrate different technologies. The technologies may be all in one discipline or technical field or across engineering and related disciplines. For installation, commissioning and project or operational management application, the unit assumes that discretion as to the type and level of integration applies and the actual level of integration must be determined.

Prior or concurrently developed experience in the application of scientific principles, mathematics, materials, manufacturing processes, computer software for computer-aided design (CAD), system analysis, modelling and simulation, project work and risk management and experience in the technologies to be integrated is required.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

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. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Clarify the scope of the integration design task and elaborate the specification	1.1	Identify processes, machine, equipment, components and technologies covered by integration task
		1.2	Determine other parameters to the integration task
		1.3	Determine stakeholders to be consulted
		1.4	Determine if and when input and advice should be obtained from experts in other technical fields and disciplines
		1.5	Assess OHS, regulatory, sustainability or environmental issues relevant to integration task
		1.6	Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility
2	Prepare integration analysis and concept proposal for designs or operational changes	2.1	Carry out initial investigations into technologies and equipment to be integrated
		2.2	Identify any existing or pre-designed integration
		2.3	Determine any special features of machines, equipment or processes that need to be considered
		2.4	Carry out required analysis, modelling and calculations using appropriate software and validation techniques
		2.5	Obtain design or advice from experts in other technical fields and disciplines, if required
		2.6	Generate a range of integration solutions
		2.7	Check feasibility and evaluate solutions against design criteria, project brief or operating specifications ensuring conformity to technical, economic and OHS

			requirements
		2.8	Determine social and sustainability implications of solutions
		2.9	Present integration concept proposals to client or supervisors
3	Finalise integration strategy	3.1	Evaluate concept proposals with client
		3.2	Finalise selected integration strategy, including design elements or modifications and implementation strategy, ensuring preparation of all required documentation, drawings, specifications and instructions
		3.3	Consult with client and stakeholders to obtain sign-off on integration strategy and documentation
4	Implement integrated engineering technologies strategy	4.1	Monitor and support prototyping or testing of machine, process or technology using selected integrated engineering strategy
		4.2	Analyse performance against strategy and internal or external client specifications
		4.3	Adjust strategy, as required
		4.4	Obtain sign-off and oversight production of adjusted documentation, drawings, specifications and instructions
		4.5	Communicate and negotiate with stakeholders to address issues such as design and resources adjustments
		4.6	Ensure design and implementation documentation and records are maintained in accordance with organisational requirements

Required Skills and Knowledge

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

Required skills

Required skills include:

- interpreting features of machines or equipment
- establishing parameters to the brief or contract, including extent to which integration task goes beyond own technical field
- communicating and negotiating with client and stakeholders
- generating a range of solutions, including the technical requirements of an implementation plan
- applying design standards, performance analysis, and modelling and simulation software
- validating software
- evaluating solutions for feasibility against design criteria
- developing and optimising chosen solution and technical implementation plan and schedule
- preparing proposals, including the implementation plan, resource requirements, documents, specifications, graphics and instructions
- monitoring and supporting implementation
- commissioning the project or operation

Required knowledge

Required knowledge includes:

- design, implementation, commissioning and troubleshooting process
- technology requirements for integration task
- holistic engineering principles, such as systems thinking, design, research and investigations methods
- modelling and calculation techniques
- current options and trends in design, performance analysis, and modelling and simulation software
- software validation techniques
- design and implementation criteria
- critical activities and resources as input to the planning process
- planning and scheduling techniques
- requirements for sign-off
- documentation, drawings, specifications and instructions required
- OHS and regulatory requirements, codes of practice, standards and registration requirements

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.

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 the scope of the integration task • establish parameters to the integration task • communicate and negotiate with client and stakeholders • generate a range of solutions, including the technical requirements of an implementation plan, using systems thinking, innovation and creativity • apply design standards, performance analysis, modelling and simulation software • validate software • evaluate solutions for feasibility against design criteria • develop and optimise chosen solution and technical implementation plan and schedule • prepare proposals, including the implementation plan, resource requirements, documents, specifications, graphics and instructions • monitor and support implementation • commission the project or operation.
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, that is, the candidate is not in productive work, 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 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 its

	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 able not only 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.

Integration task	For the purposes of this unit, an integration task has the following features: • the integration must require application of engineering skill and knowledge across a range of engineering technologies and systems. The integration task may or may not go across disciplines or technical fields of work • the integration must not already be fully pre-designed • integration may be required across one or more processes, machines and sets of equipment Typical integration tasks would be those requiring integration of mechanical, fluid power and electrical systems with control technologies, structural support, and other engineering-related systems as may be found in automated applications
Parameters to the integration brief	Parameters to the integration brief include: • technology and process limits • capital and design budgets • product cost limits and budgets • anticipated post-integration performance specifications • equipment availability, capacities and restrictions • specified administrative, communication and approval procedures

	• other special features and limits in the integration brief
Stakeholders	Stakeholders include: • clients • financier • project or operations team • support services, such as accounts and legal professionals, technical experts, suppliers and transporters • those responsible for plan implementation activities, such as installation, commissioning and process improvement
OHS, regulatory, sustainability and environmental issues	OHS, regulatory, sustainability and environmental issues may include: • OHS Acts and regulations • relevant standards • industry codes of practice • risk assessments • registration requirements • safe work practices • state and territory regulatory requirements
Software and validation techniques	Software may be employed for performance analysis/modelling. Underpinning program techniques and algorithms should be understood, such as: • the use of failure effects analysis (FEA) and numerical methods within object oriented modelling techniques Validation techniques include: • 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

Sustainability	For the purposes of this unit, sustainability includes consideration of economic, social, ecological and resources implications of activities. Sustainability issues may include:
	• resources and energy:
	  • sources, access, processing and consumption
	  • food security and agriculture, health, education and shelter
	  • land, energy and water
	• social and economic factors affecting design of machines and equipment
	• life cycle design of product (manufacture to re-manufacture or recycle)
	• raw material, solids and hazardous waste, and production

	by-products • contamination of land, air and stormwater pollutants, and discharge to sewerage • climate change
Monitor and support the implementation	Monitoring and supporting may include: • provision of assistance with hardware procurement and system assembly and arrangements to suit design • assisting installation and commissioning • provision of advice on adjustments, revisions and required documentation
Systems thinking	Systems thinking: • is the process of developing solutions within the context of an entire system • recognises that an improvement in one subsystem can adversely affect another subsystem
Critical activities and resources	Critical activities and resources are those identified as critical to schedule milestones and project success
Standards and codes	Standards refer to all relevant Australian and international standards and codes applicable to a particular design task
Planning and scheduling techniques	Implementation requirements may be a critical factor in evaluation of design options. Planning and scheduling options may include: • critical path or Pert network plans and Gantt charts

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Unit Sector(s)

Engineering practice

Custom Content Section

Not applicable.