



Australian Government

Department of Education, Employment and Workplace Relations

MEM23082A Apply scientific principles and techniques in mechatronic engineering situations

Release: 1

MEM23082A Apply scientific principles and techniques in mechatronic engineering situations

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers applying scientific principles and techniques to mechatronic engineering.
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Application of the Unit

Application of the unit	This unit applies to selecting and applying advanced mechatronic scientific principles and techniques. Computer techniques, graphical methods and mathematical calculations should complement scientific principles chosen and include unit analysis, appropriate precision and accuracy and use conservative estimations. This unit only has application in qualifications that are not points based. Band: 0 Unit Weight: 0
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM23041A	Apply basic scientific principles and techniques in mechanical engineering situations
	MEM23051A	Apply basic electro and control scientific principles and techniques

Prerequisite units		
		in mechanical and manufacturing engineering situations

Employability Skills Information

Employability skills	This unit contains employability skills.
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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.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the range of scientific principles and techniques relevant to mechatronic engineering	1.1. The scientific principles relating to mechatronic engineering. Research and report on using appropriate sources of information. 1.2. The techniques and associated technologies, software and hardware associated with implementing scientific principles relating to mechatronic engineering applications. Research and report on using appropriate sources of information.
2. Select scientific principles and techniques relevant to mechatronic engineering applications	2.1. For particular mechatronic engineering situations the relevant scientific principle or principles can be selected. 2.2. For particular mechatronic engineering situations, the relevant techniques and associated technologies, software and hardware can be selected.
3. Apply the relevant scientific principles and techniques appropriately	3.1. The scientific principles are applied in a consistent and appropriate manner to obtain any required solution. 3.2. Appropriate calculations and correct units are used to establish quantities. Coherent units are used in equations in a systematic manner to ensure meaningful solutions. 3.3. Significant figures are used in engineering calculations. 3.4. The techniques and associated technologies, software and hardware are applied in a consistent and appropriate manner to obtain required solutions.
4. Quote the results of the application of the scientific principles and techniques correctly	4.1. For applications involving engineering calculations the solution is quoted in an appropriate style. 4.2. For applications not involving engineering calculations the solution is quoted in an appropriate style.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

REQUIRED SKILLS AND KNOWLEDGE

Look for evidence that confirms skills in:

- applying advanced scientific principles relevant to mechatronic engineering
- analysing the given situation to determine what is required in the manner of a solution
- analysing the given situation to determine which mechanical scientific principles are selected
- selecting appropriate mechanical techniques and associated technologies, software and hardware to suit the application/s
- applying appropriate mechanical principles in determining the required solution
- applying and manipulating formulas and calculations for engineering applications
- using the correct units to solve engineering calculations
- checking the validity of equations using a systematic method for ensuring coherent units
- applying mechanical techniques and associated technologies, software and hardware in a manner appropriate to the application and identified scientific principles
- referring solutions to the original aim of the application
- quoting solutions in appropriate units and using appropriate significant figures
- presenting solutions referring to the original aim of the application

Required knowledge

Look for evidence that confirms knowledge of:

- mechatronic engineering techniques and related technologies, software and hardware associated with implementing scientific principles in engineering solutions and related to appropriate engineering applications
- the limitations of mechatronic engineering techniques and associated technologies, software and hardware
- the relevance of scientific principles to mechanical engineering
- the applicability and limitations of an extensive range of mechatronic engineering techniques and associated technologies, software and hardware
- the choice of mechatronic engineering scientific principles for particular applications
- the applicability of particular mechatronic engineering techniques and associated technologies, software and hardware to specific applications
- the choice of mechatronic engineering techniques and associated technologies, software and hardware for particular applications
- the method of application of the scientific principles
- fundamental and derived quantities and explained
- common systems of units
- the procedure for converting between systems of units
- common prefixes used with units and their values

REQUIRED SKILLS AND KNOWLEDGE
• the procedure for ensuring coherent units for meaningful solutions to equations • the concept of significant figures • the uncertainty of computations based on experimental data • the procedures for determining the significance of figures in calculations • the procedures for estimating errors in derived quantities • the method of application of the mechanical techniques and associated technologies, software and hardware • the significance of the calculation solution style in relation to the original task • the significance of the non calculation solution style in relation to the original task

Evidence Guide

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 apply scientific principles and techniques in mechatronic engineering situations. Competency in this unit cannot be claimed until all prerequisites have been satisfied.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.

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 an appropriate simulation 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. The assessment environment should not disadvantage the candidate.

This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying scientific principles and techniques in mechatronic engineering situations or other units requiring the exercise of the skills and knowledge covered by this unit.

Method of assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes,

EVIDENCE GUIDE	
	standards, manuals and reference materials.
Guidance information for assessment	

Range Statement

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.	
Mechatronic engineering	- The engineering discipline concerned with the conceptual development, research, design, manufacture and/or implementation and/or installation, commissioning and maintenance of automated products for domestic, commercial, industrial, civil, entertainment, medical or military applications. - Mechatronics is usually defined as the integration of mechanical, electronics, programming, electrical and fluid power in an engineering product. - The skills and underpinning knowledge of mechatronics have much in common with general automation of processes, systems and services.
Sources of information	Includes reference texts, manufacturer's catalogues and industrial magazines, websites, use of phone, email and fax information gathering.
Engineering applications	The description or definition of an objective or challenge within a real or simulated engineering environment or state requiring a conceptual development, design, manufacture and/or implementation and/or installation, commissioning and maintenance response to affect a solution or improvement.

Unit Sector(s)

Unit sector	
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Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering science
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