



Australian Government

Department of Education, Employment and Workplace Relations

MEM23041A Apply basic scientific principles and techniques in mechanical engineering situations

Release: 1

MEM23041A Apply basic scientific principles and techniques in mechanical engineering situations

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers applying basic scientific principles and techniques to appropriate mechanical and manufacturing engineering situations.
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Application of the Unit

Application of the unit	This unit requires application of basic mechanical scientific principles and techniques as a member of a design and development team or similar in support of the design and development of mechanical and manufacturing applications. Applications include identifying the range of basic mechanical scientific principles and techniques relevant to mechanical and manufacturing engineering, selecting mechanical principles and techniques for particular applications, applying mechanical principles and techniques appropriately to engineering tasks, quoting results appropriately. 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		

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. Research and identify the range of basic mechanical scientific principles and techniques relevant to mechanical and manufacturing engineering	1.1. The basic mechanical scientific principles relating to mechanical and manufacturing engineering researched and reported on from appropriate sources of information and examination of applications. 1.2. The basic mechanical techniques and associated technologies, software and hardware required to implement scientific principles relating to mechanical and manufacturing engineering situations.
2. Select basic mechanical scientific principles and techniques relevant to particular mechanical and manufacturing engineering applications	2.1. For particular mechanical and manufacturing engineering situations, the relevant basic mechanical scientific techniques and principles can be selected. 2.2. For particular mechanical engineering situations, the relevant basic mechanical techniques and associated technologies, software and hardware can be selected.
3. Apply the relevant basic mechanical scientific principles and techniques appropriately	3.1. The basic mechanical scientific principles are applied in a consistent and appropriate manner to obtain any required solution. 3.2. Appropriate calculations and coherent units are used in the solution of engineering calculations. 3.3. Significant figures are used in engineering calculations. 3.4. The basic mechanical 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 basic mechanical scientific principles and basic 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 AND KNOWLEDGE

Required skills

Look for evidence that confirms skills in:

- selecting appropriate basic mechanical scientific principles have been chosen to suit specific applications
- selecting appropriate basic mechanical techniques and associated technologies, software and hardware to suit specific applications
- applying basic mechanical scientific principles to particular engineering situations
- applying and manipulating appropriate formulas for applications involving engineering calculations
- applying appropriate calculations to engineering situations
- checking the validity of equations is using dimensional analysis
- applying basic 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, using appropriate significant figures.
- quoting limitations of solutions, due to assumptions, scientific principles and techniques used
- presenting solutions referring to the original aim of the application.

Required knowledge

Look for evidence that confirms knowledge of:

- basic mechanical scientific principles
- limitations of selected basic scientific principles
- basic mechanical techniques and related technologies, software and hardware associated with implementing scientific principles in mechanical engineering solutions
- the limitations of basic techniques and associated technologies, software and hardware
- the applicability and limitations of basic mechanical scientific principles
- the applicability and limitations of basic mechanical techniques and associated technologies, software and hardware
- appropriateness of calculations
- fundamental and derived quantities
- common systems of units
- the procedure for converting between systems of units
- common prefixes used with units and their values
- the procedure for carrying out dimensional analysis
- the concept of significant figures
- the uncertainty of computations based on experimental data

REQUIRED SKILLS AND KNOWLEDGE
• the procedures for determining the significance of figures in calculations • the procedures for estimating errors in derived quantities

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 basic scientific principles and techniques in mechanical engineering situations.

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 basic scientific principles and techniques in mechanical 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, standards, manuals and reference materials.

EVIDENCE GUIDE

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.

Sources of information

Reference texts, manufacturer's catalogues and industrial magazines, websites, use of phone, email and fax information gathering.

Basic mechanical scientific techniques and principles

- Candidates should apply appropriate basic techniques supported by their mathematical skills and introductory knowledge of scientific principles to design, manufacturing and commissioning related tasks and projects. The applications may require the use of one or two basic mechanical scientific principles together with a fundamental mathematical calculation leading to process, resources and system choices from a limited range of options.
- Basic techniques include basic hand and power tool operations, machining, fitting, welding, moulding, fabricating, wiring and programming techniques.

Mechanical engineering

The engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of mechanical products, processes, systems or services for converting energy into power and motion, materials into product and components into machines and systems for domestic, industrial, public or private services, entertainment and military applications.

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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