Australian Government

Department of Education, Employment and Workplace Relations

MEM23001A Apply advanced mathematical techniques in a manufacturing engineering or related environment

Release: 1

MEM23001A Apply advanced mathematical techniques in a manufacturing engineering or related environment

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers advanced *concepts of mathematics* appropriate to engineering situations within the individual's area of engineering expertise.

Application of the Unit

Application of the unit	This unit applies to technician level work that requires basic knowledge and skill relating to exponential, logarithmic and trigonometric equations, basic computer numerical methods and complex figures. This unit only has application in qualifications that are not points based. Band: 0 Unit Weight: 0

Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
Path 1	MEM30012A	Apply mathematical techniques in a manufacturing engineering or related environment
	MEM16008A	Interact with computing technology

Employability Skills Information

Employability skills	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

ELEMENT	PERFORMANCE CRITERIA
1. Graph exponential and logarithmic functions and solve exponential and logarithmic equations.	1.1. Simplify arithmetic and algebraic expressions using the laws of indices and logarithms. 1.2. Sketch the graphs of exponential and logarithmic functions. 1.3. Convert logarithms between bases. 1.4. Draw curves of best fit, interpolate data and estimate constants. 1.5. Solve problems involving growth and decay.
2. Graph trigonometric functions and solve trigonometric equations.	2.1. Sketch graphs of simple trigonometric functions. 2.2. Simplify trigonometric expressions. 2.3. Solve trigonometric equations.
3. Apply basic computer numerical methods to engineering situations.	3.1. Apply appropriate number systems to a range of engineering applications requiring manipulations of decimal, binary and hexadecimal information. 3.2. Apply computer techniques to the solution of engineering problems involving products, sums, divisions and subtraction of variables. 3.3. Apply computer techniques to the solution of engineering problems involving linear, quadratic, logarithmic, trigonometric equations. 3.4. Apply computer techniques to the solution of engineering problems and vector analysis.
4. Sketch and describe complex figures mathematically.	4.1. Sketch complex figures including intersections to implement pattern developments. 4.2. Describe complex figures mathematically. Relate mathematical models to computer graphics models.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • simplifying arithmetic and algebraic expressions using the laws of indices and logarithms • correctly sketching exponential and logarithmic functions

REQUIRED SKILLS AND KNOWLEDGE

- accurately converting logarithms from one base to another
- drawing curves of best fit for given sets of data
- accurately interpolating data from plotted data and/or drawn curves
- solving problems involving growth and decay
- accurately sketching trigonometric functions
- simplifying trigonometric expressions using trigonometric identities
- correctly solving trigonometric equations
- selecting an appropriate number system
- developing an appropriate program for the engineering situation
- running a program to achieve an appropriate solution

Required knowledge

Look for evidence that confirms knowledge of:

- the laws of indices and logarithms
- the procedures for simplifying arithmetic and algebraic expressions
- the procedures for sketching exponential and logarithmic functions
- the effects on the curve due to variation in size of constants
- the procedures for converting logarithms between bases
- the procedures for drawing curves of best fit and interpolating results
- the procedures for estimating constants in suggested relationships
- the concept of growth and decay
- the procedures for solving problems involving growth and decay
- the significance of amplitude, period and phase angle
- the procedures for sketching trigonometric functions
- the trigonometric identities
- the procedures for using trigonometric identities to simplify trigonometric expressions
- matching of engineering situations to appropriate number systems
- use of number systems for particular applications
- identification and description of engineering situations appropriate for analysis using simple programming techniques
- procedure for using programs to analyse engineering situation and the identification of program limitations

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 advanced mathematical skills and knowledge to simple engineering applications. Evidence from tasks and projects should/may be used to complement and demonstrate integration of competency. 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 mathematical concepts to engineering applications, 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,

EVIDENCE GUIDE	
	product and manufacturing specifications, codes, 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.	
Complex figures	May include cones, pyramids, spheres, frustums and intersections of figures singularly or in combination

Unit Sector(s)

Unit sector	

Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering science