Australian Government

MEM23086A Apply scientific principles and techniques in avionic engineering situations

Release: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

MEM23086A Apply scientific principles and techniques in avionic engineering situations

Modification History

Release 1 - New unit. Based on and equivalent to MEM23085A

Unit Descriptor

This unit of competency covers applying advanced scientific principles to avionic engineering situations.

Application of the Unit

This unit applies to selecting and applying advanced avionic 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.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEA272A	Apply basic scientific principles and techniques in aeronautical engineering situations

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	Identify the range of scientific principles and techniques relevant to avionic engineering	1.1	Identify the scientific principles relating to avionic engineering
		1.2	Research and report on avionic scientific principles using appropriate sources of information
		1.3	Identify the techniques and associated technologies, software and hardware associated with implementing scientific principles relating to avionic engineering applications
		1.4	Research and report on avionic techniques using appropriate sources of information
2	Select scientific principles and techniques	2.1	Select relevant scientific principles for specific avionic engineering situations
		2.2	Select relevant avionic techniques and associated technologies, software and hardware for specific avionic engineering situations
3	Apply the relevant scientific principles and techniques	3.1	Apply applicable scientific principles in a consistent and appropriate manner to obtain any required solution
		3.2	Use appropriate calculations and correct units to establish quantities
		3.3	Use coherent units in equations in a systematic manner to ensure meaningful solutions
		3.4	Use significant figures in engineering calculations

		3.5	Obtain required solutions by applying chosen techniques and associated technologies, software and hardware in a consistent and appropriate manner
4	Document the results of the application of the avionic scientific principles and techniques	4.1	Document solutions involving engineering calculations in an appropriate style
		4.2	Document solutions not involving engineering calculations in an appropriate style

Required Skills and Knowledge

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

Required skills

Required skills include:

- applying advanced scientific principles relevant to avionic engineering
- analysing the given situation to determine what is required in the manner of a solution
- analysing the given situation to determine which avionic scientific principles are selected
- selecting appropriate avionic techniques and associated technologies, software and hardware to suit the application/s
- applying appropriate avionic 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 avionic 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

Required knowledge includes:

- physics – analysis and application of:
  - linear kinematics
  - planar kinematics
  - Newton's Laws of Motion
  - friction
  - momentum and center of gravity
  - gravity
  - circular motion
  - orbital motion
  - rotational motion
  - oscillation
- electronic fundamentals – determination of required values and characteristics for:
  - resistors (including light and voltage dependent resistors)
  - capacitors

  - inductors
  - transformers
  - diodes
  - transistors
  - power amplifiers
  - oscillators
  - silicon controlled rectifiers
  - thyristor power control circuits
  - opto-couplers
- selection of appropriate test equipment
- digital electronics – design, construction and testing of:
  - clocked sequential circuits
  - registers
  - oscillators
  - timers
  - interfacing circuits
  - program logic array
  - state machines
- data communications – analysis and application of:
  - selection of data transmission methods
  - universal asynchronous receiver transmitter construction
  - multiplexers and demultiplexers
  - data encryption/decryption theory
- electronic circuit analysis involving the application of:
  - Fourier Transforms
  - Laplace Transforms
- aerodynamics – application of:
  - drag and speed
  - power/thrust available and power/thrust required
  - manoeuvering flight
  - stability and control
- strength of materials – application of:
  - bending and shear in beams
  - forces in trusses and frames
  - engineering concepts of stress and strain
  - properties of areas
  - torsion
  - mechanical properties of materials
  - two dimensional stress and strain, including elastic constants
- computer software/programming – application of:

  - high level languages
  - algorithm design and testing
  - Pascal and Turbo-Pascal programming
- the limitations of avionic techniques and associated technologies, software and hardware
- 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 avionic techniques and associated technologies, software and hardware
- the application of the calculation solution style
- the significance of the non-calculation solution style

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	Evidence should be provided through the application of scientific principles and techniques in a range of avionic engineering situations.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • consistently select and apply appropriate scientific principles in avionic engineering situations • document in an appropriate style the solutions obtained through the application of chosen scientific principles in avionic engineering situations.
Context of and specific resources for assessment	• Assessment may occur on the job or in an appropriately simulated environment. Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and work health and safety (WHS) and environment practices. • 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 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.

Sources of information	**Sources of information include:** • reference texts • manufacturer catalogues and industrial magazines • internet search engines and websites • email • the use of phone and fax • airworthiness and design authority regulations and

	associated advisory material
Avionic engineering	**Avionic engineering is:** • the engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of aerospace electrical, instrument, radio and electronic systems and components and related test equipment for civil and military applications

Avionic engineering applications	**Avionic engineering applications are defined as:**
	• 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 with regard to:
	  • electrical systems and related wiring and components (power generation, distribution, control interfaces with hydraulic and pneumatic systems, and caution and warning systems)
	  • mechanical and electro-mechanical flight instruments and indication systems (quantity, pressure, temperature, position) and components
	  • electronic systems and components (communications, radio navigation, pulse, display, automatic flight control, flight management, and engine management)
	  • automatic test stations, adapters and software

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.