



Australian Government

MEA725 Apply advanced scientific principles and techniques in avionic engineering situations

Release: 1

MEA725 Apply advanced scientific principles and techniques in avionic engineering situations

Modification History

Release 1 - New unit of competency

Application

This unit of competency 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.

This unit is used in workplaces that operate under the airworthiness regulatory systems of the Australian Defence Force (ADF) and the Civil Aviation Safety Authority (CASA).

Pre-requisite Unit

MEA706	Apply basic scientific principles and techniques in avionic engineering situations
MEA727	Apply calculus in avionic engineering situations

Competency Field

Avionic engineering

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.		Performance criteria describe the performance needed to demonstrate achievement of the element.	
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

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional

contexts) are included.

Sources of information include:

- Reference texts
- Manufacturer's 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 refers to:

- 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 refer to:

- 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 and 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 Mapping Information

Release 1 – new unit based on and equivalent to MEM23085A Apply scientific principles and techniques in avionic engineering situations

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ce216c9c-04d5-4b3b-9bcf-4e81d0950371>

Assessment Requirements for MEA725 Apply advanced scientific principles and techniques in avionic engineering situations

Modification History

Release 1 - New unit of competency

Performance Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria under the specified conditions of assessment, and must 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
- 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.

Knowledge Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- 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
- aerodynamics – application of:
 - drag and speed
 - power/thrust available and power/thrust required
 - manoeuvring 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.

Assessment Conditions

- 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, a simulated working environment must be used that reflects realistic workplace situations and conditions.
- 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.
- 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.
- 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.
- Assessment may be in conjunction with assessment of other units of competency where required.
- Assessors must satisfy the requirements of the National Vocational Education and Training Regulator (Australian Skills Quality Authority, or its successors).

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