Australian Government

UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems

Release: 2

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

UEENEEE127A Use advanced computational processes to provide solutions to energy sector engineering problems

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers the application of advanced computational processes to solve energy sector engineering problems. It encompasses working safely, applying problem solving techniques, using a range of advanced mathematical processes, providing solutions to electrical/electronics engineering problems and justifying such solutions.

Note.
Typical engineering problems are those encountered in meeting requirements in a design brief, meeting performance requirements and compliance standards, revising systems operating parameters and dealing with system malfunctions.

Application of the Unit

Application of the Unit **2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 6.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not

License to practice **3)**

require a license to practice in the workplace. However, practice in this unit is subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

Granting of competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.
Where pre-requisite pathways have been identified. All competencies in the Common Unit Group must be have been completed plus all the competencies in one (1) of the identified Pathway Unit Group(s):

Unit Code	Unit Title
Common Unit Group	
UEENEEE101A	Apply Occupational Health Safety regulations, codes and practices in the workplace
UEENEEE126A	Provide solutions to basic engineering computational problems
UEENEEE129A	Solve electrotechnical engineering problems
Electrotechnology Unit Pathway	
UEENEEH169A	Solve problems in basic electronic circuits
Electronics and Communications Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits
UEENEEH114A	Troubleshoot resonance circuits in an electronic apparatus
Electrical Unit Pathway	
UEENEEE104A	Solve problems in d.c. circuits
UEENEEG101A	Solve problems in electromagnetic devices and

Prerequisite Unit(s) **4)**

related circuits

Literacy and numeracy skills **4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 5	Writing 5	Numeracy 5

Employability Skills Information

Employability Skills **5)**

This unit contains Employability Skills

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit

Performance Criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the Evidence Guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1 Provide computational solutions to energy sector engineering	1.1 OHS procedures for a given work area are identified, obtained and understood.
	1.2 The nature of the problems are obtained from documentation or work supervisor to establish

ELEMENT	PERFORMANCE CRITERIA	
problems		the scope of work to be undertaken.
	1.3	Problems are clearly stated in writing and/or diagrammatic form to ensure they are understood and appropriate methods used to resolve them.
	1.4	Known constants and variable related to the problem are obtained from measured values or problem documentation.
	1.5	Alternative methods for resolving the problem are considered and where necessary discussed with appropriate person(s).
	1.6	Problems are solved using advanced mathematical processes and within the realistic accuracy.
2 Complete work and document problem solving activities.	2.1	Justification for solutions used to solve engineering problems is documented for inclusion in work/project development records in accordance with professional standards.
	2.2	Work completion is documented and appropriate person(s) notified.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence shall show that knowledge has been acquired of safe working practices and using advanced computational processes to provide solutions to energy sector engineering problems.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

KS01-EE127A Advanced Engineering Maths

Evidence shall show an understanding of advanced engineering maths to an extent indicated by the following aspects:

T1 Differential Calculus encompassing:

- basic concepts of differential calculus, limited to definition of the derivative of a function as the slope of a tangent line (the gradient of a curve); limits; basic examples from 1st principles; Notation and Results of derivative of k.f(ax + b) where f(x)=x to the power of n, sin x, cos x, tan x, e to the power of x, ln x.
- rules - derivative of sum and difference; product rule; quotient rule; chain rule (function of a function), limited to two rules for any given function, the 2nd derivative.
- applications - equations of tangents and normals; stationary points; turning points; and curve sketching; rates of change; rectilinear motion
- verbally formulated problems involving related rates and maxima: minima

T2 Integral Calculus encompassing:

- integration as the inverse operation to differentiation - results of the integral of k.f(ax + b) where f(x) = x to the power of n, sin x, cos x, sec squared x, e to the power of x, method of substitution, the definite integral.
- applications - areas between curves; rectilinear motion including displacement from acceleration and distance travelled; voltage and current relationship in capacitors and inductors and the like.

T3 Linear Algebra encompassing:

- matrices and inverse matrices;
- linear mapping,
- determinants,
- solution of linear equations.

T4 Vectors encompassing:

- geometrical representation,
- addition and scalar multiplication,
- dot and cross products,
- equations of lines and planes.

REQUIRED SKILLS AND KNOWLEDGE

T5 Variables encompassing:

- graphs, level curves and surfaces
- partial derivatives; chain rule; directional derivative;
- maxima and minima.

T6 Sequences and Series encompassing:

- algebraic and Fourier series, convergence; Taylor's Theorem
- power series manipulation.

T7 Differential Equations encompassing:

- first order and separable linear equations
- second order linear equations.
- partial differential equations.
- numerical Techniques.

T8 Number encompassing:

- integer, irrational and complex numbers.
- number systems.
- arithmetic operations.
- accuracy and stability.

T9 Statistics encompassing:

- assembly, representation and analysis of data.
- fitting distributions to data.
- non-parametric statistics.
- tests of significance for means, variances and extreme values.
- correlation

Evidence Guide

EVIDENCE GUIDE

9) The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Package.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of the unit and performed in accordance with the Assessment Guidelines of this Training Package.

Overview of Assessment **9.1)**

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. It is recognised that, in some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety nature of working with electricity, electrical equipment, gas or any other hazardous substance/material carries risk in deeming a person competent. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

Critical aspects of evidence required to demonstrate competency in this unit **9.2)**

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit shall be considered holistically. Each element and associated performance criteria shall be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence shall also comprise:

- A representative body of work performance demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this shall incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices, including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.
  - Demonstrate an appropriate level of skills enabling employment
  - Conduct work observing the relevant Anti Discrimination legislation, regulations, polices and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Use advanced computational processes to provide solutions to energy sector engineering problems as described in 8) and including:

A Clearly stating problems in written and diagrammatic form.

B Obtaining known constants and variable from an appropriate source.

C	Solving problems using appropriate advanced mathematical processes.
D	Documenting justification of solutions provided in accordance with professional standards.
E	Dealing with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Context of and specific resources for assessment

9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed in this unit.

These should be used in the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions for assessment must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

In addition to the resources listed above in Context of and specific resources for assessment, evidence should show demonstrated competency in using advanced computational processes to provide solutions to engineering problems.

Method of assessment

9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:

Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires

that the specified essential knowledge and associated skills are assessed in a structured environment which is primarily intended for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

Concurrent assessment and relationship with other units

9.5)

For optimisation of training and assessment effort, competency development in this unit may be arranged concurrently with unit:

UEENEEE125A	Provide engineering solutions for problems in complex multiple path circuit
UEENEEE126A	Provide solutions to basic engineering computational problems

Range Statement

RANGE STATEMENT

10) This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit shall be demonstrated in relation to complex problems that apply to energy sector engineering diagnosis development and work functions with the following attributes:

- working safety
- problem solving techniques application
- range of advanced mathematical processes used
- provision electrical/electronics engineering problems solutions
- such solutions justification

Providing using advanced computational processes to provide solutions to energy sector engineering problems shall be demonstrated in any of the following disciplines:

- Computers
- Data Communications
- Electrical
- Electronics
- Instrumentation
- Refrigeration and Air Conditioning

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

Unit Sector(s)

Not applicable.

Competency Field

Competency Field **11)**

Electrotechnology