Australian Government

Department of Education, Employment and Workplace Relations

UEENEEE150A Undertake computations in an energy sector environment

Release: 1

UEENEEE150A Undertake computations in an energy sector environment

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor **1) Scope:**

1.1) Descriptor

This unit covers computational and mathematical procedures to solve problems or to enhance given data. It encompasses working safely, applying knowledge of undertaking computations in energy sector environment.

Application of the Unit

Application of the Unit **2)**

This unit shall apply to persons entering work in energy sector and may be used in school-based vocational programs.

Licensing/Regulatory Information

License to practice **3)**

The skills and knowledge described in this unit do not require a license to practice in the workplace. However practice in this unit is subject to regulations directly related to occupational health and safe and contracts of training such as new apprenticeships.

Pre-Requisites

Prerequisite Unit(s) **4)**

Competencies **4.1)**

There are no prerequisite competencies for this unit.

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 3 Writing 3 Numeracy 3

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 Prepare to undertake computations.	1.1 Computational activities are planned and prepared to ensure OHS policies and procedures are followed, with the work appropriately sequenced in accordance with requirements.
	1.2 Data for computations are obtained and verified in accordance with established procedures and to comply with requirements.
	1.3 Location in which activities are undertaken or data gathered is determined from job requirements.
	1.4 Materials/devices needed to carry out the computations are obtained in accordance with established procedures.
2 Undertake computations.	2.1 OHS policies and procedures for undertaking monitoring activities are followed.
	2.2 Computations are undertaken in accordance with requirements.
	2.3 Unplanned events or conditions are responded to in accordance with established procedure.
	2.4 Ongoing checks of the quality/accuracy of the work are undertaken in accordance with established procedures.
3 Complete monitoring activities.	3.1 Computations are verified and checked against estimates.
	3.2 Documentation/reports/computations are completed to ensure all requirements are met.
	3.3 Work completion is notified in accordance with established procedures.

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 undertaking computations in an energy sector environment.

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

KS01-EE150A Energy sector applied mathematical concepts

Evidence shall show an understanding concepts of engineering mathematics with calculus to an extent indicated by the following aspects:

T1 Mathematical linear measurement in engineering situations encompassing:

- Precision and error in mathematical computations and
- Displaying mathematical outcomes in the correct format using the appropriate significant figures and in scientific notation
- Perimeters of plane figures, polygons and the perimeter of shapes involving arcs
- Pythagoras' theorem to engineering situations

T2 Mathematical spatial measurement in engineering situations encompassing:

- Areas of combined shapes
- Volume and surface areas of solids

T3 Right triangle trigonometry in engineering problem solving encompassing:

- Problems using the six trigonometrical ratios
- Problems involving compass bearings and angles of elevation/depression
- Trigonometrical concepts in problems involving inclined planes, vectors and forces and electrical sinusoidal waveforms

T4 Sine and cosine rules in practical applications encompassing:

- Sine rule to solve unknown dimensions/angles in triangles
- Cosine rule to solve unknown dimensions/angles in triangles

T5 Mathematical concepts in basic surveying and computation of areas encompassing:

- Mathematical concepts for radial and triangulation surveys
- Simpson's Rule in engineering applications

T6 Basic algebra in engineering calculations encompassing:

- Basic operations involving substitutions, additions, removal of brackets, multiplication and divisions
- Solving linear equations
- Transportation in non-linear equations

REQUIRED SKILLS AND KNOWLEDGE

T7 Linear graphical techniques in engineering problem solving encompassing:

- Graphing linear functions
- Deriving equations from graphs and tables
- Solving simulations equations algebraically and graphically
- The best line of fit graphically and determine equation

T8 Mathematical computations involving polynomials encompassing:

- Adding, subtracting and multiplying polynomials
- Factorising trinomials
- Solving quadratic equation

T9 Mathematical computations involving quadratic graphs encompassing:

- Graphs of quadratic functions
- Maxima and minima
- Graphical solutions of quadratic equations
- Properties of a parabola
- Applications of parabolas in engineering applications

T10 Trigonometry and graphical techniques in engineering outcomes encompassing:

- Graphs of trigonometric functions e.g.: $V=V_m\sin\theta, I=I_m\cos\theta$
- Addition of equations such as: $v\sin\theta + u\sin(\theta + \phi)$ graphically
- Simpson's Rule to determine the average and root mean square values of a sinusoidal waveform

T11 Statistical data presentation encompassing:

- Appropriate presentation of frequency tables, histograms, polygons, stem and leaf plots
- Advantages of different visual presentations

T12 Appropriate sampling techniques for gathering data encompassing:

- Design of surveys and census
- Sample data using correct technique

T13 Use of the measures of central tendency encompassing:

- Estimation of percentiles and deciles from cumulative frequency polygons (ogives)
- Interpreting data from tables and graphs including interpolation and extrapolation
- Analysing misleading graphs

T14 Measures of dispersion in statistical presentations encompassing:

- Box-and-whisker graphs
- Measures of dispersion using variance and standard deviation
- Standardised scores including Z-scores

REQUIRED SKILLS AND KNOWLEDGE

T15 Correlation and regression techniques encompassing:

- Interpreting scatter plots
- Correlation coefficients
- Calculate the regression equation and use for prediction purposes

T16 Elementary probability theory encompassing:

- Probabilities in everyday situations
- Counting techniques: factorials; permutations; combinations

T17 Paschal's Triangle and the Normal Curve encompassing:

- Paschal's triangle
- Characteristics of the normal curve
- Standard Deviation and applications to everyday occurrences
- Probabilities using the normal curve

T18 Differential Calculus encompassing:

- Basic concepts - 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
- Application - 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

T19 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
- The 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

T20 Differential Equations encompassing:

- First order and separable linear equations

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:
  - Undertake computations in an energy sector environment as described in 8) and including:

A Understanding transporting instructions.

B Checking transport details against job instruction.

C Obtaining relevant plant and equipment.

D Transporting plant and equipment in accordance

with requirements.

E	Undertaking computations in accordance with requirements.
F	Notifying work completing.
G	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.

Note:
Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence shall be clearly identified.

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.

The resources used for assessment should reflect current industry practices in relation to undertaking computations in an energy sector environment.

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)**

There are no concurrent assessment recommendations for this unit.

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 undertaking computations in an energy sector environment in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data Communications
- Electrical
- Electrical Machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and Air Conditioning
- Renewable / sustainable energy
- Security technology

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