

**1. Module details****Module name****Applied Mathematical Concepts 2****Module duration**

It is expected that learners with the appropriate entry knowledge and skills will successfully complete this module in 54-60 hours.

**Module code**

NUE082

**Discipline code****2. Module purpose**

The module addresses the issues of data analysis in an engineering context. More specifically it will allow the learner to :

- comprehend statistical information in written, graphical and tabular form;
- choose and apply suitable techniques for collecting, analysing and representing data;
- make predictions and inferences from their analyses;
- cooperate with others in carrying out a survey, analysing the data and reporting the results;
- use information technology to process and present information;
- understand and apply elementary probability theory;
- apply elementary counting techniques;
- use the normal distribution to compute probabilities.

**3. Prerequisites**

NUE081 - Applied Mathematical Concepts 1

**4. Relationship to competency standards**

This module provides part of the underpinning knowledge and skills identified in the 'Evidence Guide' of specific units in the National Electrotechnology Competency Standards. Namely, UTE NES057A.

**5. Content****1. Presentation of Data**

What are statistics and who uses them?

Frequency distributions

- frequency tables, histograms and polygons
- stem and leaf plots

Range of visual presentations

- comparisons – tables versus graphs
- introduction to spreadsheets to present data graphically

**2. Sampling (collecting data)**

Design and use of experiments, surveys and census

Selecting a sample using various sampling techniques

Coding and tabulating responses

**3. Describing Distributions**

Measures of central tendency

- determination and uses of mode, median and mean

Estimating percentiles and deciles from cumulative frequency polygons (ogives)

Interpreting data from tables and graphs

- interpolation/extrapolation

Analysis of misleading graphs

#### **4. Measures of Dispersion**

Box-and-whisker graphs

Measuring dispersion

- variance & standard deviation

Standardisation – using Z-scores to compare different sets of scores and standardising scores

#### **5. Correlation and Linear Regression**

Correlation

- scatter diagrams
- calculation of correlation coefficient for a set of data

Regression lines

- calculation of the regression equation
- using the regression line for prediction

#### **6. Experimental and Theoretical Probability**

Simple experiments with dice, spinners etc. to investigate equally likely outcomes.

The addition theory of probability

Complementary events

Compound events – probability trees, arrays, etc.

Simple counting techniques

- use of “box filling” method

#### **7. Applications of Probability**

Gambling games

Expected outcomes – the use of probability in real life situations such as insurance, investments etc.

Counting techniques – factorial, permutations, combinations

#### **8. Pascal’s Triangle and the Normal Curve**

Pascal’s triangle

Applications

Normal probability distribution

- probabilities using 1, 2 and 3 standard deviations

**6. Assessment strategy****Assessment methods**

Assessment should be progressive reflecting an holistic approach to ensure the module purpose is met. To assist in ensuring validity, reliability and fairness assessment instruments should include practical exercises, assignments, and written tests consisting of a number of item types, such as multiple choice, short answer and problem solving.

**Conditions of assessment**

Normally learning and assessment will take place in an environment conducive to learning.

**7. Learning outcome details****Learning outcome 1****Present statistical data in an appropriate way****Assessment criteria**

- 1.1 Choose an appropriate presentation such as
  - Frequency tables, histograms, polygons
  - Stem and leaf plots
- 1.2 Compare the advantages of different visual presentations and choose the most practicable

**Learning outcome 2****Use the appropriate sampling technique to gather data****Assessment criteria**

- 2.1 Design experiments, surveys and census
- 2.2 Sample data using correct technique

**Learning outcome 3****Describe distributions meaningfully****Assessment Criteria**

- 3.1 Describe and use correctly the measures of central tendency
- 3.2 Estimate percentiles and deciles from cumulative frequency polygons (ogives)
- 3.3 Interpret data from tables and graphs including interpolation and extrapolation
- 3.4 Analyse misleading graphs

**Learning outcome 4****Apply measures of dispersion to statistical presentations****Assessment Criteria**

- 4.1 Draw box-and-whisker graphs
- 4.2 Measure dispersion using variance and standard deviation
- 4.3 Standardise scores including Z-scores

<b>Learning outcome 5</b>	<b>Use correlation and regression techniques</b>
<b>Assessment criteria</b>	<p>5.1 Use and interpret scatter plots</p> <p>5.2 Calculate correlation coefficients</p> <p>5.3 Calculate the regression equation and use for prediction purposes</p>
<b>Learning outcome 6</b>	<b>Describe and apply elementary probability theory</b>
<b>Assessment criteria</b>	<p>6.1 Determine probabilities in everyday situations</p> <p>6.2 Describe counting techniques: factorial; permutations; combinations</p>
<b>Learning outcome 7</b>	<b>Describe and apply Paschal's Tringle and the Normal Curve</b>
<b>Assessment criteria</b>	<p>7.1 Apply Paschal's triangle</p> <p>7.2 Describe the characteristics of the normal curve</p> <p>7.3 Define a 'standard deviation' and apply to everyday occurrences</p> <p>7.4 Determine probabilities using the normal curve</p>
<b>8. Delivery of the module</b>	
<b>Delivery strategy</b>	Delivery strategies must be suitable for learning described in the module purpose. It is considered that the most effective way to achieve this is by the integration of theory and practical applications where learners learn by applying theory to workplace situations. It is recommended that learning and assessment be facilitated in a holistic manner which may require learning outcome sequence other than that indicated in the module.
<b>Resource requirements</b>	Resources should be sufficient for learners to work on an individual basis.
<b>Occupational health and safety requirements</b>	A safe and healthy environment will be provided for learners and teachers as well as safety procedure with regard to learning / teaching activity