	Unit ID: 876
Domain	**ELECTROTECHNOLOGY**
Title:	**Demonstrate knowledge of electrotechnology fundamentals**
Level: 2	**Credits: 3**

Purpose

This unit standard specifies the competencies required to demonstrate knowledge of electrotechnology fundamentals. It includes basic atomic theory, the principle of direct current (DC) flow, fundamentals of resistance and conductance of materials, fundamentals of energy and power, the concept of alternating current (AC) theory and basic knowledge of magnetism and electromagnetism. This unit standard is intended for those who work in electrotechnology work environment.

Special Notes

1. Entry information:

   Prerequisite
   - Unit 864 - *Apply safety rules and regulations in electrotechnology environment* or demonstrated equivalent knowledge and skills.

2. Assessment evidence may be collected from a real workplace or an appropriate simulated realistic environment in which electrical operations are carried out.

3. Performance of all elements in this unit standard must comply with manufacturers' specifications and workplace specific requirements.

4. Glossary of terms:
   - *'SANS'* refers to South Africa National Standards

5. Regulations and legislation relevant to this unit standard include the following:
   - Labour Act, No. 11, 2007.
   - Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.
   - SANS 10142-1.

Quality Assurance Requirements

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority and the Namibia Training Authority. All approved unit standards, qualifications and national assessment arrangements are available on the Namibia Training Authority website www.nta.com.na.

Elements and Performance Criteria

Element 1: Outline the basic atomic theory.

Performance Criteria

1.1 The structure of an atom is described.

1.2 Terms atomic structure, atomic number and ionisation are explained.

1.3 The difference between conductive, insulation and semi conductive materials is described.

1.4 The electrical behaviour of conductors, insulators and semiconductors is described in terms of free and bound charges.

Element 2: Outline the principle of direct current flow.

Range

Terms related to DC may include but are not limited to charge, polarities, ground and source of energy.

Performance Criteria

2.1 The concepts of conventional and electron current flow are explained.

2.2 Electrical quantities, units and symbols are explained in terms of charge, current, resistance, voltage and power.

2.3 Terms related to DC are explained using appropriate sketches.

2.4 Generation of direct current is explained using a simple and appropriate model.

2.5 Behaviours of resistive (R), inductive (L) and capacitive (C) in DC circuits are described.

2.6 Ohm's law, Kirchhoff's law and other appropriate laws are described.

2.7 Units and symbols of electrotechnology quantities (voltage, current, resistance power etc) are identified and explained.

2.8 Calculations relating to voltage, current, resistance and power are performed.

2.9 Measurements related to current, voltage and power in DC circuits are performed.

Element 3: Outline fundamentals of resistance and conductance of materials.

Performance Criteria

3.1 Fundamentals of resistance and conductance of conductive materials are explained.

3.2 Factors (length, cross-sectional area, resistivity, and temperature) affecting resistance are explained and related calculations are performed.

3.3 Basic calculations of resistance, length, cross-sectional area, and resistivity of materials are performed.

Element 4: Outline fundamentals of energy and power.

Performance Criteria

4.1 The difference between potential and kinetic energy is described.

4.2 The meaning and equations of electrical energy and power are explained.

4.3 Impedance matching and power transfer are described.

4.4 Calculations of electrical energy and power are performed.

Element 5: Outline the concept of alternating current theory.

Range

AC terms related to waveforms may include but are not limited to cycle, period, frequency, peak, peak-to-peak, average values, instantaneous values and rms.

Calculations may include but are not limited to peak, peak-to-peak, root means square (rms), frequency, pulse repetitive time (PRT),pulse repetitive frequency PRF, angle velocity phase and period.

Non-sinusoidal waveforms may include but are not limited to square, triangular, and saw-tooth waveforms.

Performance Criteria

5.1 Differences between direct current, alternating current and voltages are explained using graphic illustrations.

5.2 Generation of alternating current is explained using a simple and appropriate model.

5.3 Sinusoidal and non-sinusoidal waveforms are sketched and explained.

5.4 Terms related to AC waveforms are explained using appropriate sketches.

5.5 Calculations relating to instantaneous values, rms, average, peak and peak-to-peak values in terms of voltage, current and power are performed.

5.6 Behaviours of R, L and C in AC circuits are described.

5.7 Measurements related to current, voltage and power in an AC circuits are performed.

Element 6: Demonstrate knowledge of magnetism and electromagnetism induction.

Range

Magnetic terms may include but are not limited to magnetization, magnetic field, lines of forces, magnetic poles, attraction, repulsion and magnetic flux.

Terms relevant to magnetic circuits to may include but are not limited to permeability, reluctance, flux density and hysteresis.

Terms related to electromagnetic induction may include but are not limited to rate of changes of flux (induction), generation of electromotive force (emf), time constant, back-emf and inductor losses.

Performance Criteria

6.1 Natural magnets are explained in terms of their behaviour and material characteristics.

6.2 Terms relevant to magnetism are described.

6.3 The difference between natural (permanent) magnetism and electromagnetism is outlined.

6.4 Magnetic circuits and relevant terms used are described.

6.5 The effects of magnetism on current flow are explained using the right hand rule and clock rule.

6.6 Various applications of electromagnetism are identified and explained.

6.7 Electromagnetic induction is explained using Faraday's law and Lens law.

6.8 Terms related to electromagnetic induction are explained.

6.9 Inductive circuits and their electrical behaviours are described.

6.10 Measurements and calculations relevant to inductive circuits are performed.

Registration Data

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