

1. Module details**Module name****Science and Materials - Electrotechnology****Module duration**

It is expected that students with the appropriate entry knowledge and skills will successfully complete this module in 36 – 40 hours.

Module code

NUE204

Discipline code

0703130

2. Module purpose

This module aims to provide the student with the opportunity to consolidate relevant previous studies and develop an integrated understanding of the link between theory and practice of science and materials in an engineering environment.

3. Prerequisites

Nil.

4. Relationship to competency standards

This module addresses several Units 2.1, 2.3, 2.7-2.11, 2.13, 3.1, 3.2, 3.5, 3.7 and 3.8 of the E.S.I. National Competency Standards for Overhead Line Work and Cable Jointing and Electrical Contracting Industry Award Standards which refer to engineering science, basic mechanical principles and calculations.

5. Content**Trade calculations**

mathematical techniques

relevant calculations

linear measurement, areas, volumes, ratios

Engineering mechanics

base physical quantities

concepts, principles, S.I. units, their applications in

engineering calculations in relation to physical quantities and

associated formulae

mass, velocity, acceleration, force, weight, density, angles

energy/work/power

moments/torque

centre of gravity

mechanical advantage

levers

pulley blocks

efficiency

friction

vectors

resolution of forces

forces in strung conductors

forces on poles and towers

determination of sag

pressure/stress
elementary fluid mechanics

Engineering materials

classification
ferrous and non-ferrous metals
steels, alloys,
properties
tensile strength
temperature and expansion in metals
stress and strain
ductility
applications
corrosion
galvanic corrosion
hardwoods and soft woods

6. Assessment strategy

Assessment methods

Short answer questions (written, oral or graphic or computer based).
Suitable practical exercises which assess the skills required of each learning outcome.

Conditions of assessment

Theory room for written tests together with practical field observation where appropriate.

7. Learning outcome details

Learning outcome 1

To perform calculations which are typical of the engineering industry.

Assessment criteria

- 1.1 Use appropriate mathematical techniques to perform calculations involving fractions, decimals, ratios, proportions.
- 1.2 Calculate area, volume, mass, density.
- 1.3 Manipulate formulae - transposition, substitution.
- 1.4 Perform simple trigonometric calculations.

Learning outcome 2

Explain and identify the concepts of engineering mechanics, its principles and engineering applications.

Assessment criteria

- 2.1 Name and define the base S.I. units.
- 2.2 Define various derived S.I. quantities:
 - velocity
 - acceleration
 - force
 - weight
 - density
 - energy and work
 - torque
 - power
 - pressure.
- 2.3 Use these quantities in performing calculations which apply the concepts of engineering mechanics.
- 2.4 Describe the concept of mechanical advantage.
- 2.5 Determine the forces acting when using block and tackle under load.
- 2.6 Determine the resultant force given the component forces.
- 2.7 Determine the quadrature components of any force.
- 2.8 Determine the sag in a catenary conductor and the force applied at its ends.
- 2.9 Elaborate the basic laws of fluid mechanics.

Learning outcome 3	Explain and identify the general classification, properties and applications of materials used in the electrotechnology industry.
Assessment criteria	<p>3.1 Describe the classification of engineering materials.</p> <p>3.2 List the properties of materials commonly used in engineering.</p> <p>3.3 Identify industrial applications of engineering materials.</p> <p>3.4 Describe the property of tensile strength with respect to metals.</p> <p>3.5 Determine the effect of temperature on the expansion metals given metal type and temperature gradient.</p> <p>3.6 Define ‘ductility’ and ‘malleability’ ‘work hardening’ and ‘annealing’.</p> <p>3.7 Describe the conditions which lead to corrosion.</p> <p>3.8 Describe galvanic corrosion in terms of the electromotive series.</p> <p>3.9 Describe the physical properties of timbers and describe applications relevant to their types.</p>
8. Delivery of the module	
Delivery strategy	<p>Delivery strategies must be suitable for both theoretical and/or practical learning and module purpose. It is recommended that learning and assessment be facilitated in a holistic manner which may require a learning sequence other than indicated in the body of this module descriptor.</p>
Resource requirements	<p>Suitable enterprise manuals, enterprise drawings and calculations which draw upon the principles of this module.</p>
Occupational health and safety requirements	<p>Students should be made aware of Occupational Health and Safety issues in all situations and be expected to demonstrate safe working practices at all times. Electrical safety must be emphasised.</p>