



Republic of Rwanda  
Ministry of Education



RTB | RWANDA  
TVET BOARD

## APPLIED PHYSICS

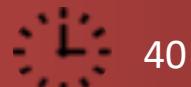
**GENMW402**

### Apply Mechanics and Waves

#### Competence

RQF Level: 4

Learning Hours



Credits: 4

Sector: ARTS AND RECREATION

Trade: Music and Performing Arts, Plastic and Fine Art

Module Type: General

**Issue Date: May 2023**

CURRICULUM: GENMW402-TVET CERTIFICATE 4 – ARTS AND CRAFTS

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<b>Purpose statement</b>	This module describes knowledge, skills and attitudes required to apply concepts of mechanics and waves. At the end of the module, the learner will be able to apply static equilibrium and elasticity, apply thermodynamics, apply optical instrument and Examine effects of electric current flow in DC electric circuit.					
<b>Delivery modality</b>	<b>Training delivery</b>		<b>100%</b>	<b>Assessment</b>		
	Theoretical content		30%	Formative assessment	30%	
	Practical work:		70%		70%	
	• Group project and presentation	20%				
	• Individual project /Work	50%	Summative Assessment			

## Elements of Competency and Performance Criteria

<b>Elements of competency</b>	<b>Performance criteria</b>
1. Apply static equilibrium and elasticity	1.1. The equilibrium conditions are correctly explained for rigid bodies
	1.2. Static equilibrium is properly applied based on free body diagram
	1.3. Elastic properties are properly described based on the type of solid material
2. Apply thermodynamics	2.1. Fundamental concepts of thermodynamics are clearly described based on system
	2.2. Thermodynamic laws are properly explained based on the system
	2.3. Application thermodynamic laws are explained based on the area of application
3. Examine effects of electric current flow in DC electric circuit	3.1. Simple electric circuit is properly described based on ohm's law
	3.2. Electric current, resistances and voltages in DC electric circuits are accurately determined based on Kirchhoff's laws
	3.3. Electric energy, work and power in DC electric circuit are correctly determined in accordance with the law of conservation of energy
4. Apply geometric instruments	4.1. Optical instruments are effectively described based on its corresponding types

	4.2. Magnification of optical instruments is correctly determined in accordance to the image location
	4.3. Optical aberrations are effectively described based on their types

## Course content

<b>Learning outcomes</b>	<b>At the end of the module the learner will be able to:</b>
	<ol style="list-style-type: none"> <li>1. Apply static equilibrium and elasticity</li> <li>2. Apply thermodynamics</li> <li>3. Examine effects of electric current flow in DC electric circuit</li> <li>4. Apply Geometric instruments</li> </ol>

<b>Learning outcome 1: Apply static equilibrium and elasticity</b>	<b>Learning hours: 8</b>
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Explanation of equilibrium conditions</b> <ul style="list-style-type: none"> <li>✓ Moment of the force <ul style="list-style-type: none"> <li>■ Torque associated with the force</li> <li>■ Rotational equilibrium and static equilibrium</li> </ul> </li> <li>✓ Necessary conditions for equilibrium of an object <ul style="list-style-type: none"> <li>■ First condition for equilibrium</li> <li>■ Second condition for equilibrium</li> </ul> </li> <li>✓ Centre of gravity</li> </ul> </li> <li>• <b>Application of static equilibrium</b> <ul style="list-style-type: none"> <li>✓ Standing on horizontal beam <ul style="list-style-type: none"> <li>■ Upward force</li> <li>■ Downward force</li> </ul> </li> <li>✓ Standing on a slope <ul style="list-style-type: none"> <li>■ Determination of horizontal and vertical components</li> <li>■ Applying conditions for equilibrium in solving problems</li> </ul> </li> </ul> </li> <li>• <b>Application of elastic properties</b> <ul style="list-style-type: none"> <li>✓ Deformation of solids in terms of the concepts of stress and strain</li> </ul> </li> </ul>	

-  Relation between stress and strain
-  Elastic modulus
- ✓ types of deformation and elastic modulus
  -  Young's modulus (elasticity in length)
  -  Shear modulus (elasticity of shape)
  -  Bulk modulus (Volume elasticity)
- ✓ Stress versus strain curve for an elastic solid.

### Resources required for the indicative content

Equipment	PPE, whiteboard and chalkboard
Materials	Chalks, Markers
Tools	Compute, projector, textbooks, scientific calculator, meter ruler, compass
Facilitation techniques	<ul style="list-style-type: none"> <li>• Demonstration and simulation</li> <li>• Individual and group work</li> <li>• Practical exercise</li> <li>• Trainer guided</li> <li>• Group discussion</li> <li>• Search engine</li> </ul>
Formative assessment methods	<ul style="list-style-type: none"> <li>• Written assessment</li> <li>• Oral presentation</li> <li>• Performance assessment</li> <li>• Product based assessment</li> <li>• Project based assessment</li> </ul>

<b>Learning outcome 2: Apply</b> <b>Learning hours: 12</b>	
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Description of fundamental concepts</b> <ul style="list-style-type: none"> <li>✓ <b>Key terms:</b> system, boundary, surrounding, extensive &amp; intensive properties</li> <li>✓ <b>Heat Transfer and Quantity of heat</b> <ul style="list-style-type: none"> <li> Heat and temperature</li> <li> Modes of heat transfer</li> <li> Heat capacity</li> <li> Specific heat capacity</li> <li> Thermal expansions.</li> </ul> </li> </ul> </li> <li>• <b>Analysing thermodynamic laws</b> <ul style="list-style-type: none"> <li>✓ Zeroth law and temperature measurement</li> </ul> </li> </ul>	

- ✓ First Law of Thermodynamics
- ✓ Second law statements

- **Application of thermodynamic laws**

- ✓ Refrigerators
- ✓ Heat engines
- ✓ Ventilators
- Power plant

### Resources required for the indicative content

Equipment	PPE, Computer, whiteboard, chalkboard, projector, textbooks
Materials	Chalks, markers, internet
Tools	scientific calculator, calorimeters, thermometers
Facilitation techniques	<ul style="list-style-type: none"> <li>• Demonstration and simulation</li> <li>• Individual and group work</li> <li>• Practical exercise</li> <li>• Trainer guided</li> <li>• Group discussion</li> <li>• Search engine</li> </ul>
Formative assessment methods	<ul style="list-style-type: none"> <li>• Written assessment</li> <li>• Oral presentation</li> <li>• Performance assessment</li> <li>• Product based assessment</li> <li>• Project based assessment</li> </ul>

Learning outcome 3: Examine effects of electric current flow in DC electric circuit	Learning hours: 12
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li>• <b>Description of a simple electric circuit.</b> <ul style="list-style-type: none"> <li>✓ DC electric circuit <ul style="list-style-type: none"> <li>■ Elements of DC electric circuit</li> <li>■ Electric current</li> <li>■ Electrical resistance</li> <li>■ Voltage</li> </ul> </li> <li>✓ Measuring instruments used in DC electric circuit <ul style="list-style-type: none"> <li>■ Ammeter</li> <li>■ Voltmeter</li> <li>■ Ohmmeter</li> <li>■ Multimeter</li> </ul> </li> <li>✓ Ohm's law</li> </ul> </li></ul>	

- ✓ Combination of resistors
  -  Series
  -  Parallel
  -  Mixed
- ✓ Electric cells
  -  E.M.F(Electromotive force) of a cell
  -  Internal resistance
  -  Cells network
- **Determination of electric current, resistances and voltages in DC electric circuits**
  - ✓ Key concepts
    -  Path, junction, branch
    -  Voltage supply
    -  Voltage drop
    -  Voltage gain
  - ✓ Kirchhoff's laws
    -  Conservation of charges
    -  Current law
    -  Voltage law
- **Determination of electric energy, work and power in DC electric circuit**
  - ✓ Calculations of energy and power in DC electric circuit
    -  Electrical energy
    -  Electric work
    -  Electrical power
  - ✓ Effects associated with electric current in a circuit
    -  Joule's effect
    -  Chemical effect
    -  Magnetic effect

### Resources required for the indicative content

Equipment	PPE, whiteboard, chalkboard, optical benc, optical slides, computer, projector, textbooks
Materials	Chalks, Markers, Candles, Water
Tools	Scientific calculator
Facilitation techniques	<ul style="list-style-type: none"> <li>• Demonstration and simulation</li> <li>• Individual and group work</li> <li>• Practical exercise</li> <li>• Trainer guided</li> <li>• Group discussion</li> <li>• Search engine</li> </ul>

Formative assessment methods	<ul style="list-style-type: none"> <li>Written assessment</li> <li>Oral presentation</li> <li>Performance assessment</li> <li>Product based assessment</li> <li>Project based assessment</li> </ul>
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Learning outcome 4: Apply Geometric instruments	Learning hours: 8
<b>Indicative content</b>	
<ul style="list-style-type: none"> <li><b>Description of optical instruments</b> <ul style="list-style-type: none"> <li>✓ Single lens optical instruments           <ul style="list-style-type: none"> <li>Human eye</li> <li>Magnifying glass</li> <li>Single lens camera</li> </ul> </li> <li>✓ Multi-lens optical instruments           <ul style="list-style-type: none"> <li>Microscope</li> <li>Telescope</li> <li>Projector</li> </ul> </li> </ul> </li> <li><b>Determination of the magnification of optical instruments</b> <ul style="list-style-type: none"> <li>✓ Magnification of microscope</li> <li>✓ Magnification of telescope</li> </ul> </li> <li><b>Correction of optical aberrations</b> <ul style="list-style-type: none"> <li>✓ Spherical aberration</li> <li>✓ Chromatic aberrations</li> <li>✓ Astigmatic aberration</li> </ul> </li> </ul>	

#### **Resources required for the indicative content**

Equipment	PPE, whiteboard, chalkboard, computer, projector, textbooks telescope, microscope
Materials	Chalks, markers
Tools	Scientific calculator, digital camera, magnifying glass
Facilitation techniques	<ul style="list-style-type: none"> <li>Simulation software</li> <li>Individual and group work</li> <li>Practical exercise</li> <li>Trainer guided</li> <li>Group discussion</li> <li>Search engine</li> </ul>
Formative assessment methods	<ul style="list-style-type: none"> <li>Written assessment</li> <li>Oral presentation</li> <li>Performance assessment</li> <li>Product based assessment</li> </ul>

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