

MECHANICAL SCIENCE PRINCIPLES

UNIT CODE: 0716 441 09A

TVET CDACC UNIT CODE: ENG/CU/AGR/CC/04/5/MA

Duration of Unit: 100 Hours

Relationship to Occupational Standards

This unit addresses the unit of competency: **Apply mechanical science principles**

Unit Description

This unit describes the competencies required by agricultural engineering Technologist level 6 to apply mechanical science principles. Competencies include: applying force, moment and motion in structural components and applying work, energy, power, gas, heat energy, density and pressure principles in engineering operations.

Summary of Learning Outcomes

S/No	Learning Outcomes	Duration (Hours)
1.	Apply force and moment in structural components	25
2.	Apply motion principles in structural components	25
3.	Apply work, energy and power principles in engineering operations	25
4.	Apply density and pressure concepts in engineering operations	25
TOTAL		100

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Apply force and moment in structural components	1.1 Types of forces 1.1.1 Applied Force. 1.1.2 Gravitational Force. 1.1.3 Normal Force. 1.1.4 Frictional Force. 1.1.5 Air Resistance Force. 1.1.6 Tension Force. 1.1.7 Spring Force	• Practical • Project • Portfolio of evidence • Third party report • Written tests • Oral questioning

Learning Outcome	Content	Suggested Assessment Methods
	1.1.8 Coplanar force 1.2 Distance, velocity and acceleration 1.3 Turning effects of a force (Moments)	
2. Apply motion principles in structural components	2.1 Types of motion 2.1.1 Linear Motion. 2.1.2 Rotary Motion. 2.1.3 Oscillatory Motion 2.2 Laws of motion 2.2.1 Newton's laws of motion 2.2.2 Law of conservation of linear momentum 2.2.3 Law of conservation of energy 2.3 Displacement-time graphs	• Practical • Project • Portfolio of evidence • Third party report • Written tests • Oral questioning
3. Apply work, energy and power principles in engineering operations	3.1 Work 3.1.1 Definition 3.1.2 Computation 3.1.3 Application 3.2 Energy 3.2.1 Definition 3.2.2 Computation 3.2.3 Application 3.3 Power 3.3.1 Definition 3.3.2 Computation 3.3.3 Application 3.4 Simple machine (levers) sample problems	○ Observation ○ Oral questioning ○ Written tests ○ Practical tests

Learning Outcome	Content	Suggested Assessment Methods
	3.4.1 Mechanical advantage 3.4.2 Velocity ratio 3.4.3 Efficiency	
4. Apply density and pressure concepts in engineering operations	4.1 Solid and fluid density 4.2 Applications of density 4.3 Pressure principles 4.4 Applications of pressure 4.4.1 Vacuum pump 4.4.2 Hydraulic pump 4.4.3 Hydrometers	○ Practical ○ Project ○ Portfolio of evidence ○ Third party report ○ Written tests ○ Oral questioning

Suggested Methods of Delivery

- Demonstration
- Projects
- Group discussion
- Direct instructions

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	Learning Materials			
	Projector		1	1:25
	Manuals		1	1:25
	Scientific calculators		25	1:25
	Computer with internet		1	1:25
B	Learning Facilities & infrastructure			
	Classroom	40 M ²	1	1:25
C	Consumable materials			

1.	Stationery	Assorted	1 rim of printing papers 1 packet of pens	1:25
D	Tools and Equipment			
1.	Welding and Fabrication Tools:		2 pc	1:13
2.	Welding Machines		2 pcs	1:13
3.	Cutting Torches and Plasma Cutters		21pc	1:25
4.	Welding Helmets and Gloves		1 pc	1:25
5.	Hardness Testers		1	1:25
6.	Tensile Testing Machines		1	1:25
7.	Impact Testers:		1	1:25