REPUBLIC OF KENYA

NATIONAL OCCUPATIONAL STANDARDS

FOR

AGRICULTURAL ENGINEERING TECHNICIAN

LEVEL 6

PROGRAMME ISCED CODE: 0716 454 A

TVET CDACC
P.O. BOX 15745-00100
NAIROBI

APPLY THERMODYNAMICS PRINCIPLES

UNIT CODE: 0716 541 21A

TVET CDACC CODE: ENG/OS/AGR/CC/05/6/MA

UNIT DESCRIPTION

This unit specifies the competencies required by an Agricultural Engineering Technologist Level 6 to apply thermodynamics principles. It involves applying fundamentals of thermodynamics, applying steady and non-steady flow processes, applying ideal gas laws and steam generation principles, demonstrating understanding of fuel and combustion and applying heat transfer and exchange principles.

ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT These describe the key outcomes which make up workplace function.	**PERFORMANCE CRITERIA** These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
1. Apply fundamentals of thermodynamics	1.1 ***Thermodynamics processes*** are determined as per paths in which changes takes place 1.2 ***Thermodynamic cycles*** are described as per work requirement 1.3 ***Thermodynamics laws*** are applied in solving engineering problems
2. Apply steady and non-steady flow processes	2.1 Steady and non-steady flow processes are described as per their characteristics 2.2 Steady flow characteristics are determined as per their steady flow energy equations 2.3 Non-steady flow characteristics are determined as per their steady flow energy equations
3. Apply ideal gas laws	3.1 Ideal ***gas laws*** are stated as per state 3.2 Ideal gas cycle is explained as per microscopic property 3.3 Ideal gas cycle is applied in solving engineering problems

ELEMENT These describe the key outcomes which make up workplace function.	PERFORMANCE CRITERIA These are assessable statements which specify the required level of performance for each of the elements. ***Bold and italicized terms are elaborated in the Range.***
4. Apply steam generation principles	4.1 Relationships between pressure and boiling point are determined based in changes in state 4.2 Energy balance is carried out as per work requirement 4.3 Relationship between temperature and pressure is determined as per change in state
5. Demonstrate understanding of fuel and combustion	5.1 Fuels are classified as per occurrence 5.2 Properties of fuels are described based on occurrence 5.3 Combustion equation is applied to combustion and exhaust gas problems
6. Apply heat transfer and exchange principles	6.1 Heat transfer processes are determined as per difference in temperature 6.2 Heat exchangers are classified according to transfer process 6.3 Heat transfer equations are applied in solving heat exchanger problems

RANGE

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

Variable	Range
1. Thermodynamics processes may include but are not limited to:	• Adiabatic • Isothermal • Isochoric • Isobaric
2. Thermodynamic cycles may include but are not limited to:	• Otto cycle • Carnot cycle

	• Rankine cycle • Bryton cycle
3. Thermodynamics laws may include but are not limited to:	• First law • Second law • Third law
4. Gas laws may include but are not limited to:	• Boyle's law • Charles's law • Avogadro's law • Gay Loussac's law

REQUIRED SKILLS AND KNOWLEDGE

This section describes knowledge and skills required for this unit of competency.

Required knowledge

The individual needs to demonstrate knowledge of:

- Newton's law
- Laws of conservation of energy
- Type of forces
- Power transmission systems
- Units of measurement, conversions and abbreviations

Required Skills

The individual needs to demonstrate the following skills:

- Logical thinking
- Problem solving
- Communication
- Analytical
- Problem Solving
- Interpretation

EVIDENCE GUIDE

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge and range.

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Applied thermodynamics laws in solving engineering problems 1.2 Applied non-steady flow energy equations in problem solving 1.3 Applied ideal gas cycle in solving engineering problems 1.4 Determined relationship between temperature and pressure and their relationship. 1.5 Applied combustion equation to combustion and exhaust gas problems 1.6 Applied heat transfer equations in solving heat exchanger problems
2. Resource Implications	The following resources should be provided: 2.1 Appropriately simulated environment where assessment can take place 2.2 Access to relevant work environment 2.3 Resources relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Practical 3.2 Project 3.3 Portfolio of evidence 3.4 Third party report 3.5 Written tests 3.6 Oral assessment
4. Context of Assessment	Competency may be assessed: 4.1 Workplace 4.2 Simulated work environment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.