

ELECTRICAL ENGINEERING PRINCIPLES

UNIT CODE: 0713 441 06A

TVET CDACC UNIT CODE: ENG/CU/AGR/CC/03/5/MA

Duration of Unit: 80 hours

Relationship to Occupational Standards

This unit addresses the unit of competency: **Apply electrical engineering principles**

Unit Description

This unit describes the competencies required by an Agricultural Engineering Technologist Level 6 in order to apply electrical engineering principles. Competencies include: applying basic electrical quantity concepts, applying D.C and AC circuit concepts in electrical installation, applying earthing principles in electrical installation, applying lightening protection measures and operating basic electrical machines

Summary of Learning Outcomes

S/No.	Learning Outcomes	Duration (Hours)
1.	Apply basic electrical quantity concepts	10
2.	Apply D.C and AC circuit concepts in electrical installation	20
3.	Apply earthing principles in electrical installation	20
4.	Apply lightening protection measures	10
5.	Operate basic electrical machines	20
TOTAL		80

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1 Apply basic electrical quantity concepts	1.1 Basic SI units 1.1.1 Power – Watts (W) 1.2.1 Current – Amperes (A) 1.3.1 Resistance – Ohms(Ω) 1.4.1 Voltage – Volts (V) 1.2 Measuring instruments 1.2.1 Ammeter	• Practical • Project • Portfolio of evidence • Third party report

Learning Outcome	Content	Suggested Assessment Methods
	1.2.2 voltmeter 1.3 Derived units 1.4 Units of electrical quantities 1.5 Calculation of charge, force, work and power	• Written tests • Oral questioning
2 Apply D.C and AC circuit concepts in electrical installation	2.1 Construction of simple cell 2.1.1 Electrolysis and applications 2.1.2 Determination of e. m. f. in cells 2.2 Parallel and series circuits 2.3 Network theorems 2.4 Photovoltaic solar system 2.5 AC and DC converters	• Practical • Project • Portfolio of evidence • Third party report • Written tests • Oral questioning
3 Apply earthing principles in electrical installation	3.1 Earthing types 3.2 Earthing points 3.3 Sample earthing computations 3.4 Earthing potential testing	• Practical • Project • Portfolio of evidence • Third party report • Written tests • Oral questioning
4 Apply lightning protection measures	4.1 Types of lightning strokes 4.2 Components of lighting protection systems 4.2.1 Terminals 4.2.2 Conductors 4.2.3 Ground connections	• Practical • Project • Portfolio of evidence • Third party report

Learning Outcome	Content	Suggested Assessment Methods
	4.2.4 Bonding 4.2.5 Lightning arrestors 4.3 Installation of lightening protection devices e.g. 4.3.1 Earth rods 4.3.2 Lightning arrestor	• Written tests • Oral questioning
5 Operate basic electrical machines	5.1 Single phase electrical machines 5.2 Three phase electrical machines 5.3 DC generators 5.4 DC motors 5.5 Induction and synchronous machines 5.6 Step-up and step-down transformers	• 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			
	Stationery	Assorted	1 rim of printing papers 1 packet of pens 1 packet of marker pens	1:25
D	Tools and Equipment			
	Solar panels		2 pc	1:13
	Battery		2 pcs	1:13
	Solar converter		21pc	1:25
	Voltmeters		10 pcs	1:3
	Multimeter		10	1:3
	Aammeters		10	1:3
	Electrical cables		250 m	1:10
	Inverter		5	1:5
	clips		50	1:10
	Solar panels		5	1:5
	Battery		5	1:5
	Solar converter		5	1:5