ELECTRICAL PRINCIPLES II

UNIT CODE: 0713441 13A

TVET CDACC UNIT CODE: ENG/CU/MDE/CC/08/5/MA
UNIT DURATION: 80 HOURS

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Apply electrical principles II.

UNIT DESCRIPTION

This unit describes competences required to apply electrical principles in their work. It involves applying magnetism and electromagnetism, applying electrostatics principles, applying ac circuits and conducting system earthing and protection.

Summary of Learning Outcomes

S/No.	Learning Outcome	Duration in hours.
1.	To apply magnetism and electromagnetism	10
2.	To apply electrostatics principles	20
3.	To apply AC circuits	20
4.	To conduct electrical installation, system earthing and protection	30
	TOTAL	**80**

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Apply magnetism and electromagnetism	1.1 Magnetic and non-magnetic materials 1.2 Concepts of magnetic fields and field distribution 1.3 Existence of magnetic field 1.4 Concepts of electromagnetism 1.5 Laws of electromagnetic induction	• Practical Assessment • Project • Third Party Report • Portfolio of Evidence • Written Assessment • Oral Questioning

	1.5.1 Screw rule 1.5.2 Grip 1.5.3 Flemings 1.5.4 Faradays 1.6 Concepts of self and mutual induction	
2. Apply Electrostatics principles	2.1 Electrostatics quantities 2.2 Types of capacitors 2.3 Concept of charge and electrostatic field 2.4 Capacitors in series and parallel 2.5 Measurement of capacitance 2.6 Application of Capacitors 2.7 Testing of capacitor	• Practical Assessment • Project • Third Party Report • Portfolio of Evidence • Written Assessment • Oral Questioning
3. Apply A.C circuits concepts	3.1 AC generators concepts 3.2 AC waveforms concepts 3.3 Derivation of generator e.m.f equation 3.4 Sine wave equations 3.5 Passive elements in AC circuits 3.6 Power triangle Active, Apparent and reactive power 3.7 Power factor correction 3.8 Methods of power factor correction	• Practical Assessment • Project • Third Party Report • Portfolio of Evidence • Written Assessment • Oral Questioning
4. Conduct Electrical installation, system earthing and protection	4.1 Electrical installation 4.1.1 Preparation of cable ways and wiring systems 4.1.2 Call and alarm circuits installation 4.1.3 Domestic wiring circuits	• Practical Assessment • Project • Third Party Report • Portfolio of Evidence • Written Assessment

	installation 4.1.4 Testing electrical installation 4.2 Application of System and equipment protection principles 4.2.1 Protection zones 4.2.2 Protection systems 4.3 Perform Protection system design 4.3.1 Protection system Drawings 4.3.2 Protection system Device sizing 4.3.3 Protection system Location 4.4 Design Earthing systems 4.4.1 TT 4.4.2 TNC 4.4.3 TNCS 4.4.4 IT 4.4.5 TNS 4.5 Perform Test on an earthing system 4.5.1 Earth resistance test 4.5.2 Earth loop impedance test 4.6 Identification of various types of lightning strikes based on Benjamin Franklin 4.7 Perform Lightning system design 4.7.1 Lightning arrestors 4.7.2 Lightning design drawing 4.7.3 Size of lightning system 4.8	• Oral Questioning

Suggested Methods of Instruction

- Practical
- Projects
- Demonstrations
- Group Discussions
- Field trips
- On-job-training

Recommended Resources for 25 trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	**Learning Materials**			
1.	Textbooks	J. Bird Electrical and Electronic Principles V.K. Mehta & R. Mehta Basic Electrical Engineering	5 pcs	1:5
2.	Installation manuals	Electronic components datasheets	5 pcs	1:5
3.	Charts	Circuit diagrams Colour codes	1 pcs for each	1:25
4.	Scientific Calculators		25	1:1
5.	Power point presentations	For trainer's use	1	1:25

B	**Learning Facilities & infrastructure**			
6.	Lecture/theory room	60m^2	1	1:25
7.	Workshop	150m^2	1	1:25
C	**Consumable materials**			
8.	Connector wires	Jumper wires,	5 pkts	1:5
9.	Insulation tapes		25 pcs	1:1
10.	Circuit boards	Bread board, copper strip boards	25 pcs	1:1
11.	Assorted electronic components	Resistors, diodes, capacitors, transistors, ICs, Transformers, Inductors, Batteries	25 pcs	1:1
12.	Soldering wires		5 rolls	1:5
D	**Tools and Equipment**			
13.	Striping knives		25 pcs	1:1
14.	Side cutters		25 pcs	1:1
15.	Pliers		25 pcs	1:1
16.	Assorted Screw driver		25 pcs	1:1

17.	Crimping tools		5 pcs	1:5
18.	PPEs		25 pcs	1:1
19.	Multimeters		5 pcs	1:5
20.	Oscilloscope		5 pcs	1:5
21.	Function generator		5 pcs	1:5
22.	Spectrum analyser		5 pcs	1:5
23.	Variable power supply		5 pcs	1:5
24.	Solder guns		25 pcs	1:1
25.	Hot air gun		5 pcs	1:5
26.	Work stations		25	1:1