ELECTRICAL PRINCIPLES

UNIT CODE: ENG/CU/PO/CC/03/5/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Electrical principles

Duration of Unit: 150 hours

Unit Description

This unit describes the competencies required by a technician in order to apply a wide range of Electrical principles in their work. Which includes; Use of the concept of basic Electrical quantities, use of the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, demonstrating the understanding of three phase power supply systems, use of power factor in electrical installation, use of earthing in Electrical installations, apply lightning protection measures and apply Electromagnetic field theory

Summary of Learning Outcomes

1. Use the concept of basic Electrical quantities
2. Use the concepts of D.C and A.C circuits in electrical installation
3. Use of basic electrical machine
4. Demonstrate understanding of three phase power supply
5. Use of power factor in electrical installation
6. Use of earthing in Electrical installations
7. Apply lightning protection measures
8. Apply Electromagnetic field theory

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Use the concept of basic Electrical quantities	• The meaning of SI unit • Basic SI units • Length • Mass • Time • SI unit of various types of Electrical parameters e.g. • Coulomb • Joule • Ohm	• Written tests • Oral questioning • Assignments • Supervised exercises

	• Watt • Siemen • Newton • Volt • Ohm's law • Calculations involving various Electrical parameters e.g. Power, Current, Voltage, Resistance • Instruments used in measuring various types of Electrical parameters	
2. Use the concepts of D.C and A.C circuits	• Meaning of terms • AC and DC, parallel and series circuits, R-L-C circuits • Network theorems • Thevenin's theorem • Superposition • Kirchhoff's laws i.e. current and voltage laws • Norton theorem • AC to DC and DC to AC Conversion • Basic solar photovoltaic systems • T_1 • T_2	• Written tests • Oral questioning • Assignments • Supervised exercises

3. Use of basic electrical machine	• Types of Electrical machines
	• Basic construction, operation, and maintenance of electrical machines
	• Motors (AC and DC)
	• Generators (AC and DC)
	• Motor winding
	• AC Single and three phase motors, generators and Transformers
	• Motor Starting methods
	  • DOL
	  • Star-Delta
		• Assignments
		• Oral questioning
		• Supervised exercises
		• Written tests
		• Practical tests

	• Shaded pole • Split phase • Capacitor start • Application of AC and DC machines	
4. Demonstrate understanding of three phase power supply	• Meaning of Terms • Three phase power supply connection • Star connection • Delta connection • Voltage, Current and power calculation • Measurements of power • Wattmeter methods • Interconnection of three phase power supply • Star- Delta and Delta- Star	• Assignments • Oral questioning • Supervised exercises • Written tests • Practical tests
5. Use of power factor in electrical installation	• Meaning of power factor • Meaning of terms • Power triangle • Power factor correction	• Assignments • Oral questioning • Practical tests • Observation • Supervised exercises • Written tests
6. Use of earthing in Electrical installations	• Terms in Earthing • Earthing points in Electrical installation • Methods of earthing • Factors to consider in selecting an earthing method • Testing an earthing system	• Assignments • Supervised exercises • Written tests • Practical test
7. Apply lightening protection measures	• Meaning of lightening • Lightening strokes and their types • Lightening protection components • Testing a lightening system • Application of lightening system • Maintenance of lightening system	• Assignments • Oral questioning • Supervised exercises • Written tests

8. Apply Electromagnetic field Theory	• Meaning of Electromagnetic Field Theory • Sources of Electromagnetic Fields • Detectors of Electromagnetic radiation • Application of Electromagnetic waves • Electromagnetics Laws • Faraday's Law • Lenz's law • Fleming's Laws • Properties and Effects of Electromagnetic waves • Wave Characteristics and Shielding • Skin Effect	• Assignments • Oral questioning • Supervised exercises • Written tests

Suggested methods of instructions

- Group discussions
- Demonstration by trainer
- Exercises by trainee

Recommended Resources

- Scientific Calculators
- Relevant reference materials
- Stationeries
- Electrical workshop
- Relevant practical materials
- Dice
- Computers with internet connection