ELECTRICAL PRINCIPLES

UNIT CODE: ENG/CU/EIT/CC/03/6/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, use of power factor in electrical installation, use of earthing in electrical installations, apply lightning protection measures, apply electromagnetic field theory , apply electrodynamics, apply energy and momentum in electromagnetic field, apply transient in electrical circuit analysis, use two port network, demonstrate understanding of refrigeration and air conditioning

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. Use of power factor in electrical installation
5. Use of earthing in Electrical installations
6. Use of earthing in electrical installation
7. Apply lightning protection measures
8. Apply Electromagnetic field theory
9. Apply Electrodynamics
10. Apply Energy and momentum in Electromagnetic field
11. Apply Transient in Electrical circuit analysis
12. Use two port networks
13. Demonstrate understanding of Refrigeration and Air conditioning

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Use the concept of basic Electrical	❑ The meaning of SI unit ❑ SI unit of various types of Electrical	❑ Written tests ❑ Oral questioning

quantities	parameters ❑ Ohm's law ❑ Calculations involving various Electrical parameters e.g. Power, Current, Voltage, Resistance ❑ Instruments used in measuring various types of Electrical parameters	❑ Assignments ❑ Supervised exercises
2. Use the concepts of D.C and A.C circuits in electrical installation	❑ Meaning of terms ❑ AC and DC, parallel and series circuits ❑ AC and DC network theorems • AC to DC and DC to AC Conversion • Basic solar photovoltaic systems	❑ Written tests ❑ Oral questioning ❑ Assignments ❑ Supervised exercises
3. Use of basic electrical machine	❑ Types of Electrical machines ❑ DC machines, ❑ AC Single and three phase motors, generators and Transformers ❑ Motor starting methods e.g • DOL • Star-Delta • Auto-transformer • Resistance starter • Shaded pole • Split phase • Capacitor start • Capacitor Start and run • Face plate Starting ❑ Application of AC and DC machines ❑ Special machines and their Applications ❑ Electric Drives	❑ Assignments ❑ Oral questioning ❑ Supervised exercises ❑ Written tests ❑ Practical tests
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	❑ Assignments ❑ Oral questioning ❑ Practical tests ❑ Observation ❑ Written test

	• Wattmeter methods ❑ Interconnection of three phase power supply • Star- Delta and Delta- Star	
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
9. Apply Electrodynamics	❑ Meaning of Electrostatics ❑ Identification of Electrostatic terms	❑ Assignments

	and their meaning ❑ Meaning of terms in magnetostatics ❑ Electrodynamics laws Faraday's law	❑ Oral questioning ❑ Supervised exercises ❑ Written tests
10. Apply Energy and Momentum in Electromagnetic field	❑ Energy conservation theorem: • Poyntings' Theorem ❑ Momentum Energy Flow ❑ Electromagnetic Energy flow	❑ Assignments ❑ Oral questioning ❑ Supervised exercises ❑ Written tests
11. Apply transients in Electrical Circuit Analysis	❑ Meaning of Growth and decay in R-L & R-C circuits ❑ Calculations involving R-L& R-C circuits ❑ Application of Growth and decay in R-L & R-C Circuits	❑ Assignments ❑ Oral questioning ❑ Supervised exercises ❑ Written tests
12. Use Two Port networks	❑ Meaning of passive networks • Types of Passive network ❑ Characteristic impedance in T & pie networks ❑ Design of T & pie networks ❑ Transmission lines ❑ ABCD Constants ❑ Network in cascade	❑ Assignments ❑ Oral questioning ❑ Supervised exercises ❑ Written tests
13. Demonstrate understanding of Refrigeration and Air conditioning	❑ Meaning of Refrigeration and Air Conditioning ❑ Operation of Refrigeration and Air conditioning ❑ Plant layout of Refrigeration and Air conditioning system	❑ Assignments ❑ Oral questioning ❑ Supervised exercises ❑ Written tests

Suggested Methods of Instruction

- 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