# ELECTRICAL PRINCIPLES

**UNIT CODE:** ENG/CU/EI/CC/03/4/A

**Relationship to Occupational Standards**

This unit addresses the unit of competency: Apply Electrical principles skills

**Duration of Unit:** 40 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; Basic Electrical quantities, D.C and A.C circuits in electrical installation, electrical machines, earthing in Electrical installations, capacitance and inductance

**Summary of Learning Outcomes**

1. Basic Electrical quantities
2. D.C and A.C circuits in electrical installation
3. Electrical machines
4. Earthing in Electrical installations
5. Capacitance and inductance



**Learning Outcomes, Content and Suggested Assessment Methods**

| Learning Outcome | Content | Suggested Assessment Methods |
|---|---|---|
| 1. Basic Electrical quantities | ❑ The meaning of SI unit<br>❑ SI unit of Electrical quantities<br>❑ Calculations involving various Electrical quantities e.g Charge, Power, Current, Voltage, Resistance<br>❑ Instruments used in measuring Electrical quantities | ❑ Written tests<br>❑ Oral questioning<br>❑ Assignments<br>❑ Supervised exercises |
| 2. D.C and A.C circuits in electrical installation | ❑ Meaning of terms<br>❑ Conductors and insulators<br>❑ Ohm's law | ❑ Written tests<br>❑ Oral questioning<br>❑ Assignments |

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| | ❑ Resistance variation<br>❑ Resistors and color coding<br>❑ AC and DC circuits<br>• R-L, R-C, R-L-C circuits<br>• Series<br>• Parallel<br>• Parallel and series<br>❑ Parallel resonance and Q-factor<br>❑ Power factor improvement<br>❑ AC and DC network theorems e.g<br>• Kirchoff's laws<br>❑ AC to DC and DC to AC Conversion | ❑ Supervised exercises |
| 3. Single phase electrical machines | ❑ Single phase Electrical machines<br>❑ DC single phase motors and generators<br>❑ AC Single phase motors and generators<br>❑ Single phase transformers<br>❑ Application of AC and DC machines<br>❑ Motor starter<br>❑ DC Motor speed control<br>❑ Motor cooling | ❑ Assignments<br>❑ Oral questioning<br>❑ Supervised exercises<br>❑ Written tests<br>❑ Practical tests |
| 4. Earthing in Electrical installations | ❑ Meaning of earthing<br>❑ Terms in earthing<br>❑ earthing systems<br>• earthing points in electrical installation<br>• IEE regulations<br>❑ Factors to consider in selecting an earthing system<br>❑ Testing an earthing system<br>• earthing improvement | ❑ Assignments<br>❑ Supervised exercises<br>❑ Written tests<br>❑ Practical test |
| 5. Capacitance and inductance | ❑ Meaning of electrostatic field<br>• Sources of electrostatic field<br>❑ Meaning of terms<br>• Electric field strength<br>• Capacitance | ❑ Assignments<br>❑ Oral questioning<br>❑ Supervised exercises<br>❑ Written tests |

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| | • Capacitors<br>• Electric flux density<br>• Permittivity<br>❑ Types capacitors<br>❑ Charging and discharging<br>❑ Capacitors connection<br>• Series<br>• Parallel<br>• Parallel and series<br>❑ Application of capacitors<br>❑ Calculations involving capacitors<br>❑ Magnetic circuits<br>❑ Magnetic fields<br>• Magnetic flux and flux density<br>• Magnetomotive force and magnetic field strength<br>• Permeability and B-H curves<br>• Hysteresis and hysteresis losses<br>❑ Force on current-carrying conductor<br>❑ Principle of operation of a simple DC motor<br>❑ Principle of operation of a moving coil instrument<br>❑ Electromagnetic field and electromagnets<br>❑ Electromagnetic induction<br>• Laws of electromagnetic induction<br>• Rotation of a loop in a magnetic field<br>❑ Inductance and inductors<br>❑ Inductor connections<br>• Series<br>• Parallel<br>• Parallel and series<br>❑ Applications of inductors | |



**Suggested Delivery Methods**

- 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