COMPETENCY BASED CURRICULUM

FOR

ELECTRICAL ENGINEERING (POWER OPTION)

KNQF LEVEL: 6

ISCED PROGRAMME CODE: 0713 554B

TVET CDACC
P.O BOX 15745-00100
NAIROBI

ELECTRICAL INSTALLATION

UNIT CODE: ENG/CU/PO/CR/01/6/B

Relationship to Occupational Standards
This unit addresses the unit of competency: Perform Electrical Installation

Duration of Unit: 120 hours

Unit Description
This unit specifies the competencies required for performing electrical installation. Competencies required includes; applying EHS Standards, conducting site survey, designing installation, performing system sizing, preparation of working drawings, planning for logistics, preparation of list of tools equipments and materials, preparation of installation work plan, establishment of installation team, preparation of work site, marking, piping and fixing accessories, performing installation, terminating installation testing and inspecting installation and finally preparation of tenders and service contracts.

Summary of Learning Outcomes

1. Apply EHS Standards
2. Conduct site survey
3. Design Electrical installation
4. Perform system sizing
5. Prepare working drawings
6. Plan for logistics
7. Prepare list of tools, equipment and materials
8. Prepare installation work plan
9. Establish installation team
10. Prepare work site
11. Perform marking, pipe and fixing of accessories
12. Perform Electrical Installation
13. Terminate Electrical Installation
14. Test and Inspect Electrical Installation
15. Prepare Tenders and Service contract

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods

1. Apply EHS standards	• Relevant clauses in appropriate Acts e.g.
	  • Occupational safety and health act (OSHA)
	  • Work injury benefits act (WIBA)
	  • Environment management and coordination Act (EMCA)
	Relevant regulations:
	  • IEE regulations
	  • KPLC by-laws
	  • County by-laws
	• Causes of accidents and sources of danger e.g burns, cuts, electric shock, falling from heights, falling objects, noise, dust, chemicals
	• Meaning of term PPE
	• Purpose of PPE
	• Types of PPE
	• Safe and correct handling, use, maintenance and storage of different types of PPE
	• Classes of fires and fire fighting equipment
	• First aid procedures
	  • Rescuing electric shock victim
	  • Methods of resuscitation
		• Written tests
		• Oral questioning
		• Observation

Learning Outcome	Content	Suggested Assessment Methods

2. Conduct site survey	• Type of installations
	  • Domestic installations
	  • Industrial installations
	  • Commercial installations
	• Type of building e.g.
	  • Permanent building
	  • Semi-permanent buildings
	• Utilities available
	  • Water
	  • Electricity
	  • Communication e.g. Phones
	  • Installation conditions e.g. temperature, humidity, moisture
	• Taking measurements on site
	  • Length e.g. conduits size
	  • Total area
	  • Temperature
	  • Humidity
		• Written tests
		• Observation
		• Oral questioning

3. Design Electrical Installation	• Meaning of terms
	• Types of wiring systems
	• Factors to consider in designing Electrical installation e.g.
	  • Load size
	  • Structure
	  • Clients need
	• Types of supply
	• DC, Single phase and three phase
		• Written tests
		• Observation
		• Oral questioning

4. Perform system sizing	• Introduction to standards
	  • IEE regulations.
	  • Kenya bureau of standards (KEBS)
	  • British standards
	• KPLC by-laws
	• ERC regulations
	• County by-laws
	  • National Construction Authority (NCA)
		• Written tests
		• Observation
		• Oral questioning

Learning Outcome	Content	Suggested Assessment Methods

	• Reference to relevant IEE regulation tables
	• Load Estimation e.g.
	  • Factor of simultaneity (Ks)
	  • Factor of utilization (Ku)
	• Determining cable:
	  ✓ Types
	  ✓ Ratings
	  ✓ sizes
	  ✓ Insulation type
	  • Protective devices
	  ✓ Types
	  ✓ Ratings
	• Reference to relevant regulations	

5.Prepare working drawing	• Working drawings
	  • Meaning of working drawings
	  • Identification and care of drawing instruments and equipment
	  • Identification of drawing paper sizes
	  • Drawing various types of lines
	  • Drawing title block
	  • Drawing standard electrical symbols
	  • Conversion of scales
	  • Interpretation of orthographic projections
	  • Dimensioning of drawings
	  • Drawing of electrical diagrams
	• Block
	• Circuits
	• Schematic
	• Wiring
	• Line
	• Reading and Interpretation of architectural drawings
	• Reading and Interpretation of electrical drawings
		• Observation
		• Oral questioning
		• Practical tests
		• Written tests

Learning Outcome	Content	Suggested Assessment Methods
	• Use of Computer Aided Design (CAD) applications e.g. AutoCAD	

6. Plan for logistics	• Transport for:
	  • Materials and their safety
	  • Personnel
	• Storage of materials on site
	• Site security
	• Human resource
	  • Skills required
	• Communication
	  • Purpose
	  • Modes
		• Written tests
		• Oral questioning

7. Prepare list of tools, equipment and materials	• Identification of tools and materials e.g.
	  • Cutting tools
	  • Measuring tools
	  • Measuring equipment
	  • Cables and conductors
	  • Crimping tools
	  • Conduits
	  • Trunking
	  • Consumables
	• Types, application, care, maintenance and storage of:
	  • Tools e.g.
	  • Cable strippers
	  • Pliers
	  • Screw drivers
	  • Hammers
	  • Chisels
	  • Allen keys
	  • Electrician knives
	  • Crimping tools
	  • Bending springs
	  • Steel tapes
	  • Draw wires
	  • Hack saws
		• Oral questioning
		• Written tests
		• Observation
		• Practicals

Learning Outcome	Content	Suggested Assessment Methods
	• Drills • Equipment e.g. • Stock and die • Vice • Materials e.g. ✓ Cables ✓ Fittings ✓ Accessories • Assemble tools, equipment and materials • Inventory management	
8. Prepare installation work plan	• Identification of scope of installation work • Identify installation team • Meaning of terms • Preparation of work schedules • Bar charts • Gantt charts • Critical path networks • Raise the necessary permit and licences • Permit to work • Types of permits e.g. Gate pass, Name tags • Sources and application procedures in acquiring the permits • Classes of ERC licences C2, C1, B, A2, A1	• Written tests • Oral questioning • Observation
9. Establish installation team	• Team building • Team members familiarization • Collaboration • Task distribution • Communication protocol	• Written tests • Oral questioning
10. Prepare work site	• Identification of hazards and safety requirements for the site • Reference to relevant regulations e.g. • Occupational Safety and Health Act (OSHA) • County by-laws	• Written tests • Oral questioning

Learning Outcome	Content	Suggested Assessment Methods

	• Utilities
	  • Access roads
	  • Water
	  • Electricity	

11. Perform marking, piping and fixing of accessories	• Meaning of marking, piping, fixing and accessories in electrical installation
	• Importance of marking
	• Tools used in marking
	• Accessories used in Electrical installation e.g.
	  • Lamp holders
	  • Conduits
	  • Ceiling roses
	  • Patress
		• Written tests
		• Observation
		• Oral questioning
		• Practical tests

12. Perform electrical installation	• Meaning of terms
	• Single phase and three phase installation
	  • Domestic Installation
	  • Industrial Installation
	  • Commercial Installation
	  ➢ Phase/load balancing
	• Cables and cable joints
	• Wiring systems and accessories
	  • Meaning of terms
	  • Types and applications e.g.
	  • Conduits
	  • Cable trays
	  • Cable ducts
	  • Trunkings
	• Preparation of wiring systems
	• Marking out, cutting, bending, threading, chiselling, trenching
	• Draw –in/Lay of cables routes
	  • Cable Identification
	• Installation of final circuits
	  • Lighting circuits
		• Written tests
		• Observation
		• Oral questioning
		• Practical test

Learning Outcome	Content	Suggested Assessment Methods
	• One way, two way, intermediate • Dimmer switches • Looping in methods at ceiling rose, joint boxes, switches • Power circuits • Radial circuits, ring circuits • Water heating circuits • Electric cooker circuits • Call and alarm circuits • Bell circuits • Intruder alarm circuits • Fire alarm circuits	
13. Terminate Electrical installation	• Meaning of Terms • Importance of termination • Cable labelling • Cable lugging • Tools used in cable termination e.g. • Crimping tool • Strip Knife	• Written tests • Oral questioning • Practical tests • Observation
14. Test and inspect Electrical installation	• Meaning of terms • Types of tests e.g. • Earth continuity tests • Ring circuit test • Insulation tests • Short circuit tests • Open circuit test • Testing tools e.g. • Multimeter • Insulation tester • Ohmmeter • Importance of installation testing	• Written tests • Oral questioning • Observation

Learning Outcome	Content	Suggested Assessment Methods
15. Prepare tenders and service contracts	• Sources of law • Law of tort • Laws of contract and tendering • Types and forms of contract • Types of tenders • Tender estimation and costing • Statutory documents in contracts and tendering	• Written tests • Observation • Oral questioning

Suggested Methods of Instruction

- Demonstration by trainer
- Practice by the trainee
- Field trips
- On-job-training
- Discussions

Recommended Resources

Tools	Materials and supplies
• Measuring tools • Cutting tool • Drawing tools • Drilling tools • Fastening tools	• Stationery • Assorted Cables • Assorted protective devices • Pipes and trunkings • Cable lugs • Joints • Accessories
Equipment	**Reference materials**
• PPEs (Personal Protective Equipment) • Measuring equipment • Communication equipment	• Standards • County by-laws • Occupational Safety and Health Act (OSHA) • National Environmental Management Authority (NEMA) regulations • National Construction Authority (NCA) regulations • IEE • tables