



REPUBLIC OF KENYA

COMPETENCY BASED CURRICULUM

FOR

ELECTRICAL INSTALLATION

LEVEL 4



TVET CDACC
P.O BOX 15745-00100
NAIROBI

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FOREWORD

The provision of quality education and training is fundamental to the Government's overall strategy for social economic development. Quality education and training will contribute to achievement Kenya's development blue print and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution and this resulted to the formulation of the Policy Framework for Reforming Education and Training (Sessional Paper No. 4 of 2016). A key feature of this policy is the radical change in the design and delivery of the TVET training. This policy document requires that training in TVET be competency based, curriculum development be industry led, certification be based on demonstration of competence and mode of delivery allows for multiple entry and exit in TVET programmes.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that this Curriculum has been developed.

It is my conviction that this curriculum will play a great role towards development of competent human resource for the Electrical sector's growth and sustainable development.

PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING
MINISTRY OF EDUCATION

PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013 and the Sessional Paper No. 4 of 2016 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Electrical Engineering Sector Skills Advisory Committee (SSAC) have developed this curriculum.

This curriculum has been developed following the CBET framework policy; the CBETA Standards and guidelines provided by the TVET Authority and the Kenya National Qualification framework designed by the Kenya National Qualification Authority.

This curriculum is designed and organized with an outline of learning outcomes; suggested delivery methods, training/learning resources and methods of assessing the trainee’s achievement. The curriculum is competency-based and allows multiple entry and exit to the course.

I am grateful to the Council Members, Council Secretariat, Electrical Engineering SSAC, expert workers and all those who participated in the development of this curriculum.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng. Tech. CHAIRMAN,
TVET CDACC**

ACKNOWLEDGEMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organizations.

I recognize with appreciation the role of the Electrical Engineering Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the Electrical sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that workers in Electrical Sector acquire competencies that will enable them to perform their work more efficiently.

DR. LAWRENCE GUANTAI M'ITONGA, PhD

COUNCIL SECRETARY/CEO

TVET CDACC

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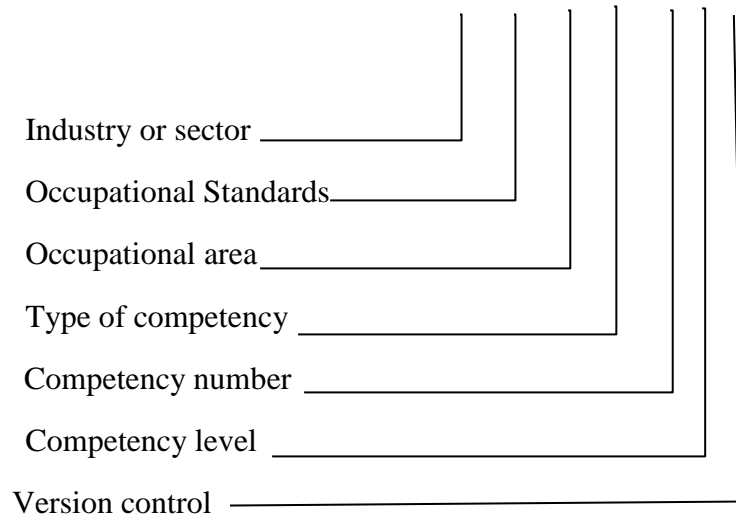
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ACRONYMNS AND ABBREVIATIONS

CAD	Computer Aided Design
CCTV	Closed Circuit Tele Vision
CDACC	Curriculum Development, Assessment and Certification Council
EHS	Environment Health and Safety
IEE	Institute of Electrical Engineers
HVAC	Heating Ventilation and Air Conditioning
IBMS	Integrated Building Management System
K.C.S.E	Kenya Certificate of Secondary Education
KNQA	Kenya National Qualification Authority
KNQF	Kenya National Qualification Framework
KEBS	Kenya Bureau of Standards
KPLC	Kenya Power and Lighting Company
NCA	National Construction Authority
NEMA	National Environment Management Authority
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
PV	Photo Voltaic
TVET	Technical and Vocational Education and Training
WIBA	Work Injury Benefits Act

KEY TO UNIT CODE

ENG/CU/EI/BC/01/4/A



OVERVIEW

Description of the course

This course is designed to equip electrical Craft person with the competencies required to plan, install, test, maintain and repair different types of electrical installations. The activities involved include the installation types ranging from domestic to commercial of the single-phase type.

The course consists of basic, common and core units of learning as indicated below:

Basic Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit factors
ENG/CU/EI/BC/01/4/A	Communication skills	20	2
ENG/CU/EI/BC/02/4/A	Digital literacy	30	3
ENG/CU/EI/BC/03/4/A	Entrepreneurial skills	60	6
ENG/CU/EI/BC/04/4/A	Employability skills	30	3
ENG/CU/EI/BC/05/4/A	Environmental literacy	20	2
ENG/CU/EI/BC/06/4/A	Occupational safety and health practices	20	2
Total		180	18

Common Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit Factors
ENG/CU/EI/CC/01/4/A	Engineering Mathematics	30	3
ENG/CU/EI/CC/02/4/A	Electrical principles	40	4
ENG/CU/EI/CC/03/4/A	Workshop Technology	20	2
ENG/CU/EI/CC/04/4/A	Technical Drawing	20	2
Total		110	11

Core Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit factors
ENG/CU/EI/CR/02/4/A	Perform Electrical Installation	90	9
ENG/CU/EI/CR/03/4/A	Testing of Electrical Installation	30	3
ENG/CU/EI/CR/05/4/A	Electrical Installation Breakdown Maintenance	40	4
	Industrial Attachment	300	30
Total		460	46
GRAND TOTAL		750	75

The total duration of the course is **750** hours, inclusive of industrial attachment.

Entry Requirements

An individual entering this course should have any of the following minimum requirements:

- a) Kenya Certificate of Secondary Education (K.C.S.E.) mean grade E
- Or**
- b) Level 3 certificate in electrical installation with **one** year of continuous work experience
- Or**
- c) Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)

1. Industrial attachment

An individual enrolled in this course will be required to undergo an industrial attachment in an Electrical firm for a period of at least 300 hours. Attachment will be undertaken upon completion of the course or the unit of learning.

2. Assessment

The course will be assessed at two levels: internally and externally. Internal assessment is continuous and is conducted by the trainer who is monitored by an internal accredited verifier while external assessment is the responsibility of TVET/CDACC.

3. Certification

A candidate will be issued with a Record of Achievement on demonstration of competence in a unit of competency. To attain the qualification Electrical Artisan Level 4, the candidate must demonstrate competence in all the units of competency as given in qualification pack. These certificates will be issued by TVET CDACC in conjunction with training provider.

BASIC UNITS OF LEARNING

COMMUNICATION SKILLS

UNIT CODE: ENG/CU/EI/BC/01/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate communication skills

Duration of Unit: 20 hours

Unit Description

This unit describes the competencies required to use specialized communication skills to meet specific needs of internal and external clients, conduct interviews, facilitate discussion with groups and contribute to the development of communication strategies.

Summary of Learning Outcomes

1. Utilize specialized communication skills processes
2. Contribute to the development of communication strategies
3. Conduct interviews
4. Facilitate group discussions
5. Represent the organization

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Utilize specialized communication skills processes	<ul style="list-style-type: none"><input type="checkbox"/> Communication process<input type="checkbox"/> Modes of communication<input type="checkbox"/> Medium of communication<input type="checkbox"/> Effective communication<input type="checkbox"/> Barriers to communication<input type="checkbox"/> Flow of communication<input type="checkbox"/> Sources of information<input type="checkbox"/> Organizational policies<input type="checkbox"/> Organization requirements for written and electronic communication methods<input type="checkbox"/> Report writing<input type="checkbox"/> Effective questioning	<ul style="list-style-type: none"><input type="checkbox"/> Observation<input type="checkbox"/> Oral

	<p>techniques (clarifying and probing)</p> <ul style="list-style-type: none"> <input type="checkbox"/> Workplace etiquette <input type="checkbox"/> Ethical work practices in handling communication <input type="checkbox"/> Active listening <input type="checkbox"/> Feedback <input type="checkbox"/> Interpretation <input type="checkbox"/> Flexibility in communication 	
2. Contribute to the development of communication strategies	<ul style="list-style-type: none"> <input type="checkbox"/> Dynamics of groups <input type="checkbox"/> Styles of group leadership <input type="checkbox"/> Openness and flexibility in communication <input type="checkbox"/> Communication skills relevant to client groups 	<ul style="list-style-type: none"> <input type="checkbox"/> Written <input type="checkbox"/> Observation
3. Conduct interviews	<ul style="list-style-type: none"> <input type="checkbox"/> Types of interview <input type="checkbox"/> Establishing rapport <input type="checkbox"/> Facilitating resolution of issues <input type="checkbox"/> Developing action plans 	<ul style="list-style-type: none"> <input type="checkbox"/> Written <input type="checkbox"/> Observation
4. Facilitate group discussions	<ul style="list-style-type: none"> <input type="checkbox"/> Identification of communication needs <input type="checkbox"/> Dynamics of groups <input type="checkbox"/> Styles of group leadership <input type="checkbox"/> Presentation of information <input type="checkbox"/> Encouraging group members participation <input type="checkbox"/> Evaluating group communication strategies 	<ul style="list-style-type: none"> <input type="checkbox"/> Written <input type="checkbox"/> Observation
5. Represent the organization	<ul style="list-style-type: none"> <input type="checkbox"/> Presentation techniques <input type="checkbox"/> Development of a presentation <input type="checkbox"/> Multi-media utilization in presentation <input type="checkbox"/> Communication skills relevant to client groups 	<ul style="list-style-type: none"> <input type="checkbox"/> Observation <input type="checkbox"/> Written

Suggested Delivery Methods

- Interview
- Role playing

- Observation
- Viewing of related videos

Recommended Resources

- Desktop computers/laptops
- Internet connection
- Projectors
- Telephone

DIGITAL LITERACY

UNIT CODE: ENG/CU/EI/BC/02/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate digital literacy

Duration of Unit: 30 hours

Unit Description

This unit describes competencies required to use a computer and other digital devices for the purposes of communication, work performance and management at the workplace.

Summary of Learning Outcomes

1. Identify computer software and hardware
2. Apply security measures to data, hardware, software in automated environment
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace
5. Apply desktop publishing in official assignments
6. Prepare presentation packages

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify computer hardware and software	<input type="checkbox"/> Concepts of ICT <input type="checkbox"/> Functions of ICT <input type="checkbox"/> History of computers <input type="checkbox"/> Components of a computer <input type="checkbox"/> Classification of computers	<input type="checkbox"/> Written tests <input type="checkbox"/> Oral presentation <input type="checkbox"/> Observation
2. Apply security measures to data, hardware and software	<input type="checkbox"/> Data security and control <input type="checkbox"/> Security threats and control measures <input type="checkbox"/> Types of computer crimes <input type="checkbox"/> Detection and protection against computer crimes <input type="checkbox"/> Laws governing protection of ICT	<input type="checkbox"/> Written tests <input type="checkbox"/> Oral presentation <input type="checkbox"/> Observation <input type="checkbox"/> Project
3. Apply computer software in solving tasks	<input type="checkbox"/> Operating system <input type="checkbox"/> Word processing <input type="checkbox"/> Spread sheets <input type="checkbox"/> Data base design and manipulation	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Observation <input type="checkbox"/> Project

	<input type="checkbox"/> Data manipulation, storage and retrieval	
4. Apply internet and email in communication at workplace	<input type="checkbox"/> Computer networks <input type="checkbox"/> Network configurations <input type="checkbox"/> Uses of internet <input type="checkbox"/> Electronic mail (e-mail) concept	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Observation <input type="checkbox"/> Oral presentation <input type="checkbox"/> Written report
5. Apply desktop publishing in official assignments	<input type="checkbox"/> Concept of desktop publishing <input type="checkbox"/> Opening publication window <input type="checkbox"/> Identifying different tools and tool bars <input type="checkbox"/> Determining page layout <input type="checkbox"/> Opening, saving and closing files <input type="checkbox"/> Drawing various shapes using DTP <input type="checkbox"/> Using colour pellets to enhance a document <input type="checkbox"/> Inserting text frames <input type="checkbox"/> Importing and exporting text <input type="checkbox"/> Object linking and embedding <input type="checkbox"/> Designing of various publications <input type="checkbox"/> Printing of various publications	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Observation <input type="checkbox"/> Oral presentation <input type="checkbox"/> Written report <input type="checkbox"/> Project
6. Prepare presentation packages	<input type="checkbox"/> Types of presentation packages <input type="checkbox"/> Procedure of creating slides <input type="checkbox"/> Formatting slides <input type="checkbox"/> Presentation of slides <input type="checkbox"/> Procedure for editing objects	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Observation <input type="checkbox"/> Oral presentation <input type="checkbox"/> Written report <input type="checkbox"/> Project

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos
- Project
- Group discussions

Recommended Resources

- Desk top computers
- Laptop computers

- Other digital devices
- Printers
- Storage devices
- Internet access
- Computer software

ENTREPRENEURIAL SKILLS

UNIT CODE: ENG/CU/EI/BC/03/4/A

Relationship to occupational standards

This unit addresses the unit of competency: Demonstrate entrepreneurial skills

Duration of unit: 60 hours

Unit description

This unit describes the competencies critical to demonstration of entrepreneurial capabilities. It involves, enhancing the entrepreneur's business skills, fostering a culture of continuous improvement at individual and organization level, implementing appropriate internal controls for profitability, improving employed capital base and undertaking regional/county business expansion.

Summary of Learning Outcomes

1. Develop one's business skill
2. Develop individual workers and teams
3. Expand markets and customers
4. Expand employed capital
5. Undertake regional/county business expansion

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Develop one's business skill	<input type="checkbox"/> Entrepreneurial skills development <input type="checkbox"/> Market trends <input type="checkbox"/> Monitoring and anticipating market trends <input type="checkbox"/> New technologies in entrepreneurship <input type="checkbox"/> Products and processes in entrepreneurship <input type="checkbox"/> Linkages with other entrepreneurs <input type="checkbox"/> Business conventions ad exhibitions	<input type="checkbox"/> Observation <input type="checkbox"/> Case studies <input type="checkbox"/> Individual/group assignments <input type="checkbox"/> Projects <input type="checkbox"/> Written <input type="checkbox"/> Oral

	<input type="checkbox"/> Personal improvement and growth	
2. Develop individual workers and teams	<input type="checkbox"/> Good staff/workers <input type="checkbox"/> Team building and team work <input type="checkbox"/> Staff development and enhancement <input type="checkbox"/> Culture of continuous improvement <input type="checkbox"/> Increasing products and services <input type="checkbox"/> Marketing improvement <input type="checkbox"/> Intrapreneurship	<input type="checkbox"/> Observation <input type="checkbox"/> Case studies <input type="checkbox"/> Individual/group assignments <input type="checkbox"/> projects <input type="checkbox"/> Written <input type="checkbox"/> Oral
3. Expand markets and customers base	<input type="checkbox"/> Maintaining appropriate cash flow in the organization <input type="checkbox"/> Internal controls <input type="checkbox"/> Business break-even point <input type="checkbox"/> Business profitability determinants <input type="checkbox"/> Prudent purchases in an enterprise <input type="checkbox"/> Reducing business expenses <input type="checkbox"/> Good staff/workers and customer relations <input type="checkbox"/> Identifying and maintain new customers and markets <input type="checkbox"/> Product/ service promotions <input type="checkbox"/> Products / services diversification <input type="checkbox"/> SWOT / PESTEL analysis <input type="checkbox"/> Conducting a business survey <input type="checkbox"/> Market expansion <input type="checkbox"/> Small business records management <input type="checkbox"/> Book keeping and auditing for small businesses <input type="checkbox"/> Business support services <input type="checkbox"/> Small business resources mobilization and utilization <input type="checkbox"/> Basic business social responsibility <input type="checkbox"/> Management of small business <input type="checkbox"/> Word processing concepts in small business management <input type="checkbox"/> Computer application software <input type="checkbox"/> Monitoring and controlling business operations	<input type="checkbox"/> Oral <input type="checkbox"/> Observation <input type="checkbox"/> Case studies <input type="checkbox"/> Individual/group assignments <input type="checkbox"/> projects <input type="checkbox"/> Written

4. Expand employed capital	<input type="checkbox"/> Employed capital in small businesses <input type="checkbox"/> Share holdings <input type="checkbox"/> Business expansion and diversification <input type="checkbox"/> Resources for growing small business <input type="checkbox"/> Small business Strategic Plan <input type="checkbox"/> Cooperate Social responsibility <input type="checkbox"/> Computer software in business development <input type="checkbox"/> ICT and business growth	<input type="checkbox"/> Observation <input type="checkbox"/> Case studies <input type="checkbox"/> Individual/group assignments <input type="checkbox"/> projects <input type="checkbox"/> Written
5. Undertake county/regional business expansion	<input type="checkbox"/> Region identification process <input type="checkbox"/> Regional laws and regulation <input type="checkbox"/> Business regional expansion requirements	<input type="checkbox"/> Oral <input type="checkbox"/> Observation <input type="checkbox"/> Case studies <input type="checkbox"/> Individual/group assignments <input type="checkbox"/> projects <input type="checkbox"/> Written

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practice by trainee
- Role play
- Case study

Recommended Resources

- Case studies for small businesses
- Business plan templates
- Lap top/ desk top computer
- Internet
- Telephone
- Writing materials

EMPLOYABILITY SKILLS

UNIT CODE: ENG/CU/EI/BC/04/4/A

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate employability skills

Duration of Unit: 30 hours

Unit Description

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

Summary of Learning Outcomes

1. Conduct self-management
2. Demonstrate critical safe work habits
3. Demonstrate workplace learning
4. Demonstrate workplace ethics

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Conduct self-management	<ul style="list-style-type: none"><input type="checkbox"/> Self-awareness<input type="checkbox"/> Formulating personal vision, mission and goals<input type="checkbox"/> Strategies for overcoming life challenges<input type="checkbox"/> Emotional intelligence<input type="checkbox"/> Assertiveness<input type="checkbox"/> Expressing personal thoughts, feelings and beliefs<input type="checkbox"/> Developing and maintaining high self-esteem<input type="checkbox"/> Developing and maintaining positive self-image<input type="checkbox"/> Articulating ideas and aspirations<input type="checkbox"/> Accountability and responsibility<input type="checkbox"/> Good work habits	<ul style="list-style-type: none"><input type="checkbox"/> Observation<input type="checkbox"/> Written<input type="checkbox"/> Oral interview<input type="checkbox"/> Third party report

	<input type="checkbox"/> Self-awareness <input type="checkbox"/> Self-development <input type="checkbox"/> Financial literacy <input type="checkbox"/> Healthy lifestyle practices	
2. Demonstrate critical safe work habits	<input type="checkbox"/> Stress and stress management <input type="checkbox"/> Punctuality and time consciousness <input type="checkbox"/> Interpersonal communication <input type="checkbox"/> Sharing information <input type="checkbox"/> Leisure <input type="checkbox"/> Integrating personal objectives into organizational objectives <input type="checkbox"/> Resources utilization <input type="checkbox"/> Setting work priorities <input type="checkbox"/> HIV and AIDS <input type="checkbox"/> Drug and substance abuse <input type="checkbox"/> Handling emerging issues	<input type="checkbox"/> Observation <input type="checkbox"/> Written <input type="checkbox"/> Oral interview <input type="checkbox"/> Third party report
3. Demonstrate workplace learning	<input type="checkbox"/> Personal training needs identification and assessment <input type="checkbox"/> Managing own learning <input type="checkbox"/> Contributing to the learning community at the workplace <input type="checkbox"/> Cultural aspects of work <input type="checkbox"/> Variety of learning context <input type="checkbox"/> Application of learning <input type="checkbox"/> Safe use of technology <input type="checkbox"/> Identifying opportunities <input type="checkbox"/> Workplace innovation <input type="checkbox"/> Performance improvement <input type="checkbox"/> Handling emerging issues <input type="checkbox"/> Future trends and concerns in learning	<input type="checkbox"/> Observation <input type="checkbox"/> Oral interview <input type="checkbox"/> Written <input type="checkbox"/> Third party report
4. Demonstrate workplace ethics	<input type="checkbox"/> Meaning of ethics <input type="checkbox"/> Ethical perspectives <input type="checkbox"/> Principles of ethics <input type="checkbox"/> Values and beliefs <input type="checkbox"/> Ethical standards <input type="checkbox"/> Organization code of ethics <input type="checkbox"/> Common ethical dilemmas	<input type="checkbox"/> Observation <input type="checkbox"/> Oral interview <input type="checkbox"/> Written <input type="checkbox"/> Third party report

	<input type="checkbox"/> Organization culture <input type="checkbox"/> Corruption, bribery and conflict of interest <input type="checkbox"/> Privacy and data protection <input type="checkbox"/> Diversity, harassment and mutual respect <input type="checkbox"/> Financial responsibility/accountability <input type="checkbox"/> Etiquette <input type="checkbox"/> Personal and professional integrity <input type="checkbox"/> Commitment to jurisdictional laws <input type="checkbox"/> Emerging issues in ethics	
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Suggested Methods of Delivery

- Instructor lead facilitation of theory
- Demonstrations
- Simulation/Role play
- Group Discussion
- Presentations
- Projects
- Case studies
- Assignments

Recommended Resources

- Computers
- Stationery
- Charts
- Video clips
- Audio tapes
- Radio sets
- TV sets
- LCD projectors

ENVIRONMENTAL LITERACY

UNIT CODE:ENG/CU/EI/BC/05/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate environmental literacy

Duration of Unit: 20 hours

Unit Description

This unit describes the competencies required to control environmental hazard, control environmental pollution, comply with workplace sustainable resource use, evaluate current practices in relation to resource usage, identify environmental legislations/conventions for environmental concerns, implement specific environmental programs and monitor activities on environmental protection/programs.

Summary of Learning Outcomes

1. Control environmental hazard
2. Control environmental Pollution
3. Demonstrate sustainable resource use
4. Evaluate current practices in relation to resource usage
5. Identify Environmental legislations/conventions for environmental concerns
6. Implement specific environmental programs
7. Monitor activities on Environmental protection/Programs

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Control environmental hazard	<ul style="list-style-type: none"><input type="checkbox"/> Purposes and content of Environmental Management and Coordination Act 1999<input type="checkbox"/> Purposes and content of Solid Waste Act<input type="checkbox"/> Storage methods for environmentally hazardous materials<input type="checkbox"/> Disposal methods of hazardous wastes<input type="checkbox"/> Types and uses of PPE in line with environmental regulations<input type="checkbox"/> Occupational Safety and Health	<ul style="list-style-type: none"><input type="checkbox"/> Written questions<input type="checkbox"/> Oral questions<input type="checkbox"/> Observation of work procedures

	Standards (OSHS)	
2. Control environmental Pollution control	<input type="checkbox"/> Types of pollution <input type="checkbox"/> Environmental pollution control measures <input type="checkbox"/> Types of solid wastes <input type="checkbox"/> Procedures for solid waste management <input type="checkbox"/> Different types of noise pollution <input type="checkbox"/> Methods for minimizing noise pollution	<input type="checkbox"/> Written questions <input type="checkbox"/> Oral questions <input type="checkbox"/> Observation of work procedures <input type="checkbox"/> Role play
3. Demonstrate sustainable resource use	<input type="checkbox"/> Types of resources <input type="checkbox"/> Techniques in measuring current usage of resources <input type="checkbox"/> Calculating current usage of resources <input type="checkbox"/> Methods for minimizing wastage <input type="checkbox"/> Waste management procedures <input type="checkbox"/> Principles of 3Rs (Reduce, Reuse, Recycle) <input type="checkbox"/> Methods for economizing or reducing resource consumption	<input type="checkbox"/> Written questions <input type="checkbox"/> Oral questions <input type="checkbox"/> Observation of work procedures <input type="checkbox"/> Role play
4. Evaluate current practices in relation to resource usage	<input type="checkbox"/> Collection of information on environmental and resource efficiency systems and procedures, <input type="checkbox"/> Measurement and recording of current resource usage <input type="checkbox"/> Analysis and recording of current purchasing strategies. <input type="checkbox"/> Analysis of current work processes to access information and data <input type="checkbox"/> Identification of areas for improvement	<input type="checkbox"/> Written questions <input type="checkbox"/> Oral questions <input type="checkbox"/> Observation of work procedures <input type="checkbox"/> Role play
5. Identify Environmental legislations/conventions for environmental concerns	<input type="checkbox"/> Environmental issues/concerns <input type="checkbox"/> Environmental legislations /conventions and local ordinances <input type="checkbox"/> Industrial standard /environmental practices <input type="checkbox"/> International Environmental Protocols (Montreal, Kyoto)	<input type="checkbox"/> Written questions <input type="checkbox"/> Oral questions <input type="checkbox"/> Observation of work procedures

	<input type="checkbox"/> Features of an environmental strategy	
6. Implement specific environmental programs	<input type="checkbox"/> Community needs and expectations <input type="checkbox"/> Resource availability <input type="checkbox"/> 5 s of good housekeeping <input type="checkbox"/> Identification of programs/Activities <input type="checkbox"/> Setting of individual roles /responsibilities <input type="checkbox"/> Resolving problems /constraints encountered <input type="checkbox"/> Consultation with stakeholders	<input type="checkbox"/> Written questions <input type="checkbox"/> Oral questions <input type="checkbox"/> Observation of work procedures <input type="checkbox"/> Role play
7. Monitor activities on Environmental protection/Programs	<input type="checkbox"/> Periodic monitoring and Evaluation of activities <input type="checkbox"/> Gathering feedback from stakeholders <input type="checkbox"/> Analysing data gathered <input type="checkbox"/> Documentation of recommendations and submission <input type="checkbox"/> Setting of management support systems to sustain and enhance the program <input type="checkbox"/> Monitoring and reporting of environmental incidents to concerned /proper authorities	<input type="checkbox"/> Oral questions <input type="checkbox"/> Written tests <input type="checkbox"/> Practical test <input type="checkbox"/> Observation

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos

Recommended Resources

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Environmental Management and Coordination Act 1999
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE)
- ISO standards

- Company environmental management systems (EMS)
- Montreal Protocol
- Kyoto Protocol

OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE:ENG/CU/EI/BC/07/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate occupational safety and health practices

Duration of Unit: 20 hours

Unit Description

This unit describes the competencies required to comply with regulatory and organizational requirements for occupational safety and health.

Summary of Learning Outcomes

1. Identify workplace hazards and risk
2. Identify and implement appropriate control measures to hazards and risks
3. Implement OSH programs, procedures and policies/guidelines

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify workplace hazards and risks	<ul style="list-style-type: none"> <input type="checkbox"/> Identification of hazards in the workplace and/or the indicators of their presence <input type="checkbox"/> Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace is conducted by <ul style="list-style-type: none"> <input type="checkbox"/> Authorized personnel or agency <input type="checkbox"/> Gathering of OHS issues and/or concerns raised 	<ul style="list-style-type: none"> <input type="checkbox"/> Oral questions <input type="checkbox"/> Written tests <input type="checkbox"/> Observation of trainees identify hazards and risks
2. Identify and implement appropriate control measure to hazards and risks	<ul style="list-style-type: none"> <input type="checkbox"/> Prevention and control measures, including use of PPE (personal protective equipment) for specific hazards are identified and implemented <input type="checkbox"/> Appropriate risk controls based on 	<ul style="list-style-type: none"> <input type="checkbox"/> Oral questions <input type="checkbox"/> Written tests <input type="checkbox"/> Practical test <input type="checkbox"/> Observation of implementation of control measures

	<p>result of OSH hazard evaluation is recommended</p> <ul style="list-style-type: none"> <input type="checkbox"/> Contingency measures, including emergency procedures during workplace incidents and emergencies are recognized and established in accordance with organization procedures 	
3. Implement OSH programs, procedures and policies/guidelines	<ul style="list-style-type: none"> <input type="checkbox"/> Providing information to work team about company OHS program, procedures and policies/guidelines <input type="checkbox"/> Participating in implementation of OSH procedures and policies/guidelines <input type="checkbox"/> Training of team members and advice on OSH standards and procedures <input type="checkbox"/> Implementation of procedures for maintaining OSH-related records 	<ul style="list-style-type: none"> <input type="checkbox"/> Oral questions <input type="checkbox"/> Written tests <input type="checkbox"/> Practical test <input type="checkbox"/> Observation

Suggested Delivery Methods

- Instructor led facilitation of theory
- Demonstration by trainer
- Practical work by trainee
- Viewing of related videos

Recommended Resources

- Standard operating and/or other workplace procedures manuals
- Specific job procedures manuals
- Machine/equipment manufacturer's specifications and instructions
- Personal Protective Equipment (PPE) e.g.
 - ✓ Mask
 - ✓ Face mask/shield
 - ✓ Safety boots
 - ✓ Safety harness
 - ✓ Arm/Hand guard, gloves
 - ✓ Eye protection (goggles, shield)
 - ✓ Hearing protection (ear muffs, ear plugs)

- ✓ Hair Net/cap/bonnet
- ✓ Hard hat
- ✓ Face protection (mask, shield)
- ✓ Apron/Gown/coverall/jump suit
- ✓ Anti-static suits
- ✓ High-visibility reflective vest

COMMON UNITS OF LEARNING

ENGINEERING MATHEMATICS

UNIT CODE: ENG/CU/EI/CC/01/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply engineering mathematics

Duration of Unit: 30 hours

Unit Description

This unit describes the competencies required by a technician in order to apply algebra, binomial expansion, coordinate geometry, trigonometric functions, mensuration, statistic, matrix, vectors and calculus.

Summary of Learning Outcomes

1. Apply Algebra
2. Apply Coordinate Geometry
3. Carry out Mensuration
4. Apply Matrix
5. Apply Vectors

Learning Outcomes, Content and Suggested Assessment Methods

Building Technology Curriculum		
Learning Outcome	Content	Suggested Assessment Methods

1. Apply Algebra	<input type="checkbox"/> Base and Index <input type="checkbox"/> Law of indices <input type="checkbox"/> Indicial equations <input type="checkbox"/> Laws of logarithm <input type="checkbox"/> Logarithmic equations <input type="checkbox"/> Conversion of bases <input type="checkbox"/> Use of calculator <input type="checkbox"/> Reduction of equations <input type="checkbox"/> Solutions of simultaneous linear equations in two unknowns <input type="checkbox"/> Solution of quadratic equation	<input type="checkbox"/> Written tests <input type="checkbox"/> Oral questioning <input type="checkbox"/> Assignments <input type="checkbox"/> Supervised exercises
2. Apply Coordinate Geometry	<input type="checkbox"/> Polar equations <input type="checkbox"/> Cartesian equation <input type="checkbox"/> Graphs of polar equations <input type="checkbox"/> Normal and tangents	<input type="checkbox"/> Written tests <input type="checkbox"/> Oral questioning <input type="checkbox"/> Assignments <input type="checkbox"/> Supervised exercises
3. Carry out Mensuration	<input type="checkbox"/> Units of measurements <input type="checkbox"/> Perimeter and areas of regular figures <input type="checkbox"/> Volume of regular solids <input type="checkbox"/> Surface area of regular solids <input type="checkbox"/> Area of irregular figures <input type="checkbox"/> Areas and volumes using Pappus theorem	<input type="checkbox"/> Written tests <input type="checkbox"/> Oral questioning <input type="checkbox"/> Assignments <input type="checkbox"/> Supervised exercises
4. Apply Matrix methods	<input type="checkbox"/> Matrix operation <input type="checkbox"/> Determinant of 2x2 matrix <input type="checkbox"/> Inverse of 2x2 matrix <input type="checkbox"/> Solution of linear simultaneous equations in 2 unknowns <input type="checkbox"/> Application of matrices	<input type="checkbox"/> Assignments <input type="checkbox"/> Oral questioning <input type="checkbox"/> Supervised exercises <input type="checkbox"/> Written tests
5. Apply Vector	<input type="checkbox"/> Vectors and scalar in two dimensions <input type="checkbox"/> Operations on vectors: Addition and Subtraction <input type="checkbox"/> Dot and Cross product <input type="checkbox"/> Gradient, Divergence and curl <input type="checkbox"/> Position vectors <input type="checkbox"/> Resolution of vectors	<input type="checkbox"/> Assignments <input type="checkbox"/> Oral questioning <input type="checkbox"/> Supervised exercises <input type="checkbox"/> Written tests

Suggested Delivery Methods

- Group discussions
- Demonstration by trainer
- Exercises by trainee

Recommended Resources

- Scientific Calculators
- Rulers, pencils, erasers
- Charts with presentations of data
- Graph books
- Dice
- Computers with internet connection

WORKSHOP TECHNOLOGY

UNIT CODE: ENG/CU/EI/CC/02/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Manage an Electrical workshop

Duration of Unit: 20 hours

Unit Description

This unit covers the competencies required to perform workshop process. Competencies include applying workshop Safety, use of workshop tools and instruments, preparation of workshop for electrical installation, Storage of Electrical tools and materials, troubleshoot and repair/replace workshop tools and equipment

Summary of Learning Outcomes

1. Apply workshop safety
2. Use of workshop tools, Instruments and equipment
3. Prepare workshop tools and instruments for an Electrical installation
4. Prepare the workshop for an Electrical installation
5. Store Electrical tools and materials
6. Troubleshoot and repair workshop tools and equipment

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Apply workshop safety	<ul style="list-style-type: none"><input type="checkbox"/> Meaning of PPE<ul style="list-style-type: none">• Standard operating procedure in PPE<input type="checkbox"/> Workshop rules<input type="checkbox"/> Electrical hazards e.g.<ul style="list-style-type: none">• Electric shock.<input type="checkbox"/> Fire<ul style="list-style-type: none">• Classes of fire• Causes of fire• Various methods of fire extinguishing	<ul style="list-style-type: none"><input type="checkbox"/> Oral questioning<input type="checkbox"/> Written tests<input type="checkbox"/> Practical test

	<input type="checkbox"/> First Aid	
2. Use of workshop tools, Instruments and equipment	<input type="checkbox"/> Meaning of workshop tools, instruments and equipment <input type="checkbox"/> Classification of workshop tools and equipment <input type="checkbox"/> Uses of workshop tools, Instruments and equipment <input type="checkbox"/> Care and Maintenance of workshop tools and Instruments	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
3. Prepare workshop tools and instruments for an Electrical installation	<input type="checkbox"/> Tools and instruments for an Electrical practical <ul style="list-style-type: none"> • Preparation of a list of tools and instruments for an Electrical practical. • Issuing and confirmation of tools and instruments before and after practical <input type="checkbox"/> Testing of practical tools and Instruments	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
4. Store Electrical tools and materials after installation	<input type="checkbox"/> Classification of workshop tools and instruments. <input type="checkbox"/> Storage of workshop Tools and equipment <input type="checkbox"/> Waste disposal	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
5. Troubleshoot and repair/replace workshop tools and equipment	<input type="checkbox"/> Meaning of troubleshooting <input type="checkbox"/> Common faults in Electrical equipments Fault diagnosis procedure <input type="checkbox"/> Repair/Replace of components in Electrical equipment <input type="checkbox"/> Calibration and service of equipment	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests

Suggested Methods of Delivery

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

Recommended Resources

Tools <ul style="list-style-type: none">• Set of screw drivers• Pliers• Phase testers• Multimeter	Materials and supplies <ul style="list-style-type: none">• Stationery• Cables• Lubricants• Service parts
Equipment <ul style="list-style-type: none">• PPE –hand gloves, dust coat, dust masks• Multimeter• Clamp meter• Earth electrode resistance meter• Phase sequence meter	Reference materials <ul style="list-style-type: none">• IEE regulations• Organizational procedures manual

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	<ul style="list-style-type: none"><input type="checkbox"/> The meaning of SI unit<input type="checkbox"/> SI unit of Electrical quantities<input type="checkbox"/> Calculations involving various Electrical quantities e.g Charge, Power, Current, Voltage, Resistance<input type="checkbox"/> Instruments used in measuring Electrical quantities	<ul style="list-style-type: none"><input type="checkbox"/> Written tests<input type="checkbox"/> Oral questioning<input type="checkbox"/> Assignments<input type="checkbox"/> Supervised exercises
2. D.C and A.C circuits in electrical installation	<ul style="list-style-type: none"><input type="checkbox"/> Meaning of terms<input type="checkbox"/> Conductors and insulators<input type="checkbox"/> Ohm's law	<ul style="list-style-type: none"><input type="checkbox"/> Written tests<input type="checkbox"/> Oral questioning<input type="checkbox"/> Assignments

	<input type="checkbox"/> Resistance variation <input type="checkbox"/> Resistors and color coding <input type="checkbox"/> AC and DC circuits <ul style="list-style-type: none"> • R-L, R-C, R-L-C circuits • Series • Parallel • Parallel and series <input type="checkbox"/> Parallel resonance and Q-factor <input type="checkbox"/> Power factor improvement <input type="checkbox"/> AC and DC network theorems e.g <ul style="list-style-type: none"> • Kirchoff's laws <input type="checkbox"/> AC to DC and DC to AC Conversion	<input type="checkbox"/> Supervised exercises
3. Single phase electrical machines	<input type="checkbox"/> Single phase Electrical machines <input type="checkbox"/> DC single phase motors and generators <input type="checkbox"/> AC Single phase motors and generators <input type="checkbox"/> Single phase transformers <input type="checkbox"/> Application of AC and DC machines <input type="checkbox"/> Motor starter <input type="checkbox"/> DC Motor speed control <input type="checkbox"/> Motor cooling	<input type="checkbox"/> Assignments <input type="checkbox"/> Oral questioning <input type="checkbox"/> Supervised exercises <input type="checkbox"/> Written tests <input type="checkbox"/> Practical tests
4. Earthing in Electrical installations	<input type="checkbox"/> Meaning of earthing <input type="checkbox"/> Terms in earthing <input type="checkbox"/> earthing systems <ul style="list-style-type: none"> • earthing points in electrical installation • IEE regulations <input type="checkbox"/> Factors to consider in selecting an earthing system <input type="checkbox"/> Testing an earthing system <ul style="list-style-type: none"> • earthing improvement 	<input type="checkbox"/> Assignments <input type="checkbox"/> Supervised exercises <input type="checkbox"/> Written tests <input type="checkbox"/> Practical test
5. Capacitance and inductance	<input type="checkbox"/> Meaning of electrostatic field <ul style="list-style-type: none"> • Sources of electrostatic field <input type="checkbox"/> Meaning of terms <ul style="list-style-type: none"> • Electric field strength • Capacitance 	<input type="checkbox"/> Assignments <input type="checkbox"/> Oral questioning <input type="checkbox"/> Supervised exercises <input type="checkbox"/> Written tests

	<ul style="list-style-type: none"> • Capacitors • Electric flux density • Permittivity <input type="checkbox"/> Types capacitors <input type="checkbox"/> Charging and discharging <input type="checkbox"/> Capacitors connection <ul style="list-style-type: none"> • Series • Parallel • Parallel and series <input type="checkbox"/> Application of capacitors <input type="checkbox"/> Calculations involving capacitors <input type="checkbox"/> Magnetic circuits <input type="checkbox"/> Magnetic fields <ul style="list-style-type: none"> • Magnetic flux and flux density • Magnetomotive force and magnetic field strength • Permeability and B-H curves • Hysteresis and hysteresis losses <input type="checkbox"/> Force on current-carrying conductor <input type="checkbox"/> Principle of operation of a simple DC motor <input type="checkbox"/> Principle of operation of a moving coil instrument <input type="checkbox"/> Electromagnetic field and electromagnets <input type="checkbox"/> Electromagnetic induction <ul style="list-style-type: none"> • Laws of electromagnetic induction • Rotation of a loop in a magnetic field <input type="checkbox"/> Inductance and inductors <input type="checkbox"/> Inductor connections <ul style="list-style-type: none"> • Series • Parallel • Parallel and series <input type="checkbox"/> Applications of inductors 	
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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

TECHNICAL DRAWING

UNIT CODE: ENG/CU/EI/CC/04/4

Relationship to Occupational Standards

This unit addresses the unit of competency: Prepare and interpret technical drawings

Duration of Unit: 20 hours

Unit Description

This unit covers the competencies required to prepare and interpret technical drawings. It involves competencies to select, use and maintain drawing equipment and materials. It also involves producing plain geometry drawings, solid geometry drawings, orthographic drawings of components and Electrical drawings.

Summary of Learning Outcomes

1. Use and maintenance of drawing equipment and materials
2. Produce plane geometry drawings
3. Produce solid geometry drawings
4. Produce and orthographic drawings
5. Produce Electrical drawings

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Use and maintenance of drawing equipment and materials	<ul style="list-style-type: none"><input type="checkbox"/> Identification and care of drawing equipment<input type="checkbox"/> Identification and care of drawing materials<input type="checkbox"/> Reference to manufacturer's instructions and work place procedures on use and maintenance of drawing equipment and materials<input type="checkbox"/> Reference to relevant environmental legislations<input type="checkbox"/> Use of Personal Protective Equipment (PPEs)	<ul style="list-style-type: none"><input type="checkbox"/> Observation<input type="checkbox"/> Oral questioning<input type="checkbox"/> Written tests

2. Produce plane geometry drawings	<input type="checkbox"/> Types of lines in drawings <input type="checkbox"/> Construction of geometric forms e.g. squares, circles <input type="checkbox"/> Construction of different angles <input type="checkbox"/> Measurement of different angles <input type="checkbox"/> Bisection of different angles and lines <input type="checkbox"/> Standard drawing conventions	<input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Observation
3. Produce solid geometry drawings	<input type="checkbox"/> Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids <input type="checkbox"/> Sectioning of solids e.g. prisms, cones <input type="checkbox"/> Development and interpenetrations of solids e.g. cylinder to cylinder and cylinder to triangular, prism	<input type="checkbox"/> Observation <input type="checkbox"/> Practical tests <input type="checkbox"/> Oral questioning
4. Produce orthographic drawings	<input type="checkbox"/> Meaning of pictorial and orthographic drawings <input type="checkbox"/> Meaning of sectioning <input type="checkbox"/> Meaning of symbols and abbreviations <input type="checkbox"/> Drawing and interpretation of orthographic elevations <input type="checkbox"/> Dimensioning of orthographic elevations <input type="checkbox"/> Sectioning of views <input type="checkbox"/> Assembly drawing	<input type="checkbox"/> Observation <input type="checkbox"/> Practical tests <input type="checkbox"/> Oral questioning
5. Produce electrical drawings	<input type="checkbox"/> Electrical symbols and abbreviations <input type="checkbox"/> Meaning of electrical drawings <input type="checkbox"/> Drawing of electrical diagrams e.g. block, schematic, circuit, line and wiring <input type="checkbox"/> Interpretation of electrical drawings	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests

Suggested Methods of Delivery

- Projects
- Demonstration by trainer
- Practice by the trainee
- Discussions

Recommended Resources

- Drawing room
- Drawing instruments e.g. T-squares, set squares, drawing sets
- Drawing tables
- Pencils, papers, erasers
- Masking tapes

CORE UNITS OF LEARNING

PERFORM ELECTRICAL INSTALLATION

UNIT CODE: ENG/CU/EI/CR/01/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Electrical Installation

Duration of Unit: 90 hours

Unit Description

This unit specifies the competencies required to perform electrical installation work for single phase systems. It focuses on the application of health, safety and environmental standards, preparation of working drawings, Assemble tools, equipment, materials and drawing instruments, and Perform electrical installation

Summary of Learning Outcomes

1. Apply health, safety and environmental standards
2. Prepare working drawings
3. Assemble tools, equipment and materials
4. Perform electrical installation

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Apply health, safety and environmental standards	<ul style="list-style-type: none"><input type="checkbox"/> Relevant clauses in appropriate Acts e.g.<ul style="list-style-type: none">• Occupational safety and health act (OSHA)• Work injury benefits act (WIBA)• Environment management and coordination Act (EMCA)<input type="checkbox"/> Relevant regulations:<ul style="list-style-type: none">• IEE regulations	<ul style="list-style-type: none"><input type="checkbox"/> Written tests<input type="checkbox"/> Oral questioning

	<ul style="list-style-type: none"> • KPLC by-laws • County by-laws <input type="checkbox"/> Causes of accidents and sources of danger e.g burns, cuts, electric shock, falling from heights, falling objects, noise, dust, chemicals <input type="checkbox"/> Meaning of PPE <input type="checkbox"/> Purpose of PPE <input type="checkbox"/> Types of PPE <input type="checkbox"/> Safe and correct handling, use, maintenance and storage of different types of PPE <input type="checkbox"/> Classes of fires and fire fighting equipment <input type="checkbox"/> First aid procedures <ul style="list-style-type: none"> • Rescuing electric shock victim • Methods of resuscitation 	
2. Prepare working drawings	<input type="checkbox"/> Meaning of working drawings <input type="checkbox"/> Interpret electrical design drawings <ul style="list-style-type: none"> • Reading and Interpretation of architectural drawings • Relate architectural drawing to the work site <input type="checkbox"/> Take actual measurements <ul style="list-style-type: none"> • Liaise with other service providers <input type="checkbox"/> Produce sketch drawing <input type="checkbox"/> Produce final working drawing	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
3. Assemble tools, equipment and materials	<input type="checkbox"/> Types, application, care, maintenance and storage of: <ul style="list-style-type: none"> • Tools e.g. <ul style="list-style-type: none"> ➤ Cable strippers ➤ Pliers ➤ Screw drivers ➤ Hammers ➤ Chisels 	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests

	<ul style="list-style-type: none"> ➤ Allen keys ➤ Electrician knives ➤ Crimping tools ➤ Bending springs ➤ Steel tapes ➤ Draw wires ➤ Hack saws ➤ Drills <ul style="list-style-type: none"> • Equipment e.g. ➤ Multimeter ➤ Earth tester ➤ Phase sequence meter <ul style="list-style-type: none"> • Materials e.g. <ul style="list-style-type: none"> ✓ Cables ✓ Fittings ✓ Accessories <input type="checkbox"/> Inventory management 	
4. Perform electrical installation	<ul style="list-style-type: none"> <input type="checkbox"/> Meaning of terms <input type="checkbox"/> Single phase systems <input type="checkbox"/> Cables and cable joints <input type="checkbox"/> Wiring systems and accessories <ul style="list-style-type: none"> • Meaning of terms • Types and applications e.g. ➤ Conduits ➤ Cable trays ➤ Cable ducts ➤ Trunkings <ul style="list-style-type: none"> • Preparation of wiring systems ➤ Marking out, cutting, bending, threading, chiselling, trenching <input type="checkbox"/> Laying of cable routes <input type="checkbox"/> Installation of final circuits <ul style="list-style-type: none"> • Lighting circuits <ul style="list-style-type: none"> ➤ One way, two way, intermediate ➤ Looping in methods at ceiling rose, joint boxes, switches 	<ul style="list-style-type: none"> <input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests

	<ul style="list-style-type: none"> • Power circuits <ul style="list-style-type: none"> ➤ Radial circuits, ring circuits • Water heating circuits • Electric cooker circuits • Bell and alarm circuits • Electrical machines circuits <ul style="list-style-type: none"> e.g Single phase motors □ Relevant technical standards e.g. <ul style="list-style-type: none"> ➤ IEE regulations ➤ British standards ➤ Kenya bureau of standards (KEBS) ➤ Kenya power by-laws ➤ County by-laws 	
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Suggested Methods of Delivery

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

Recommended Resources

<p>Tools and equipment</p> <ul style="list-style-type: none"> ➤ Cable Strippers ➤ Pliers ➤ Screw drivers ➤ Hammers ➤ Chisels ➤ Allen keys ➤ Electrician knives ➤ Crimping tools ➤ Bending springs ➤ Bending machine ➤ Steel tapes ➤ Draw wires 	<p>Materials and supplies</p> <ul style="list-style-type: none"> • Stationery • Cables • Light fittings • Accessories • Conduits and fittings • Cable trays • Cable ducts • Trunkings • Computers • Drawing instruments • Screws
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<ul style="list-style-type: none"> ➤ Hack saws ➤ Drilling tools ➤ Stock and die ➤ Bench vice ➤ Machine vice ➤ PPE – hand gloves, dust coats, dust masks, helmets, ear muffs, industrial boots 	
<p>Reference materials</p> <ul style="list-style-type: none"> • IEE regulations • Occupational safety and health act (OSHA) • Work injury benefits act (WIBA) • Manufacturers’ catalogues • British standards • KEBS standards 	

TESTING OF ELECTRICAL INSTALLATION

UNIT CODE: ENG/CU/EI/CR/02/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Testing of Electrical Installation

Duration of Unit: 30 hours

Unit Description

This unit covers the competencies required to carry out inspection and testing of an electrical installation. It covers testing activities starting from verifying the installed fittings and accessories, identifying the type of tests, carrying out the tests and issuing test certificates.

Summary of Learning Outcomes

1. Conduct physical inspection
2. Identify the test to be carried out and test equipment
3. Perform the test
4. Issue installation test and wiring certificates

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Carry out physical inspection	<input type="checkbox"/> Inspection <ul style="list-style-type: none">• Reasons for inspection• Physical and visual check<ul style="list-style-type: none">➤ Firmness➤ Loose connections➤ Damaged accessories and fittings➤ Colour coding➤ Cable management	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning
2. Identify the tests to be carried out.	<input type="checkbox"/> Testing <ul style="list-style-type: none">• Meaning• Purpose and reasons• Types of tests<ul style="list-style-type: none">➤ Polarity➤ Earth testing➤ Insulation resistance➤ Continuity test	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Written tests

Learning Outcome	Content	Suggested Assessment Methods
	<ul style="list-style-type: none"> ➤ Earth loop impedance test • Identification of test equipment • Specification of test equipment • Calibrate test equipment • Test equipment care, storage and maintenance 	
3. Perform identified tests	<ul style="list-style-type: none"> <input type="checkbox"/> Reading and interpretation of appropriate manuals <input type="checkbox"/> Identification of test equipment e.g. <ul style="list-style-type: none"> ➤ Continuity tester (ohmmeter) ➤ Insulation resistance tester ➤ Earth loop impedance tester ➤ Test lamp <input type="checkbox"/> Procedure of conducting identified tests <ul style="list-style-type: none"> ➤ Polarity ➤ Effectiveness of earthing ➤ Insulation resistance ➤ Ring circuit continuity <input type="checkbox"/> Recording and verification of results against appropriate standards <ul style="list-style-type: none"> ➤ Rectification of any anomalies <input type="checkbox"/> Safety precautions 	<ul style="list-style-type: none"> <input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
4. Issue installation test results and wiring completion certificates	<ul style="list-style-type: none"> <input type="checkbox"/> Installation test results certificate <ul style="list-style-type: none"> • Meaning terms • Importance <input type="checkbox"/> Wiring certificate <ul style="list-style-type: none"> • Meaning • Importance • Types • Issuing authority 	<ul style="list-style-type: none"> <input type="checkbox"/> Written tests <input type="checkbox"/> Oral questioning

Suggested Methods of Delivery

- Demonstration by trainer
- Practice by the trainee
- Field trips

- Discussions

Recommended Resources

<ul style="list-style-type: none"> • Test instruments <ul style="list-style-type: none"> ➤ Continuity tester (ohmmeter) ➤ Insulation resistance tester ➤ Earth loop impedance tester ➤ Test lamp 	<p>Materials and supplies</p> <ul style="list-style-type: none"> • Stationery • Wiring certificates
<p>Reference materials</p> <ul style="list-style-type: none"> • Manufacturers' manuals • Relevant catalogues • IEE regulations 	

ELECTRICAL INSTALLATION BREAKDOWN MAINTENANCE

UNIT CODE: ENG/CU/EI/CR/03/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Conduct Electrical Installation Breakdown Maintenance

Duration of Unit: 40 hours

Unit Description

This unit specifies the competencies required to conduct breakdown maintenance of an electrical installation. It includes fault identification, repairing, testing and generating maintenance report.

Summary of Learning Outcomes

1. Identify system failure
2. Troubleshoot cause of failure
3. Repair the installation
4. Test the repaired system

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Identify installation failure	<ul style="list-style-type: none"><input type="checkbox"/> Gathering information<ul style="list-style-type: none">• Principle of operation• Visual inspection• Interview of users<input type="checkbox"/> Types of failures<ul style="list-style-type: none">• Partial• Total<input type="checkbox"/> Referring to as-built drawings and manuals	<ul style="list-style-type: none"><input type="checkbox"/> Oral questioning<input type="checkbox"/> Written tests
2. Troubleshoot cause of failure.	<ul style="list-style-type: none"><input type="checkbox"/> Conducting fault diagnosis e.g.<ul style="list-style-type: none">• Open circuit• Short circuit	<ul style="list-style-type: none"><input type="checkbox"/> Oral questioning<input type="checkbox"/> Practical tests<input type="checkbox"/> Written tests

	<ul style="list-style-type: none"> • Earth fault • Mechanical faults <input type="checkbox"/> Identification of tools, equipment and materials for repair/replace <input type="checkbox"/> Specification of tools <input type="checkbox"/> Recording of installation failure results <ul style="list-style-type: none"> • Parameters e.g. <ul style="list-style-type: none"> ➤ Voltage ➤ Current ➤ Resistance 	
3. Repair the installation	<input type="checkbox"/> Repair/Replace <ul style="list-style-type: none"> • Meaning • Power isolation • Conducting repair activities • Recording repair activities 	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests
4. Test the repaired system	<input type="checkbox"/> Identification of test and test points <ul style="list-style-type: none"> • Test parameters e.g. <ul style="list-style-type: none"> ➤ Voltage ➤ Resistance ➤ Current <input type="checkbox"/> Prepare and document maintenance report	<input type="checkbox"/> Observation <input type="checkbox"/> Oral questioning <input type="checkbox"/> Practical tests <input type="checkbox"/> Written tests

Suggested Methods of Delivery

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

Recommended Resources

Tools <ul style="list-style-type: none"> • Set of screw drivers • Pliers • Phase testers • Multimeter 	Materials and supplies <ul style="list-style-type: none"> • Stationery • Cables • Lubricants • Service parts
Equipment	Reference materials

<ul style="list-style-type: none">• PPE –hand gloves, dust coat, dust masks• Multimeter• Clamp meter• Earth electrode resistance meter• Phase sequence meter	<ul style="list-style-type: none">• IEE regulations• Organizational procedures manual
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