



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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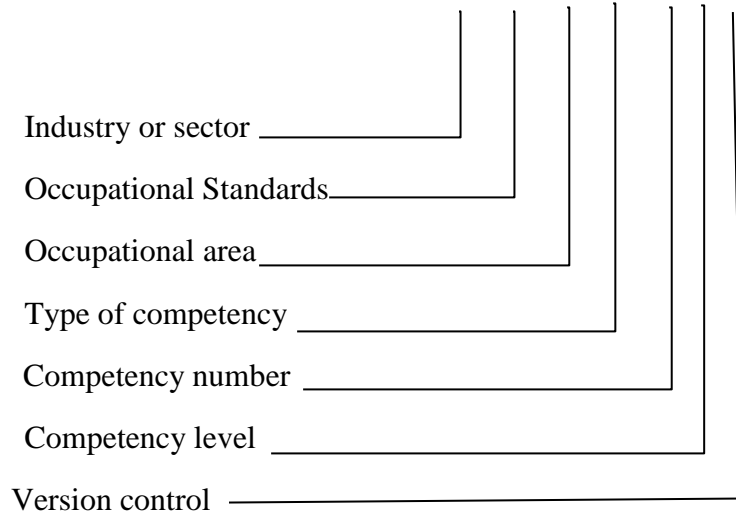
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ACRONYMNS AND ABBREVIATIONS

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



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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.

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BASIC UNITS OF LEARNING

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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 lead in the dissemination and discussion of ideas, information and issues in the workplace.

Summary of Learning Outcomes

1. Obtain and convey workplace information
2. Complete relevant work-related documents
3. Communicate information about workplace processes
4. Lead workplace discussion
5. Identify and communicate issues arising in the workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Obtain and convey workplace information	<ul style="list-style-type: none">• Communication process• Modes of communication• Medium of communication• Effective communication• Barriers to communication• Flow of communication• Sources of information• Types of questions• Organizational policies• Workplace etiquette• Ethical work practices in handling communication	<ul style="list-style-type: none">• Observation• Interview• Third party reports
2. Complete relevant work-related documents	<ul style="list-style-type: none">• Types and purposes of workplace documents and forms• Methods used in filling forms and	<ul style="list-style-type: none">• Observation• Interview• Third party reports

	<p>documents</p> <ul style="list-style-type: none"> • Recording workplace data • Process of distributing workplace forms and documents • Report writing • Types of workplace reports 	
3. Communicate information about workplace processes	<ul style="list-style-type: none"> • Communication process • Modes of communication • Medium of communication • Effective communication • Barriers to communication • Flow of communication • Sources of information • Organizational policies • Organization requirements for written and electronic communication methods • Report writing • Effective questioning techniques (clarifying and probing) • Workplace etiquette • Ethical work practices in handling communication 	<ul style="list-style-type: none"> • Observation • Interview • Portfolio
4. Lead workplace discussion	<ul style="list-style-type: none"> • Methods of discussion e.g. <ul style="list-style-type: none"> ✓ Coordination meetings ✓ Toolbox discussion ✓ Peer-to-peer discussion • Solicitation of response 	<ul style="list-style-type: none"> • Observation • Interview • Third party reports
5. Identify and communicate issues arising in the workplace	<ul style="list-style-type: none"> • Identification of problems and issues • Organizing information on problems and issues • Relating problems and issues • Communication barriers affecting workplace discussions 	<ul style="list-style-type: none"> • Observation • Interview • Portfolio

Suggested Delivery Methods

- Discussion
- Role play
- Brainstorming

Recommended Resources

- Desktop computers/laptops
- Internet connection
- Projectors
- Telephone
- Report writing templates

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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: 35 hours

Unit Description

This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

Summary of Learning Outcomes

1. Identify computer hardware and software
2. Apply security measures to data, hardware and software
3. Apply computer software in solving tasks
4. Apply internet and email in communication at workplace

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify computer hardware and software	<ul style="list-style-type: none">• Meaning of a computer• Functions of a computer• Components of a computer• Classification of computers	<ul style="list-style-type: none">• Written• Oral• Observation
2. Apply security measures to data, hardware and software	<ul style="list-style-type: none">• Data security and control• Security threats and control measures• Types of computer crimes• Detection and protection against computer crimes	<ul style="list-style-type: none">• Written tests• Oral presentation• Observation• Projects
3. Apply computer software in solving tasks	<ul style="list-style-type: none">• Operating system• Word processing• Spread sheets	<ul style="list-style-type: none">• Oral questioning• Observation• Project

	<ul style="list-style-type: none"> • Data base 	
4. Apply internet and email in communication at workplace	<ul style="list-style-type: none"> • Computer networks • Uses of internet • Electronic mail (e-mail) concept 	<ul style="list-style-type: none"> • Oral questioning • Observation • Oral presentation • Written report

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

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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 skills. It includes creating and maintaining small scale business, establishing small scale business customer base, managing and growing a small business.

Summary of Learning Outcomes

1. Create and maintain small scale business
2. Establish small scale business customer base
3. Manage small scale business
4. Grow/ expand small scale business

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Create and maintain small scale business	<ul style="list-style-type: none">• Starting a small business• Legal regulatory requirements in starting a small business• SWOT/ PESTEL analysis• Conducting market/industry survey• Generation and evaluation of business ideas• Matching competencies with business opportunities• Forms of business ownership• Location of a small business• Legal and regulatory requirement• Resources required to start a	<ul style="list-style-type: none">• Observation• Case studies• Individual/group assignments• projects• Written• Oral

	<p>small business</p> <ul style="list-style-type: none"> • Common terminologies in entrepreneurship • Entrepreneurship in national development • Self-employment • Formal and informal employment • Entrepreneurial culture • Myths associated with entrepreneurship • Types, characteristics, qualities & role of entrepreneurs • History, development and importance of entrepreneurship • Theories of entrepreneurship • Quality assurance for small businesses • Policies and procedures on occupational safety and health and environmental concerns 	
<p>2. Establish small scale business customer base</p>	<ul style="list-style-type: none"> • Good staff/workers and customer relations • Marketing strategy • Identifying and maintain new customers and markets • Product/ service promotions • Products / services diversification • SWOT / PESTEL analysis • Conducting a business survey • Generating Business ideas • Business opportunities 	<ul style="list-style-type: none"> • Observation • Case studies • Individual/group assignments • projects • Written • Oral

<p>3. Manage small scale business</p>	<ul style="list-style-type: none"> • Organization of a small business • Small business' business plan • Marketing for small businesses • Managing finances for small business • Production/ operation process for goods/services • Small business records management • Book keeping and auditing for small businesses • Business support services • Small business resources mobilization and utilization • Basic business social responsibility • Management of small business • Word processing concepts in small business management • Computer application software • Monitoring and controlling business operations 	<ul style="list-style-type: none"> • Oral • Observation • Case studies • Individual/group assignments • projects • Written
<p>4. Grow/expand small scale business</p>	<ul style="list-style-type: none"> • Methods of growing small business • Resources for growing small business • Small business growth plan • Computer software in business development • ICT and business growth 	<ul style="list-style-type: none"> • Observation • Case studies • Individual/group assignments • projects • 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

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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<input type="checkbox"/> Self-awareness	<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-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"/> Organization culture	<input type="checkbox"/> Observation <input type="checkbox"/> Oral interview <input type="checkbox"/> Written <input type="checkbox"/> Third party report

	<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

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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 and evaluate current practices in relation to resource usage.

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

Learning Outcomes, Content and Suggested Assessment Methods

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

Pollution control	<ul style="list-style-type: none"> • Environmental pollution control measures • Types of solid wastes • Procedures for solid waste management • Different types of noise pollution • Methods for minimizing noise pollution 	<ul style="list-style-type: none"> • Oral questions • Observation of work procedures • Role play
3. Demonstrate sustainable resource use	<ul style="list-style-type: none"> • Types of resources • Techniques in measuring current usage of resources • Calculating current usage of resources • Methods for minimizing wastage • Waste management procedures • Principles of 3Rs (Reduce, Reuse, Recycle) • Methods for economizing or reducing resource consumption 	<ul style="list-style-type: none"> • Written questions • Oral questions • Observation of work procedures • Role play
4. Evaluate current practices in relation to resource usage	<ul style="list-style-type: none"> • Collection of information on environmental and resource efficiency systems and procedures, • Measurement and recording of current resource usage • Analysis and recording of current purchasing strategies. • Analysis of current work processes to access information and data • Identification of areas for improvement 	<ul style="list-style-type: none"> • Written questions • Oral questions • Observation of work procedures • Role play
5. Identify Environmental legislations/conventions for environmental concerns	<ul style="list-style-type: none"> • Environmental issues/concerns • Environmental legislations /conventions and local ordinances • Industrial standard /environmental practices • International Environmental Protocols (Montreal, Kyoto) • Features of an environmental strategy 	<ul style="list-style-type: none"> • Written questions • Oral questions • Observation of work procedures

Suggested Delivery Methods

- Instructor led facilitation of theory

- Practical demonstration of tasks by trainer
- Practice by trainees/ role play
- Discussion
- Observations and comments and corrections by trainers

Recommended Resources

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

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OCCUPATIONAL SAFETY AND HEALTH PRACTICES

UNIT CODE:ENG/CU/EI/BC/06/4/A

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate Safety and Health Practices

Duration of Unit: 20 hours

Unit Description

This unit describes the competencies required to practice safety and health, and comply with OSH requirements relevant to work.

Summary of Learning Outcomes

1. Observe workplace procedures for hazards and risk prevention
2. Participate in arrangements for workplace safety and health maintenance

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Observe workplace procedures for hazards and risk prevention	<ul style="list-style-type: none">• Arrangement of work area and items in accordance with Company housekeeping procedures• Adherence to work standards and procedures• Application of preventive and control measures, including use of safety gears/PPE• Study and apply standards and procedures for incidents and emergencies.	<ul style="list-style-type: none">• Oral questions• Written questions• Observation of work procedures
2. Participate in arrangements for workplace safety and health maintenance	<ul style="list-style-type: none">• Participating in orientations on OSH requirements/regulations of tasks• Providing feedback on health, safety, and security concerns to appropriate personnel as required in a sufficiently detailed manner• Practice workplace procedures for	<ul style="list-style-type: none">• Oral questions• Written tests• Practical test• Observation of practical work by trainees

	<p>reporting hazards, incidents, injuries and sickness</p> <ul style="list-style-type: none"> • OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed, and compliance reported to appropriate personnel • Identification of needed OSH-related trainings are proposed to appropriate personnel 	
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Suggested Delivery Methods

- Instructor led facilitation of theory
- Practical demonstration of tasks by trainer
- Practice by trainees/ role play
- Discussion
- Observations and comments and corrections by trainers

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

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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

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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

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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

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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

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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

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CORE UNITS OF LEARNING

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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

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Recommended Resources

Tools and equipment	Materials and supplies
<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 	<ul style="list-style-type: none"> • Stationery • Cables • Light fittings • Accessories • Conduits and fittings • Cable trays • Cable ducts • Trunkings • Computers • Drawing instruments • Screws

<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 	

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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 	

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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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