



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

COMPETENCY BASED CURRICULUM

FOR

ELECTRICAL ENGINEERING (POWER OPTION) TECHNOLOGY

LEVEL 6



**TVET CDACC
P.O BOX 15745-00100
NAIROBI**

First published 2018

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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 Engineering 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.

CHAIRPERSON, 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 Electrical Engineering 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.

COUNCIL SECRETARY/CEO

TVET CDACC

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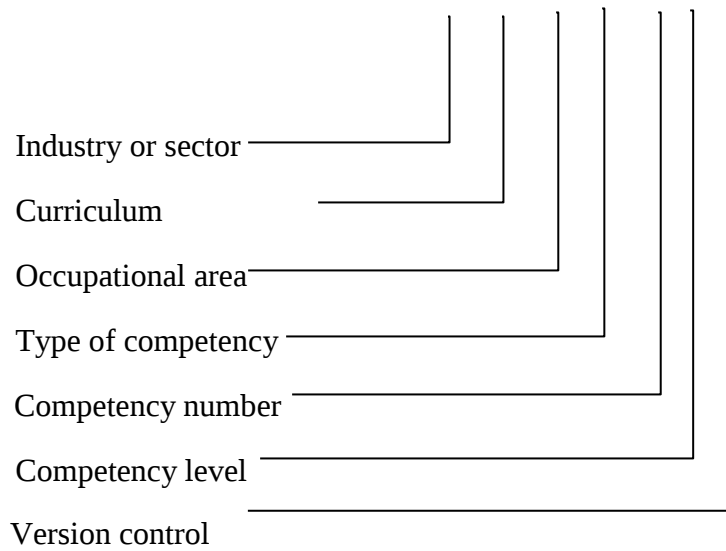
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ACRONYMNS AND ABBREVIATIONS

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/PO/BC/01/6 A



OVERVIEW

Description of the course

This course is designed to equip Electrical Technicians with the competencies required to perform electrical installation, power line construction, electronics, electrical machine installation, machine automation, security system installation, solar installation, Electrical equipment and system maintenance, project management and power generation.

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/PO/BC/01/6	Communication skills	40	4
ENG/CU/PO/BC/02/6	Digital literacy	60	6
ENG/CU/PO/BC/03/6	Entrepreneurial skills	100	10
ENG/CU/PO/BC/04/6	Employability skills	80	8
ENG/CU/PO/BC/05/6	Environmental literacy	40	4
ENG/CU/PO/BC/06/6	Occupational safety and health practices	40	4
Total		360	36

Common Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit Factors
ENG/CU/PO/CC/01/6	Engineering Mathematics	110	11
ENG/CU/PO/CC/02/6	Workshop Technology	240	24
ENG/CU/PO/CC/03/6	Electrical Principles	60	6
ENG/CU/PO/CC/04/6	Technical Drawing	130	13
Total		540	54

Core Units of Learning

Unit Code	Unit Title	Duration in Hours	Credit Factors
ENG/CU/PO/CR/01/6	Electrical Installation	120	12
ENG/CU/PO/CR/02/6	Electrical Power Lines	190	19
ENG/CU/PO/CR/03/6	Electrical Machine Installation	130	13
ENG/CU/PO/CR/04/6	Electronics	120	12

ENG/CU/PO/CR/05/6	Electrical Machine Automation	130	13
ENG/CU/PO/CR/06/6	Security Systems Installation	110	11
ENG/CU/PO/CR/07/6	Solar Systems Installation	70	7
ENG/CU/PO/CR/08/6	Electrical Equipment and System maintenance	130	13
ENG/CU/PO/CR/09/6	Electrical project management	120	12
ENG/CU/PO/CR/10/6	Power Generation	110	11
	Industrial Attachment	480	48
Total		1,710	171
Grand Total		2,610	261

The core units of learning are independent of each other and may be taken independently.

The total duration of the **course is 2,610 hours** (87 weeks at 30 hours per week) inclusive of industrial attachment.

1. 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.) with a minimum mean grade of C- (C minus)

Or

- b) Level 5 certificate in a related course with **one** year of continuous work experience

Or

- c) Equivalent qualifications as determined by Kenya National Qualifications Authority (KNQA)

2. Trainer qualification

A trainer for this course should have a higher qualification than the level of this course

3. 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 480 hours. Attachment will be undertaken upon completion of the course or the unit of learning.

4. 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.

5. Certification

A candidate will be issued with a Certificate of Competency on demonstration of competence in a unit of competency. To attain a National Certificate on the qualification Electrical Technician Level 6, 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/PO/BC/01/6

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Communication Skills

Duration of Unit: 40 hours

Unit Description

This unit covers the competencies required to demonstrate communication skills .It involves, meeting communication needs of clients and colleagues; developing communication strategies, establishing and maintaining communication pathways, conducting interviews, facilitating group discussion and representing the organization.

Summary of Learning Outcomes

1. Meet communication needs of clients and colleagues
2. Develop communication strategies
3. Establish and maintain communication pathways
4. Promote use of communication strategies
5. Conduct interview
6. Facilitate group discussion
7. Represent the organization

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Meet communication needs of clients and colleagues	• 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	• Interview • Written texts

	(clarifying and probing) • Workplace etiquette • Ethical work practices in handling communication • Active listening • Feedback • Interpretation • Flexibility in communication • Types of communication strategies • Elements of communication strategy	
2. Develop communication strategies	• Dynamics of groups • Styles of group leadership • Openness and flexibility in communication • Communication skills relevant to client groups	• Interview • Written texts
3. Establish and maintain communication pathways	• Types of communication pathways	• Interview • Written texts
4. Promote use of communication strategies	• Application of elements of communication strategies • Effective communication techniques	• Interview • Written texts
5. Conduct interview	• Types of interview • Establishing rapport • Facilitating resolution of issues • Developing action plans	• Interview • Written texts
6. Facilitate group discussion	• Identification of communication needs • Dynamics of groups • Styles of group leadership • Presentation of information • Encouraging group members participation • Evaluating group communication strategies	• Interview • Written texts

7. Represent the organization	• Presentation techniques • Development of a presentation • Multi-media utilization in presentation • Communication skills relevant to client groups	• Interview • Written texts
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Suggested Methods of Instruction

- Discussion
- Role playing
- Simulation
- Direct instruction

Recommended Resources

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

DIGITAL LITERACY

UNIT CODE:ENG/CU/PO/BC/02/6

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Digital Literacy

Duration of Unit: 60 hours

Unit Description

This unit describes competencies required to demonstrate digital literacy. It involves in identifying computer software and hardware, applying security measures to data, hardware, software in automated environment, computer software in solving task, internet and email in communication at workplace, desktop publishing in official assignments and preparing presentation packages.

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	• Concepts of ICT • Functions of ICT • History of computers • Components of a computer • Classification of computers	• Written tests • Oral presentation
2. Apply security measures to data, hardware, software in automated environment	• Data security and control • Security threats and control measures • Types of computer crimes • Detection and protection against computer crimes • Laws governing protection of	• Written tests • Oral presentation • Project

	ICT	
3. Apply computer software in solving tasks	• Operating system • Word processing • Spread sheets • Data base design and manipulation • Data manipulation, storage and retrieval	• Oral questioning • Project
4. Apply internet and email in communication at workplace	• Computer networks • Network configurations • Uses of internet • Electronic mail (e-mail) concept	• Oral questioning • Written report
5. Apply desktop publishing in official assignments	• Concept of desktop publishing • Opening publication window • Identifying different tools and tool bars • Determining page layout • Opening, saving and closing files • Drawing various shapes using DTP • Using colour pellets to enhance a document • Inserting text frames • Importing and exporting text • Object linking and embedding • Designing of various publications • Printing of various publications	• Oral questioning • Written report • Project
6. Prepare presentation packages	• Types of presentation packages • Procedure of creating slides • Formatting slides • Presentation of slides • Procedure for editing objects	• Oral questioning • Written report • Project

Suggested Methods of Instruction

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

Recommended Resources

- Computers
- Printers
- Storage devices
- Internet access

ENTREPRENEURIAL SKILLS

UNIT CODE: ENG/CU/PO/BC/03/6

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Entrepreneurial Skills

Duration of unit: 100 hours

Unit Description

This unit covers the competencies required to demonstrate understanding of entrepreneurship. It involves demonstrating understanding of an entrepreneur, entrepreneurship and self-employment. It also involves identifying entrepreneurship opportunities, creating entrepreneurial awareness, applying entrepreneurial motivation and developing business innovative strategies.

Summary of Learning Outcomes

1. Demonstrate understanding of who an entrepreneur
2. Demonstrate knowledge of entrepreneurship and self-employment
3. Identify entrepreneurship opportunities
4. Create entrepreneurial awareness
5. Apply entrepreneurial motivation
6. Develop business innovative strategies
7. Develop Business plan

Learning Outcome	Content	Suggested Assessment Methods
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1. Demonstrate knowledge of entrepreneurship and self-employment	• Importance of self-employment • Requirements for entry into self-employment • Role of an Entrepreneur in business • Contributions of Entrepreneurs to National development • Entrepreneurship culture in Kenya • Born or made entrepreneurs	• Individual/group assignments • Projects • Written tests • Oral questions • Third party report
2. Identify entrepreneurship opportunities	• Business ideas and opportunities • Sources of business ideas • Business life cycle • Legal aspects of business • Assessment of product demand • Business environment • Factors to consider when evaluating business environment • Technology in business	• Individual/group assignments • Projects • Written tests • Oral questions • Third party report • Interviews
3. Create entrepreneurial awareness	• Forms of businesses • Sources of business finance • Factors in selecting source of business finance • Governing policies on Small Scale Enterprises (SSEs) • Problems of starting and operating SSEs	• Individual/group assignments • Projects • Written tests • Oral questions • Third party report • Interviews

4. Apply entrepreneurial motivation	• Internal and external motivation • Motivational theories • Self-assessment • Entrepreneurial orientation • Effective communications in entrepreneurship • Principles of communication • Entrepreneurial motivation	• Case studies • Individual/group assignments • Projects • Written tests • Oral questions • Third party report • Interviews
5. Develop business innovative strategies	• Innovation in business • Small business Strategic Plan • Creativity in business development • Linkages with other entrepreneurs • ICT in business growth and development	• Case studies • Individual/group assignments • Projects • Written tests • Oral questions • Third party report • Interviews
6. Develop Business Plan	• Business description • Marketing plan • Organizational/Management plan • Production/operation plan • Financial plan • Executive summary • Presentation of Business Plan	• Case studies • Individual/group assignments • Projects • Written tests • Oral questions • Third party report • Interviews

Suggested Methods of Instruction

- Direct instruction
- Project
- Case studies
- Field trips
- Discussions
- Demonstration
- Question and answer
- Problem solving

- Experiential
- Team training

Recommended Resources

- Case studies
- Business plan templates
- Computers
- Overhead projectors
- Internet
- Mobile phone
- Video clips
- Films
- Newspapers and Handouts
- Business Journals
- Writing materials

EMPLOYABILITY SKILLS

UNIT CODE: ENG/CU/PO/BC/04/6

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Employability Skills

Duration of Unit: 80 hours

Unit Description

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating interpersonal communication, critical safe work habits, leading a workplace team, planning and organizing work, maintaining professional growth and development, demonstrating workplace learning, problem solving skills and managing ethical performance.

Summary of Learning Outcomes

1. Conduct self-management
2. Demonstrate interpersonal communication
3. Demonstrate critical safe work habits
4. Lead a workplace team
5. Plan and organize work
6. Maintain professional growth and development
7. Demonstrate workplace learning
8. Demonstrate problem solving skills
9. Manage ethical performance

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Conduct self-management	• Self-awareness • Formulating personal vision, mission and goals • Strategies for overcoming life challenges • Managing emotions • Emotional intelligence • Assertiveness versus aggressiveness • Expressing personal thoughts, feelings and beliefs • Developing and maintaining high	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report

	self-esteem • Developing and maintaining positive self-image • Setting performance targets • Monitoring and evaluating performance • Articulating ideas and aspirations • Accountability and responsibility • Good work habits • Self-awareness • Values and beliefs • Self-development • Financial literacy • Healthy lifestyle practices • Adopting safety practices	
2. Demonstrate interpersonal communication	• Meaning of interpersonal communication • Listening skills • Types of audience • Public speaking • Writing skills • Negotiation skills • Reading skills • Meaning of empathy • Understanding customers' needs • Establishing communication networks • Assertiveness • Sharing information	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report
3. Demonstrate critical safe work habits	• Stress and stress management • Time concept • Punctuality and time consciousness • Leisure • Integrating personal objectives into organizational objectives • Resources mobilization • Resources utilization	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report

	• Setting work priorities • Developing healthy relationships • HIV and AIDS • Drug and substance abuse • Managing emerging issues	
4. Lead a workplace team	• Leadership qualities • Power and authority • Team building • Determination of team roles and objectives • Team parameters and relationships • Individual responsibilities in a team • Forms of communication • Complementing team activities • Gender and gender mainstreaming • Human rights • Developing healthy relationships • Maintaining relationships • Conflicts and conflict resolution • Coaching and mentoring skills	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report
5. Plan and organize work	• Functions of management • Planning • Organizing • Time management • Decision making concept • Task allocation • Developing work plans • Developing work goals/objectives and deliverables • Monitoring work activities • Evaluating work activities • Resource mobilization • Resource allocation • Resource utilization • Proactive planning	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report

	• Risk evaluation • Problem solving • Collecting, analysing and organising information • Negotiation	
6. Maintain professional growth and development	• Avenues for professional growth • Training and career opportunities • Assessing training needs • Mobilizing training resources • Licenses and certifications for professional growth and development • Pursuing personal and organizational goals • Managing work priorities and commitments • Recognizing career advancement	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report
7. Demonstrate workplace learning	• Managing own learning • Mentoring • Coaching • Contributing to the learning community at the workplace • Cultural aspects of work • Networking • Variety of learning context • Application of learning • Safe use of technology • Taking initiative/proactivity • Flexibility • Identifying opportunities • Generating new ideas • Workplace innovation • Performance improvement • Managing emerging issues • Future trends and concerns in learning	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report
8. Demonstrate problem solving skills	• Critical thinking process • Data analysis tools	• Written tests • Oral questioning

	• Decision making • Creative thinking • Development of creative, innovative and practical solutions • Independence in identifying and solving problems • Solving problems in teams • Application of problem-solving strategies • Testing assumptions • Resolving customer concerns	• Interviewing • Portfolio of evidence • Third party report
9. Manage ethical performance	• Meaning of ethics • Ethical perspectives • Principles of ethics • Ethical standards • Organization code of ethics • Common ethical dilemmas • Organization culture • Corruption, bribery and conflict of interest • Privacy and data protection • Diversity, harassment and mutual respect • Financial responsibility/accountability • Etiquette • Personal and professional integrity • Commitment to jurisdictional laws • Emerging issues in ethics	• Written tests • Oral questioning • Interviewing • Portfolio of evidence • Third party report

Suggested Methods of Instruction

- ☐ Demonstrations
- ☐ Simulation/Role play
- ☐ Group Discussion
- ☐ Presentations
- ☐ Assignments
- ☐ Q&A

Recommended Resources

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

ENVIRONMENTAL LITERACY

UNIT CODE: ENG/CU/PO/BC/05/6

Relationship to Occupational Standards:

This unit addresses the Unit of Competency : Demonstrate Environmental Literacy

Duration of Unit: 40 hours

Unit Description

This unit describes the competencies required demonstrate environmental literacy.it involves controlling environmental hazard, controlling environmental pollution, complying with workplace sustainable resource use, evaluating current practices in relation to resource usage, identifying environmental legislations/conventions for environmental concerns, implementing specific environmental programs, monitoring activities on environmental protection/programs, analysing resource use and developing resource conservation plans.

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
8. Analyze resource use
9. Develop resource conservation plans

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Control environmental hazard	• Purposes and content of Environmental Management and Coordination Act 1999 • 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	• Written questions • Oral questions

	Standards (OSHS)	
2. Control environmental Pollution control	• Types of pollution • Environmental pollution control measures • Types of solid wastes • Procedures for solid waste management • Different types of noise pollution • Methods for minimizing noise pollution	• Written questions • Oral questions • Role play
3. Demonstrate sustainable resource use	• 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	• Written questions • Oral questions • Role play
4. Evaluate current practices in relation to resource usage	• 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	• Written questions • Oral questions • Role play
5. Identify Environmental legislations/conventions for environmental concerns	• Environmental issues/concerns • Environmental legislations /conventions and local ordinances • Industrial standard /environmental practices	• Written questions • Oral questions

	• International Environmental Protocols (Montreal, Kyoto) • Features of an environmental strategy	
6. Implement specific environmental programs	• Community needs and expectations • Resource availability • 5s of good housekeeping • Identification of programs/Activities • Setting of individual roles /responsibilities • Resolving problems /constraints encountered • Consultation with stakeholders	• Written questions • Oral questions • Role play
7. Monitor activities on Environmental protection/Programs	• Periodic monitoring and Evaluation of activities • Gathering feedback from stakeholders • Analyzing data gathered • Documentation of recommendations and submission • Setting of management support systems to sustain and enhance the program • Monitoring and reporting of environmental incidents to concerned /proper authorities	• Oral questions • Written tests • Practical test
8. Analyze resource use	• Identification of resource consuming processes • Determination of quantity and nature of resource consumed • Analysis of resource flow through different parts of the process. • Classification of wastes for possible source of resources.	• Written tests • Oral questions • Practical test

9. Develop resource Conservation plans	• Determination of efficiency of use/conversion of resources • Causes of low efficiency of use of resources • Plans for increasing the efficiency of resource use	• Written tests • Oral questions • Practical test
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Suggested Methods of Instruction

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

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/PO/BC/06/6

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Demonstrate Occupational Safety and Health Practices

Duration of Unit: 40 hours

Unit Description

This unit specifies the competencies required to demonstrate occupational health and safety practices. It involves identifying workplace hazards and risk, identifying and implementing appropriate control measures to hazards and risks and implementing OSH programs, procedures and policies/guidelines.

Summary of Learning Outcomes

1. Identify workplace hazards and risk
2. Control OSH hazards
3. Implement OSH programs

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify workplace hazards and risks	• Identification of hazards in the workplace and/or the indicators of their presence • Evaluation and/or work environment measurements of OSH hazards/risk existing in the workplace • Gathering of OSH issues and/or concerns	• Oral questions • Written tests • Portfolio of evidence • Third party report
2. Control OSH hazards	• Prevention and control measures e.g. use of PPE • Risk assessment • Contingency measures	• Oral questions • Written tests • Portfolio of evidence • Third party report
3. Implement OSH programs	• Company OSH program, evaluation and review • Implementation of OSH programs • Training of team members and advice on	• Oral questions • Written tests • Portfolio of evidence

	OSH standards and procedures • Implementation of procedures for maintaining OSH-related records	• Third party report
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Suggested Methods of Instruction

- Assignments
- Discussion
- Q&A
- Role play
- 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/PO/CC/01/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Engineering Mathematics

Duration of Unit: 110 hours

Unit Description

This unit describes the competencies required by an Electrical Technician to apply a wide range of engineering mathematics in their work. This includes applying Algebra, Apply Trigonometry and hyperbolic functions, Apply complex numbers, Apply Coordinate Geometry, Carry out Binomial Expansion, Apply Calculus, Solve Ordinary differential equations, Apply Laplace transforms, Apply Power Series, Apply Statistics, Apply Fourier Series, Apply Vector theory, Apply Matrix, Apply Numerical methods, Apply concept of probability for work, Perform commercial calculations and Perform Estimations, Measurements and calculations of quantities.

Summary of Learning Outcomes

1. Apply Algebra
2. Apply Trigonometry and hyperbolic functions
3. Apply complex numbers
4. Apply Coordinate Geometry
5. Carry out Binomial Expansion
6. Apply Calculus
7. Solve Ordinary differential equations
8. Apply Laplace transforms
9. Apply Power Series
10. Apply Statistics
11. Apply Fourier Series
12. Apply Vector theory
13. Apply Matrix
14. Apply Numerical methods
15. Apply concept of probability for work
16. Perform commercial calculations
17. Perform Estimations, Measurements and calculations of quantities

Learning Outcomes, Content and Suggested Assessment Methods

Electrical Curriculum		
Learning Outcome	Content	Suggested Assessment Methods
1. Apply Algebra	• Base and Index • Law of indices • Indicial equations • Laws of logarithm • Logarithmic equations • Conversion of bases • Use of calculator • Reduction of equations • Solution of equations reduced to quadratic form • Solutions of simultaneous linear equations in three unknowns • Solutions of problems involving AP and GP	• Written tests • Oral questioning • Assignments • Supervised exercises
2. Apply Trigonometry and hyperbolic functions	• Half -angle formula • Factor formula • Trigonometric functions • Parametric equations • Relative and absolute measures • Measures calculation • Meaning of hyperbolic equations • Properties of hyperbolic functions • Evaluations of hyperbolic functions Hyperbolic identities • Osborne's Rule • $A \sinh x + B \cosh x = C$ equation • One-to-one relationship in	• Written tests • Oral questioning • Assignments • Supervised exercises

	functions • Inverse functions for one-to-one relationship • Inverse functions for trigonometric functions • Graph of inverse functions • Inverse hyperbolic functions	
3. Apply complex numbers	• Meaning of complex numbers • Stating complex numbers in numbers in terms of conjugate argument and • Modulus • Representation of complex numbers on the Argand diagram • Arithmetic operation of complex numbers Application of De Moivre's theorem • Application of complex numbers to engineering	• Assignments • Oral questioning • Supervised exercises • Written tests
4. Apply Coordinate Geometry	• Polar equations • Cartesian equation • Graphs of polar equations • Normal and tangents • Definition of a point • Locus of a point in relation to a circle • Loci of points for given mechanism	• Written tests • Oral questioning • Assignments • Supervised exercises
5. Carry out Binomial Expansion	• Binomial theorem Power series using binomial theorem Roots of numbers using binomial theorem. • Estimation of errors of small changes using binomial theorem.	• Written tests • Oral questioning • Assignments • Supervised exercises

6. Apply Calculus	• Meaning of derivatives of a function • Differentiation from first principle • Tables of some common derivatives • Rules of differentiation • Rate of change and small change • Stationary points of functions of two variables • Meaning of integration • Indefinite and definite integral • Methods of integration application of integration. • Integrals of hyperbolic and inverse functions	• Written tests • Oral questioning • Assignments • Supervised exercises
7. Solve Ordinary differential equations	• Types of first order differential equations • Formation of first order differential equation • Solution of first order differential equations • Application of first order differential equations • Formation of second order differential equations for various systems • Solution of second order differential equations • Application of second order differential equations	• Written tests • Oral questioning • Assignments • Supervised exercises

8. Apply Laplace transforms	• Meaning of Laplace transforms deriving Laplace transforms from first principles • State properties of Laplace transform • Determination of inverse LT of simple transforms and partial fractions • Solution of differential equation by LT • Solution of simultaneous differential equation by given initial conditions	• Written tests • Oral questioning • Assignments • Supervised exercises
9. Apply Power Series	• Meaning of the term power series • Taylor's theorem • Deduction of Maclaurin's theorem to obtain power series • Application of Taylor's theorem and Maclaurin's theorems in numerical work	• Written tests • Oral questioning • Assignments • Supervised exercises
10. Apply Statistics	• Classification of data ○ Grouped data ○ Ungrouped data • Data collection • Tabulation of data ○ Class intervals ○ Class boundaries ○ Frequency tables • Diagrammatic and graphical presentation of data e.g. ○ Histograms ○ Frequency polygons ○ Bar charts ○ Pie charts ○ Cumulative frequency curves	• Assignments • Oral questioning • Supervised exercises • Written tests • Simulation • Data modelling

	• Measures of central tendency mean, mode and median • Measures of dispersion ○ Variance and standard deviation • Definition of probability • Laws of probability • Expectation variance and S.D. • Types of distributions • Mean, variance and SD of probability distributions • Application of probability distributions	
11. Apply Fourier Series	• Determination of the Fourier series as a periodic function of the period 2π and extend to π • Determination of Fourier series of non-periodic functions over a given range • Determination of Fourier series for even and odd functions and the half-range series for a given function	• Assignments • Oral questioning • Supervised exercises • Written tests
12. Apply Vector theory	• Definition of dot and cross product of vectors • Solution of problems involving dot and cross production of cross • Definition of operators • Definition of vector field • Solutions of problems involving vector fields • Definition of Gradient, Divergence and curl • Solutions of involving Gradient, Divergence and curl • Application of vectors	• Assignments • Oral questioning • Supervised exercises • Written tests
13. Apply Matrix	• Matrix operation	• Assignments

methods	• Determinant of 3x3 matrix • Inverse of 3x3 matrix • Solutions of linear simultaneous equations in three unknowns • Application of matrices	• Oral questioning • Supervised exercises • Written tests
14. Apply Numerical methods	• Meaning of interpolation and extrapolation • Application of interpolation • Application of interactive methods to solve equations • Application of interactive methods to areas and volumes	• Assignments • Oral questioning • Supervised exercises • Written tests
15. Apply concepts of probability in work	• Meaning of probability • Types of probability events • Dependent • Independent • Mutually exclusive • Laws of probability • Counting techniques • Permutation • Combination • Tree diagrams • Venn diagrams	• Written tests • Assignments • Supervised exercises
16. Perform commercial calculations	• Product pricing • Average sales determination • Stock turnover • Calculation of incomes • Profit and loss calculations • Salaries • Gross • Net • Wages • Time rate • Flat rate • Overtime • Piece rate • Commission	• Oral questioning • Written tests • Assignments • Supervised exercises

	• Percentage • Bonus • Conversion of one currency to another • Exchange rates calculation • Devaluation • Revaluation	
17. Perform estimations, measurements and calculations of quantities	• Units of measurements and their symbols • Conversion of units of measurement • Calculation of length, width, height, perimeter, area and angles of figures • Measuring tools and equipment • Performing measurements and estimations of quantities	• Assignments • Oral questioning • Practical tests • Observation • Supervised exercises • 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/PO/CC/02/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Workshop Processes

Duration of Unit: 60 hours

Unit Description

This unit covers the competencies required to perform workshop processes. Competencies include applying workshop Safety, use of workshop tools, instruments and equipments, preparation of workshop materials, preparation of workshop for Electrical installation practicals, Storage of Electrical tools and materials after practicals, troubleshoot and repair workshop tools and equipment

Summary of Learning Outcomes

1. Apply workshop safety
2. Use of workshop tools, Instruments and equipments
3. Prepare workshop tools and instruments for an Electrical installation practical
4. Prepare the workshop for an Electrical practical
5. Store Electrical tools and materials after practicals
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	• Meaning of PPE • Standard operating procedure in PPE • Workshop rules • Electrical hazards e.g. • Electric shock. • Fire • Classes of fire • Causes of fire • Various methods of fire extinguishing • First Aid	• Oral questioning • Written tests

2. Use of workshop tools, Instruments and equipment	• Meaning of workshop tools, instruments and equipment • Uses of workshop tools, Instruments and equipment • Classification of workshop tools and equipment • Care and Maintenance of workshop tools and Instruments	• Oral questioning • Practical tests • Written tests
3. Prepare workshop tools and instruments for an Electrical installation practical	• Tools and instruments for an Electrical practical • Preparation of a list of tools and instruments for an Electrical practical. • Issuing and confirmation of tools and instruments before and after practical • Testing of practical tools and Instruments	• Observation • Oral questioning • Practical tests • Written tests
4. Prepare workshop for an Electrical practical	• Practical stations • Interpretation of a list of practical material	• Observation • Oral questioning • Practical tests • Written tests
5. Store Electrical tools and materials after practicals	• Classification of workshop tools and instruments. • Storage of workshop Tools and equipment • Waste disposal	• Observation • Oral questioning • Practical tests • Written tests
6. Troubleshoot and repair/replace workshop tools and equipment	• Meaning of troubleshooting • Common faults in Electrical equipments • Fault diagnosis procedure • Repair/Replace of components in Electrical equipments	• Observation • Oral questioning • Practical tests • Written tests

Suggested Methods of Instruction

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

Recommended Resources

Tools

- Set of screw drivers
- Pliers
- Phase testers
- Multimeter

Materials and supplies

- Stationery
- Cables
- Lubricants
- Service parts

Equipment

- PPE –hand gloves, dust coat, dust masks
- Multimeter
- Clamp meter
- Earth electrode resistance meter
- Phase sequence meter

Reference materials

- IEE regulations
- Organizational procedures manual

ELECTRICAL PRINCIPLES

UNIT CODE: ENG/CU/PO/CC/03/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Apply Electrical principles

Duration of Unit: 240 hours

Unit Description

This unit describes the competencies required by a technician in order to apply a wide range of electrical principles in their work. Which includes; use of the concept of basic electrical quantities, use of the concepts of D.C and A.C circuits in electrical installation, use of basic electrical machine, use of power factor in electrical installation, use of earthing in electrical installations, apply lightning protection measures, apply electromagnetic field theory , apply electrodynamics, apply energy and momentum in electromagnetic field, apply transient in electrical circuit analysis, use two port network, demonstrate understanding of refrigeration and air conditioning

Summary of Learning Outcomes

1. Use the concept of basic Electrical quantities
2. Use the concepts of D.C and A.C circuits in electrical installation
3. Use of basic electrical machine
4. Use of power factor in electrical installation
5. Use of earthing in Electrical installations
6. Use of earthing in electrical installation
7. Apply lightning protection measures
8. Apply Electromagnetic field theory
9. Apply Electrodynamics
10. Apply Energy and momentum in Electromagnetic field
11. Apply Transient in Electrical circuit analysis
12. Use two port network
13. Demonstrate understanding of Refrigeration and Air conditioning

Learning Outcomes, Content and Suggested Assessment Methods

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

	Applications • Electric Drives	
4. Demonstrate understanding of three phase power supply	• Meaning of Terms • Three phase power supply connection • Star connection • Delta connection • Voltage, Current and power calculation • Measurements of power • Wattmeter methods • Interconnection of three phase power supply • Star- Delta and Delta- Star	• Assignments • Oral questioning • Practical tests • Observation • Written test
5. Use of power factor in electrical installation	• Meaning of power factor • Meaning of terms • Power triangle • Power factor correction	• Assignments • Oral questioning • Practical tests • Observation • Supervised exercises • Written tests
6. Use of earthing in Electrical installations	• Terms in Earthing • Earthing points in Electrical installation • Methods of earthing • Factors to consider in selecting an earthing method • Testing an earthing system	• Assignments • Supervised exercises • Written tests • Practical test
7. Apply lightening protection measures	• Meaning of lightening • Lightning strokes and their types • Lightning protection components • Testing a lightening system • Application of lightening system • Maintenance of lightening system	• Assignments • Oral questioning • Supervised exercises • Written tests
8. Apply Electromagnetic field Theory	• Meaning of Electromagnetic Field Theory • Sources of Electromagnetic Fields • Detectors of Electromagnetic radiation • Application of Electromagnetic	• Assignments • Oral questioning • Supervised exercises • Written tests

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

Suggested Methods of Instruction

- Group discussions
- Demonstration by trainer
- Exercises by trainee

Recommended Resources

- Scientific Calculators
- Relevant reference materials
- Stationeries
- Electrical workshop
- Relevant practical materials
- Dice
- Computers with internet connection

TECHNICAL DRAWING

UNIT CODE: ENG/CU/PO/CC/04/6

Relationship to Occupational Standards

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

Duration of Unit: 130 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, pictorial and orthographic drawings of components and application of Computer Aided Design (CAD) packages.

Summary of Learning Outcomes

1. Use and maintain drawing equipment and materials
2. Produce plane geometry drawings
3. Produce solid geometry drawings
4. Produce pictorial and orthographic drawings of components
5. Apply CAD packages

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Use and maintain drawing equipment and materials	• Identification and care of drawing equipment • Identification and care of drawing materials • Reference to manufacturer's instructions and work place procedures on use and maintenance of drawing equipment and materials • Reference to relevant environmental legislations • Use of Personal Protective Equipment (PPEs)	• Observation • Oral questioning • Written tests

2. Produce plane geometry drawings	• Types of lines in drawings • Construction of geometric forms e.g. squares, circles • Construction of different angles • Measurement of different angles • Bisection of different angles and lines • Standard drawing conventions	• Oral questioning • Practical tests • Observation
3. Produce solid geometry drawings	• Interpretation of sketches and drawings of patterns e.g. cylinders, prisms and pyramids • Sectioning of solids e.g. prisms, cones • Development and interpenetrations of solids e.g. cylinder to cylinder and cylinder to triangular, prism	• Observation • Practical tests • Oral questioning
4. Produce orthographic drawings	• Meaning of pictorial and orthographic drawings • Meaning of sectioning • Meaning of symbols and abbreviations • Drawing and interpretation of orthographic elevations • Dimensioning of orthographic elevations • Sectioning of views • Assembly drawing	• Observation • Practical tests • Oral questioning
5. Produce pictorial drawings	• Meaning of pictorial drawings • Drawing objects in isometric view • Drawing objects in oblique view	• Observation • Oral questioning • Practical tests
6. Produce electrical drawings	• Electrical symbols and abbreviations • Meaning of electrical drawings • Drawing of electrical diagrams e.g. block, schematic, circuit, line and wiring	• Observation • Oral questioning • Practical tests
7. Apply CAD packages	• Identification of CAD packages e.g. AutoCAD, circuit maker • Use of CAD packages in drawing of: • Plane geometry • Solid	• Observation • Oral questioning • Practical tests

	• Orthographic • Pictorial • Electrical e.g. block, schematic, circuit, line and wiring	
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Suggested Methods of Instruction

- 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
- Computers installed with relevant CAD packages

CORE UNITS OF LEARNING

ELECTRICAL INSTALLATION

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

Relationship to Occupational Standards

This unit addresses the unit of competency: Perform Electrical Installation

Duration of Unit: 120 hours

Unit Description

This unit specifies the competencies required for performing electrical installation.

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

Summary of Learning Outcomes

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

Learning Outcomes, Content and Suggested Assessment Methods

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

Learning Outcome	Content	Suggested Assessment Methods
2. Conduct site survey	• Type of installations • Domestic installations • Industrial installations • Commercial installations • Type of building e.g. • Permanent building • Semi-permanent buildings • Utilities available • Water • Electricity • Communication e.g. Phones • Installation conditions e.g. temperature, humidity, moisture • Taking measurements on site • Length e.g. conduits size • Total area • Temperature • Humidity	• Written tests • Observation • Oral questioning
3. Design Electrical Installation	• Meaning of terms • Types of wiring systems • Factors to consider in designing Electrical installation e.g. • Load size • Structure • Clients need • Types of supply • DC , Single phase and three phase	• Written tests • Observation • Oral questioning
4. Perform system sizing	• Introduction to standards • IEE regulations. • Kenya bureau of standards (KEBS) • British standards • KPLC by-laws • ERC regulations • County by-laws • National Construction Authority (NCA)	• Written tests • Observation • Oral questioning

Learning Outcome	Content	Suggested Assessment Methods
	• Reference to relevant IEE regulation tables • Load Estimation e.g. • Factor of simultaneity (Ks) • Factor of utilization (Ku) • Determining cable : ✓ Types ✓ Ratings ✓ sizes ✓ Insulation type • Protective devices ✓ Types ✓ Ratings • Reference to relevant regulations	
5.Prepare working drawing	• Working drawings • Meaning of working drawings • Identification and care of drawing instruments and equipment • Identification of drawing paper sizes • Drawing various types of lines • Drawing title block • Drawing standard electrical symbols • Conversion of scales • Interpretation of orthographic projections • Dimensioning of drawings • Drawing of electrical diagrams • Block • Circuits • Schematic • Wiring • Line • Reading and Interpretation of architectural drawings • Reading and Interpretation of electrical drawings	• Observation • Oral questioning • Practical tests • Written tests

Learning Outcome	Content	Suggested Assessment Methods
	• Use of Computer Aided Design (CAD) applications e.g. AutoCAD	
6. Plan for logistics	• Transport for: • Materials and their safety • Personnel • Storage of materials on site • Site security • Human resource • Skills required • Communication • Purpose • Modes	• Written tests • Oral questioning
7. Prepare list of tools, equipment and materials	• Identification of tools and materials e.g. • Cutting tools • Measuring tools • Measuring equipment • Cables and conductors • Crimping tools • Conduits • Trunking • Consumables • Types, application, care, maintenance and storage of: • Tools e.g. • Cable strippers • Pliers • Screw drivers • Hammers • Chisels • Allen keys • Electrician knives • Crimping tools • Bending springs • Steel tapes • Draw wires • Hack saws	• Oral questioning • Written tests • Observation • Practicals

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

Learning Outcome	Content	Suggested Assessment Methods
	- Utilities - Access roads - Water - Electricity	
11. Perform marking, piping and fixing of accessories	- Meaning of marking, piping, fixing and accessories in electrical installation - Importance of marking - Tools used in marking - Accessories used in Electrical installation e.g. - Lamp holders - Conduits - Ceiling roses - Patress	- Written tests - Observation - Oral questioning - Practical tests
12. Perform electrical installation	- Meaning of terms - Single phase and three phase installation - Domestic Installation - Industrial Installation - Commercial Installation ➤ Phase/load balancing - Cables and cable joints - Wiring systems and accessories - Meaning of terms - Types and applications e.g. - Conduits - Cable trays - Cable ducts - Trunkings - Preparation of wiring systems - Marking out, cutting, bending, threading, chiselling, trenching - Draw –in/Lay of cables routes - Cable Identification - Installation of final circuits - Lighting circuits - One way, two way,	- Written tests - Observation - Oral questioning - Practical test

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

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

Suggested Methods of Instruction

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

Recommended Resources

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

	• tables
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ELECTRICAL TRANSMISSION POWER LINES

UNIT CODE: ENG/CU/PO/CR/02/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Install Electrical power line

Duration of Unit: 190 hours

Unit Description

This unit covers the competencies required to install electrical power lines and cables: The competencies includes; design transmission lines, erect transmission poles, mount transmission cables, terminate conductors and finally test and inspect installation.

Summary of Learning Outcomes

1. Design transmission lines
2. Erect transmission lines support
3. Mount transmission lines
4. Terminate transmission line
5. Test and inspect installation

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Design transmission lines	• Meaning of transmission line • Types of transmission line • Classification of transmission line e.g. • High Voltage and Low voltage ➤ Overhead and Underground cables • Short • Medium • Long • Elements of a transmission line • Transmission line designs; • Mechanical • Electrical	• Observation • Oral questioning • Written tests

Learning Outcome	Content	Suggested Assessment Methods
2. Erect transmission line support	• Meaning of transmission line support • Types of supports • Material used in manufacturing of transmission line supports e.g. • Concrete • Steel • Wooden • Erecting of transmission line support • Application of transmission line	• Written tests • Oral questioning
3. Mount transmission line	• Types of transmission line conductors • Equipments used in mounting transmission lines e.g. • Climbers • Drilling Machine • Transmission line spacing and corona effects • Tension and sag in transmission line • Components used in mounting. transmission lines e.g. • Cross arms • Transformers • Isolators • Insulators • Danger plates • Lightning arrestors • Anti-climbing wire • Cables • Bolts and Nuts • Components used in transmission line protection e.g. • Switch gear • Fuses • Isolators • Circuit breakers • Transmission line protection • Earthing	• Observation • Oral questioning • Written tests

Learning Outcome	Content	Suggested Assessment Methods
	- Lightening arrestors - Surge diverters	
4. Terminate transmission line	- Meaning of transmission line termination - Types of transmission e.g. AC and DC - End point loads - Type of loads - Cable joints - Types of cable joints - Components used in line termination e.g. - Lugs - Fuses (Droppers)	- Observation - Oral questioning - Written tests
5. Test and inspect transmission installation	- Meaning of testing in line transmission - Types of tests in line transmission e.g. - Continuity test - Short circuit test - Insulation test - Earth continuity test - Voltage regulation testing and efficiency	- Written tests - Oral questioning - Practical tests

Suggested Methods of Instruction

- Discussions
- Site visits
- On-job-training
- Charts and Audio-visual presentations

Recommended Resources

Equipment - Computers - Printers - Cameras - Phones	Reference materials - Manufacturers' catalogues - Working drawings - EMCA Act - OSHA - County by-laws
Materials and supplies Stationery	

ELECTRICAL MACHINE INSTALLATION

UNIT CODE: ENG/CU/PO/CR/03/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Install Electrical machine

Duration of Unit: 130 hours

Unit Description

This unit covers the competencies required to Install Electrical Machine. Competencies include; electrical machine design, mounting electrical machine, mounting machine control panel, laying machine cables, terminating electrical machine installation and testing of machine installation.

Summary of Learning Outcomes

1. Design Electrical Machine layout
2. Mount Electrical Machine
3. Lay machine cables
4. Terminate Electrical machine installation
5. Test and inspect Electrical machine installation

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1.Design Electrical Machine layout	• Meaning of Machine layout • Types of machine layout e.g • Fixed position layout • Product layout • Process layout • Combinational • Types of machines • Factors to consider in design of machine layout • Cabling in machine • Safety in design of electrical machines layout	• Written tests • Oral questioning • Practical tests • Observation

2. Mount Electrical Machine	• Meaning of terms • Procedure of mounting an Electrical Machine • Factors to consider in machine mounting • Safety in design of electrical machines layout. • Machine Earthing	• Observation • Oral questioning • Practical tests • Written tests
3. Lay machine cables	• Machine cables • Cable colour coding • Factors to consider in laying machine cables • Meaning of cable segregation • Importance cable segregation • Factors to consider in cable segregation	• Observation • Oral questioning • Practical tests • Written tests
4. Terminate Electrical Machine Installation	• Meaning of Terms • Importance of termination • Cable lugging • Tools and components used in cable termination e.g. • Crimping tool • Strip Knife • Connectors • Clips • Components labelling	• Observation • Oral questioning • Practical tests • Written tests
5. Test and Inspect Electrical machine Installation	• Meaning of testing • Types of tests in in Electrical machine installation e.g. • Continuity test • Short circuit test • Insulation test • Earth continuity test • On load and offload tests • Earth Resistance test	• Written tests • Oral questioning • Practical tests

Suggested Methods of Instruction

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

Recommended Resources

Tools and equipment

- Cable Strippers
- Pliers
- Screw drivers
- Hammers
- Chisels
- Allen keys
- Electrician knives
- Crimping tools
- Bending springs
- Bending machine
- Steel tapes
- Draw wires
- Hack saws
- Drilling tools
- Stock and die
- Bench vice
- Machine vice
- PPE – hand gloves, dust coats, dust masks, helmets, ear muffs, industrial boots

Materials and supplies

- Stationery
- Cables
- Light fittings
- Accessories
- Conduits and fittings
- Cable trays
- Cable ducts
- Trunkings
- Computers

- Drawing instruments
- Screws

Reference materials

- IEE regulations
- Occupational safety and health act (OSHA)
- Work injury benefits act(WIBA)
- Manufacturers' catalogues
- British standards
- KEBS standards

ELECTRONICS

UNIT CODE: ENG/CU/PO/CR/04/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate understanding of Electronics

Duration of Unit: 120 hours

Unit Description

This unit covers the competencies required to demonstrate understanding of electronics. Competencies includes; apply semiconductor theory, applying semiconductor diodes, demonstrating understanding of transistors, applying special semiconductor devices, performing rectification, applying amplifiers, demonstrating understanding of oscillators, applying wave shaping and pulse generation circuit and applying Opto-electronics

Summary of Learning Outcomes

1. Apply semiconductor theory
2. Apply semiconductor diodes
3. Demonstrate understanding of transistors
4. Apply Special semiconductor devices
5. Perform rectification
6. Apply amplifiers
7. Demonstrate understanding of oscillators
8. Apply wave shaping and pulse generation circuits
9. Apply opto-electronics

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Demonstrate understanding of semiconductor theory	• Meaning of terms • Types of materials • Insulators • Conductors • Semiconductors • Semiconductor materials • Types of semiconductors materials • Intrinsic and Extrinsic	• Observation • Oral questioning • Written tests

Learning Outcome	Content	Suggested Assessment Methods
2. Demonstrate understanding of semiconductor diodes	• Meaning of terms • P-N junction • Semiconductor diodes • Forward and reverse Characteristics • Types of semiconductor diodes • Application of semiconductor diodes	• Written tests • Oral questioning
3. Demonstrate understanding of transistors	• Bipolar junction transistors • Operation of NPN and PNP • Field effect transistors • Operation N and P channels • Types of FETs • BJT's and FET's biasing • BJT's and FET's configuration • Characteristics of transistors • Gain of transistors • DC/AC load lines	• Observation • Oral questioning • Written tests
4. Apply Special semiconductor devices	• Meaning of terms • Types of special semiconductor devices • UJT • SCR • LASCR • TRIAC • DIAC • SCS • Application of special semiconductor devices	• Observation • Oral questioning • Written tests
5. Perform rectification	• Meaning of Terms • Classification of rectifiers • Types of rectifiers • Application of rectifiers • Types of converters • Application of converters	• Written tests • Oral questioning
6. Apply amplifiers	• Meaning of terms • Types of amplifiers • RC coupled amplifiers • Small signal amplifier	• Written tests • Oral questioning

Learning Outcome	Content	Suggested Assessment Methods
	• Power amplifiers • Wideband amplifiers • Operational Amplifiers • DC Amplifiers • Differential amplifier • Op-amp Characteristics • Op-amp Circuits • Application of Amplifiers	
7. Demonstrate understanding of oscillators	• Meaning of terms • Classification of oscillators • Sinusoidal • Non Sinusoidal • Oscillator requirements • Oscillator circuits • Damped and Undamped Oscillations	• Observation • Oral questioning • Written tests
8. Apply wave shaping and pulse generation circuits	• Meaning of terms • Wave shaping • Pulse generation circuits • Application	• Observation • Oral questioning • Written tests
9. Apply opto-electronics	• Theory of opto-electronics • Lasers and masers • Properties and drive requirement • LED • LCD • Plasma • Photo devices • Applications	• Observation • Oral questioning • Written tests

Suggested Methods of Instruction

- Discussions
- Site visits
- On-job-training
- Charts and Audio-visual presentations

Recommended Resources**Equipment**

- Computers
- Printers
- Cameras
- Phones

Reference materials

- Manufacturers' catalogues
- Working drawings
- EMCA Act
- OSHA
- County by-laws

Materials and supplies

- Stationery

AUTOMATION OF ELECTRICAL MACHINE

UNIT CODE: ENG/CU/PO/CR/05/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Automate an Electrical machine

Duration of Unit: 130 hours

Unit Description

This unit covers the competencies required to automate an electrical machine. Competencies includes an automation system design, components mountings, programming of an automation system, simulation of an automation system and test running of an automation system

Summary of Learning Outcomes

1. Design Automation system
2. Mount Electrical components
3. Program Automation System
4. Simulate Automation system
5. Test run Automation system

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Design Automation system	• Meaning of Automation system • Factors to consider in designing of automation system • Components of automation system eg • Sensors • Actuators • Limit switches • Push buttons • Logic gates • Microcontrollers • PLC • SCADA	• Observation • Oral questioning
2. Mount Electrical components	• Meaning of terms • Examples of Automation components e.g. • Relays • Contactors	• Observation • Oral questioning • Written tests

Learning Outcome	Content	Suggested Assessment Methods
	• Timers • Microcontrollers • Programmable logic controllers (PLC) • Configuration of components • Fixing of Automation components.	
3. Program Automation system	• Meaning of programming in automation • Programming languages • Coding of programming languages • PLC and SCADA • Testing and debugging of the program • Uploading of program	• Observation • Oral questioning • Practical tests • Written tests
4. Simulate Automation system	• Meaning of terms • Automation system modelling • System modelling components • Test running of the system model	• Written tests • Oral questioning • Practical tests
5. Test run Automation system	• Automation system testing • Testing parameters in an Automation system e.g. • Efficiency • Accuracy • Reproducibility • Stability • Resolution	• Observation • Oral questioning • Practical tests • Written tests

Suggested Methods of Instruction

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

Recommended Resources

- Test instruments
- Continuity tester (ohmmeter)
- Insulation resistance tester

- Earth loop impedance tester
- Test lamp

Materials and supplies

- Stationery
- Test Certificate

Reference materials

- Manufacturers' manuals
- Relevant catalogues
- IEE regulations

SECURITY SYSTEM INSTALLATION

UNIT CODE: ENG/CU/PO/CR/06/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Install Security Systems

Duration of Unit: 110 hours

Unit Description

This unit covers the competencies required in installing of security systems. Competencies includes; security system design, marking out of security systems zones, laying system cables, mounting accessories, terminate system cables and testing of the system.

Summary of Learning Outcomes

1. Design security system
2. Mark out security system zones or call points
3. Lay system cables
4. Mount accessories
5. Terminate system cables
6. Test and inspect security system

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Design Security system	• Meaning of Terms • Types of security systems e.g • CCTV • Alarms • Electric Fence • Components of security system • Smoke sensors • Vibration sensors • Security cameras • Transmitters • Receivers • Factors to consider in design of security system • Wiring security system • Security system integration with other	• Written tests • Oral questioning • Practical tests

Learning Outcome	Content	Suggested Assessment Methods
	components	
2. Mark out security system zones and call points	• Meaning of zones in security system • Marking, Piping and fixing tools e.g. • Scribes • Pliers • Connectors • Importance of marking	• Oral questioning • Written tests • Practical tests
3. Lay system cables	• Types of cables in security system • Factors to consider in security system cable laying • Segregation in cable laying • Importance segregations	• Observation • Written tests • Oral questioning
4 Mount Accessories	• Meaning of terms • Accessories used in security system • Security system control panels • Insulation classes of enclosures e.g. • IP 44 (Ingress protection) • IP 55 • IP 65 • IP 66 • IP 67	• Observation • Oral questioning • Written tests
5 Terminate System cables	• Meaning of termination • Meaning of Terms • Importance of termination • Cable lugging • Tools used in cable termination e.g. • Connectors • Strip Knife	• Observation • Oral questioning • Written tests
6 Test and Inspect Security system	Meaning Testing Types of tests in security system e.g • Insulation test • Short circuit test • Continuity test • Arming and disarming tests	• Oral questioning • Written tests • Practical test

Suggested Methods of Instruction

- Demonstration by trainer
- Practice by the trainee
- Discussions

Recommended Resources**Equipment**

- Drawing instruments

Materials and supplies

- Computer
- Stationery

Reference materials

- Manufacturers manuals
- IEE regulations
- KPLC by-laws
- County by-laws

SOLAR SYSTEM INSTALLATION

UNIT CODE: ENG/CU/PO/CR/07/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Install Solar Systems

Duration of Unit: 72 hours

Unit Description

This unit covers the competencies required to install solar system. Competencies includes; designing solar system installation, fixing solar system components, mounting solar panel, laying cables, terminating electrical and testing of a solar installation system.

Summary of Learning Outcomes

1. Design solar system installation
2. Fix solar system accessories
3. Mount solar Panel
4. Lay out Electrical cables
5. Terminate Electrical cables
6. Test and inspect solar system installation

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Design solar system installation	• Meaning of solar system • Meaning of terms • Size and rating of solar panel • Types of solar panel e.g. • PV Solar • Monocrystalline • Polycrystalline • Solar Panel Mounting positioning • Components of solar system • Charger controller • Inverters • Solar batteries	• Written tests • Oral questioning • Observation • Practical tests

	• Cables	
2. Fix solar system components	• Methods of solar panel connection • Parallel and series • Solar panel components • Types of charge controllers e.g. • Pulse width Modulated • Maximum power point tracking. • Simple one or two stage controls	• Observation • Oral questioning • Written tests
3. Mount Solar panel	• Meaning of solar panel • Meaning of Terms • Types of Solar panels • Installation of Solar panel • Slanting angle • Panel Ratings • Factors to consider in solar panel Selection and installation	• Observation • Oral questioning • Practical tests • Written tests
4. Lay Electrical cables	• Cable laying tools • Cable segregation • Cable labelling	• Observation • Oral questioning • Practical tests • Written tests
5. Terminate Electrical cables	• Meaning of terms • Cable lugging • Cable connectors	• Observation • Oral questioning • Practical tests • Written tests
6. Test Solar system installation	• Meaning of test • Types of tests • Insulation resistant test • Short circuit test • Ring circuit test • Continuity test • Earth continuity test • Firmness test	• Observation • Oral questioning • Practical tests • Written tests

Suggested Methods of Instruction

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

Recommended Resources**Tools**

- Set of screw drivers
- Set of spanners and wrenches
- Power tools
- Cutting tools
- Pliers
- Lifting and tensioning tools
- Tool box
- Phase tester

Materials and supplies

- Stationery
- Cables
- Lubricants
- Service parts

Equipment

- PPE –hand gloves, dust coat, dust masks
- Multimeter
- Clamp meter
- Earth electrode resistance meter
- Phase sequence meter

Reference materials

- Service manuals
- IEE regulations
- Organization procedures manual

ELECTRICAL EQUIPMENTS AND SYSTEM MAINTENANCE

UNIT CODE: ENG/CU/PO/CR/08/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Maintain Electrical Equipment and systems

Duration of Unit: 130 hours

Unit Description

This unit covers the competencies required to carry out maintenance in electrical equipment and systems. This includes preparing maintenance schedule, inspecting and testing electrical equipment and systems, preparing list of maintenance tools and equipment, performing maintenance activities, system testing and documenting maintenance records.

Summary of Learning Outcomes

1. Prepare maintenance schedule
2. Inspect and test electrical equipment and systems
3. Prepare list a list of maintenance tools
4. Perform maintenance activities
5. Conduct system tests
6. Document maintenance records

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Prepare maintenance schedule	• Maintenance • Meaning of terms • Maintenance checklist • Maintenance work plan and tools • Identification of maintenance personnel • Types of maintenance and procedures • Periodic service • Preventive • Breakdown • Corrective • Scheduling maintenance based on service manuals • Safety precautions to be observed during	• Written tests • Oral questioning

	maintenance	
2. Inspect and test electrical equipment and systems	• Meaning of terms • Types of faults • Identification of faulty components • System isolation points e.g. • Circuit breakers • Fuses • Isolators • Identification of maintenance activities • Types of tests • Inspection procedures • Recording of inspection findings	• Observation • Oral questioning • Written tests
3. Prepare a list of maintenance tools	• Identification and documentation of maintenance tools • Specifications of identified maintenance tools Classification of maintenance tools e.g. • Cutting tools • Fastening tools • Measuring	• Observation • Oral questioning • Practical tests • Written tests
4. Perform maintenance activities	• Identification faulty components on an Electrical system • Repair/Replacement of faulty components • Maintenance activities e.g. • Disassembling • Cleaning • Tightening • Oiling • Motor Rewinding • Assembling • Fill in maintenance checklist • Disposal of waste materials e.g. • Old batteries • Oils • Lugs and screws • Tapes • Cable sheaths • Off cuts	• Observation • Oral questioning • Practical tests • Written tests

5. Conduct system test	• Types of tests • Identification of test points and parameters • Safe test procedures	• Observation • Oral questioning • Practical tests • Written tests
6. Document maintenance records	• Maintenance report writing • Procedure of writing maintenance report • Components of maintenance report • Test results documentation	• Observation • Oral questioning • Practical tests • Written tests

Suggested Methods of Instruction

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

Recommended Resources

Tools

- Set of screw drivers
- Set of spanners and wrenches
- Power tools
- Cutting tools
- Pliers
- Lifting and tensioning tools
- Tool box
- Phase tester

Materials and supplies

- Stationery
- Cables
- Lubricants
- Service parts

Equipment

- PPE –hand gloves, dust coat, dust masks
- Multimeter
- Clamp meter
- Earth electrode resistance meter

- Phase sequence meter

Reference materials

- Service manuals
- IEE regulations
- Organization procedures manual

ELECTRICAL PROJECT MANAGEMENT

UNIT CODE: ENG/CU/PO/CR/09/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Manage Electrical project

Duration of Unit: 120 hours

Unit Description

This unit covers the competencies required to manage an electrical project. Competencies includes; preparation of work plans and policies, managing project team, managing material, tools and equipment, managing project budget, supervising and assessing project implementation, preparing project reports and commissioning

Summary of Learning Outcomes

1. Prepare work plans and policies
2. Manage Project team
3. Manage materials, tools and equipment
4. Manage project budget
5. Supervise and assess project implementation
6. Prepare project reports
7. Project commissioning

Learning Outcomes, Content and Suggested Assessment Methods:

Learning Outcome	Content	Suggested Assessment Methods
1. Prepare work plans and policies	• Meaning of terms • Project planning • Elements of project planning • Factors to consider in project planning • Project Objectives e.g. SMART • Project life cycle • Initiation • Planning • PERT • CPM	• Written tests • Oral questioning

	• Execution • Closure • Project policies	
2. Manage Project team	• Meaning of terms • Project personnel • Work break down structure • SWOT analysis • Project organization structure • Training of the project team • EHS Standards in project	• Observation • Oral questioning • Practical tests • Written tests
3. Manage materials, tools and equipment	• Identification of tool, materials and equipment in a project • Classification and maintenance of tools, materials and equipment • Tools, materials and equipment inventory system	• Observation • Oral questioning • Practical tests • Written tests
4. Manage project budget	• Meaning of terms • Project Budgetary process • Elements of the budget • Project cost management (PCM)	• Observation • Oral questioning • Practical tests • Written tests
5. Supervise and assess project implementation	• Meaning of terms • Project cycle • Project monitoring and evaluation • Project quality control	• Written tests • Oral questioning
6. Prepare project reports	• Project report • Preparation of the project report e.g. • Progress reports • Completion report • Elements of report • Documentation of the project report and operation manual	• Written tests • Oral questioning • Observation
7. Project commissioning	• Completion certificate • Importance • Components • Handover documents • User manuals	• Written tests • Oral questioning • Observation

Suggested Methods of Instruction

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

Recommended Resources**Tools and equipment**

- Cutting
- Measuring tools
- Drilling tools
- Fastening tools
- Computers
- Phones

Materials and supplies

- Stationeries
- Cables
- Pipes
- Trunkings
- Accessories
- Panels

Reference materials

- IEE regulations
- Occupational safety and health act (OSHA)
- Work injury benefits act(WIBA)
- Manufacturers' catalogues
- British standards
- KEBS standards

POWER GENERATION

UNIT CODE: ENG/CU/PO/CR/10/6

Relationship to Occupational Standards

This unit addresses the unit of competency: Demonstrate understanding of power generation

Duration of Unit: 110 hours

Unit Description

This unit covers the competencies required to demonstrate understanding of power generation. Competencies includes; identifying types of generating station, demonstrate understanding of power generating station layout, demonstrate understanding in the operation of power generating station, demonstrate understanding in the operating sequence of generating station.

Summary of Learning Outcomes

1. Identify types of generating station
2. Demonstrate understanding of Power generating station layout
3. Demonstrate understanding in the operation of power generating station
4. Demonstrate understanding in the operating sequence of generating station

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. Identify types of generating station	• Meaning of terms • Sources of energy • Factors consider in generating plant setup • Types of generating station e.g. • Geothermal • Hydro • Wind • Solar • Nuclear • Diesel	• Observation • Oral questioning • Written questions
2. Demonstrate understanding of Power generating station layout	• Meaning of terms • Schematic arrangement of different power generating plants • Safety standards of different power generating plants	• Observation • Oral questioning • Written tests

Learning Outcome	Content	Suggested Assessment Methods
3. Demonstrate understanding in the operation of power generating station	• Components of various power generating station • Operation of various power generating station • Energy conversion in a power generating station • Efficiency of power station • Comparison of various types of generating station	• Observation • Oral questioning • Practical tests • Written tests
4. Demonstrate understanding in the operating sequence of generating station	• Meaning of terms • Operation sequence of a power station in various types of generating station • Grid system in power generation	• Written tests • Oral questioning

Suggested Methods of Instruction

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

Recommended Resources

Test instruments

- Continuity tester (ohmmeter)
- Insulation resistance tester
- Earth loop impedance tester
- Test lamp

Materials and supplies

- Stationery
- Wiring certificates

Reference materials

- Manufacturers' manuals
- Relevant catalogues
- IEE regulations