6.1.0 TECHNICAL DRAWING

6.1.01 Introduction

This module unit is intended to equip the trainee with knowledge, skills and attitudes to enable him/her apply technical drawing techniques in drawing and interpretation of electrical drawings.

6.1.02 General Objectives

By the end of the module unit, the trainee should be able to:

a) understand the importance of engineering drawing
b) demonstrate the trainee should have the ability to use engineering drawing techniques
c) interpret electrical and electronic drawings
d) understand common symbols used in architectural drawings.

6.1.03 Module Summary and Time Allocation

Technical Drawing

Code	Sub-Module Unit	Content	Time Hrs
6.1.1	General Communication	• Importance of engineering drawing • Artistic drawings • Identification, use and care for various drawing instruments and materials • Setting up a drawing paper • Drawing quality lines	2
6.1.2	Plane Geometry	• Construction of various geometrical shapes • Construction of tangents to circles • Construction of Loci • Reduction and enlargement	4
6.1.3	Pictorial Drawing	• Isometric drawings of given solid objects • Oblique drawings of given solid objects	5

6.1.4	Orthographic Projection	• Third angle projection • First angle projection	4
6.1.5	Free Hand Sketching	• Sketching techniques	2
6.1.6	Dimensioning	• Dimensioning of orthographic views and pictorial • Interpreting drawings in engineering	4
6.1.7	Sectioning	• Sectional views • Sectioning exception • Sectional views in first and third angle orthographic projections	4
6.1.8	Assembly Drawing	• Sectional assembly drawing • Dimensions for assembly drawings	4
6.1.9	Solid Geometry	• Construction of parallel lines • Construction of radial lines development • Construction of lines of intersections • Construction of triangulation development	4
6.1.10	Electrical Drawing	• Graphical symbols British Standards (BS) 3939 • Block diagrams • Wiring diagrams • Schematic diagrams	4
6.1.11	Architectural Drawings	• Symbols • Electrical installation • Machine layout • Lighting schemes	4
6.1.12	Electronic Drawing	• Printed Circuit Board (PCB) • Chassis drawing and fasteners	4
6.1.13	Computer Related Drawings	• Linear design solutions • 2Dimentional and 3Dimentional (2D and 3D) designs	10
Total Time			**55**

6.1.1 GENERAL COMMUNICATION

6.1.1P0 Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

a) state the importance of engineering drawing
b) identify, use and care for various drawing instruments and materials
c) correctly set up a drawing paper
d) print alphabetical letters and numbers
e) draw quality lines.

Competence

The trainee should have the ability to communicate through pictures and writing.

Content

6.1.1P1 Importance of engineering drawing
- i) artistic drawings
- ii) scaled drawings
- iii) sketches
- iv) site plans

6.1P 2 Identification use and care for various drawing instruments and materials
- i) drawing boards
- ii) instruments
- iii) drawing machines
- iv) scales
- v) pencils (all types and grades)
- vi) drawing papers
- vii) tracing papers

6.1. P3 Set up a drawing paper
- i) Instruments
- ii) layout and preparation
- iii) boarder lines
- iv) title block
- v) hidden lines
- vi) centre lines
- vii) construction lines

6.1. P4 Free hand printing
- i) letters
- ii) numbers

6.1. P5 Quality lines
- i) boarder line
- ii) outlines
- iii) hidden lines
- iv) centre lines

Suggested Learning/Teaching Resources
- i) Drawing instruments
- ii) Drawing materials
- iii) Drawing equipment

6.1.2 PLANE GEOMETRY

6.1.2P0 Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

a) construct various geometrical shapes
b) construct tangents to circles
c) construct loci
d) reduce or enlarge figures by construction method

e) construct given figures to other shapes of equal area.

Competence
The trainee should have the ability to apply plane geometry in the electrical and electronic trade.

6.1.2P1 Construction of various geometrical shapes
Bisection of lines
i) Bisection of angles
ii) Various geometrical shapes

6.1.2P2 Construction of tangents to circles
i) Inscribed circles
ii) Subscribed circles
iii) Bisection of lines
iv) Bisection of angles

6.1.2P3 Construction of Loci
i) Ellipses
ii) Involutes
iii) Cycloids
iv) Cams
v) Parabola
vi) Hyperbola
vii) Archimedia spiral
viii) Cycloid
ix) Epicycloids

6.1.2P4 Reduction and enlargement

6.1.2P5 Shapes of equal area

Learning/Teaching Resources
i) Drawing equipment
ii) Drawing instruments
iii) Drawing materials

6.1.3 PICTORIAL DRAWING

6.1.3P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) draw isometric drawings of given solid objects
b) draw oblique drawings of given solid objects
c) construct perspective drawings of given solid objects.

Competence
The trainee should have the ability to:
- Make drawings of solid objects using various methods.

Content

6.1.3P1 Drawing isometric drawings of given solid objects
i) 290 receding lines
ii) Isometric box (boxing method of construction)
iii) Isometric circles (4 centre method)
iv) Exercises on isometric drawings for cavalier and cabinet

6.1.3P2 Drawing Oblique Drawings of Given Solid Objects
i) Oblique box
ii) Circles and arcs

iii) Picture plane
iv) Horizon line

6.1.3P43 Perspective Drawings of Given Solid Objects
i) Vanishing points
ii) Stationary points
iii) Line of site
iv) Single line perspective
v) Two line perspective
vi) Drawing exercises

Learning/Teaching Resources
i) Drawing equipment
ii) Drawing instruments
iii) Drawing materials
iv) Models of solid objects

6.1.4 ORTHOGRAPHIC PROJECTION

6.1.4P0 *Specific* Objectives
By the end of the sub-module unit, the trainee should be able to:
a) draw given objects in third angle projection
b) draw given objects in first projection.

Content

6.1.4P1 Third Angle Projection
i) Placement of views
ii) Front
iii) Plan
iv) End
v) Projections symbols

6.1.4P2 First Angle Projection
i) Placement of views
ii) Front
iii) Plan
iv) End
v) Projections symbols
vi) Drawing exercises

Competence
The trainee should have the ability to produce various types of views for solid objects.

Learning/Teaching Resources
i) Drawing equipment
ii) Drawing instruments
iii) Drawing materials

6.1.5 FREE HAND SKETCHING

6.1.5P0 *Specific Objective*
By the end of the sub-module unit, the trainee should be able to make pictorial sketches of common electrical tools and accessories.

Content

6.1.5P1 Sketching Techniques
i) Neatness
ii) Proportionality
iii) Hand tools
iv) Electrical/electronics components
v) Accessories
vi) Symbols

Learning/Teaching Resources
i) Drawing equipment
ii) Drawing instruments
iii) Drawing materials
iv) Electrical tools

v) Electrical accessories, components and equipment

6.1.6 DIMENSIONING

6.1.6P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to;

a) dimension orthographic views and pictorial drawings
b) interpret drawings in engineering and architectural drawings.

Competence

The trainee should have the ability to show sectional views of various objects

Content

6.1.6P1 Dimensioning of orthographic views and pictorial drawings
- i) Overall dimensions
- ii) Major dimensions
- iii) Circles and arcs
- iv) Lines

6.1.6P2 Interpreting drawings in engineering
- i) Detailed dimensions
- ii) Architectural drawing dimensions

Competence

The trainee should have the ability to:

- i) Dimension various engineering drawing
- ii) Interpret dimensions for architectural drawings

Learning/Teaching Resources

- i) Drawing equipment
- ii) Drawing instruments
- iii) Drawing materials

6.1.7 SECTIONING

6.1.7P0 Specific Objectives

By the end of the sub-module unit, the trainee should be able:

a) identify various sectional views
b) identify sectioning exceptions
c) draw sectional views in first angle and third angle orthographic projections.

Content

6.1.7P1 Identification of various sectional views
- i) Full sections
- ii) Half sections
- iii) off set sections
- iv) Revolved section
- v) Removed section
- vi) Slugged section

6.1.7P2 Identification of sectioning exception
- i) Webs
- ii) Shafts
- iii) Keys and key ways
- iv) Bolts and washers
- v) Rivets and pins

vi) Hatching lines

6.1.7P3 Drawing sectional views in first and third angle orthographic projections
- i) Full sectioned drawings
- ii) Half sectioned drawings
- iii) Cutting plans

Learning/Teaching Resources
- i) Drawing equipment
- ii) Drawing instruments
- iii) Drawing materials

6.1.8 ASSEMBLY DRAWING

6.1.8P0 Specific Objectives

By the end of the sub-module unit, the trainee should be able to:
- a) draw sectional assembly drawing
- b) dimension assembly drawings.

Content

6.1.8P1 Sectional assembly drawing
- i) Hatching lines
- ii) Sectioning of different lines
- iii) Hidden details (not required)
- iv) Oven all dimensions
- v) Parts list

6.1.8P2 Dimensions for assembly
Assembly drawings
-drawings

Competence

The trainee should have the ability to assemble and make drawings for sectional objects

Learning/Teaching Resources
- i) Drawing equipment
- ii) Drawing instruments
- iii) Drawing materials

6.1.9 SOLID GEOMETRY

6.1.9P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:
- a) construct parallel line development
- b) construct radial lines development
- c) construct lines of intersections
- d) construct triangulation development.

Competence

The trainee should have the ability to;
- i) Make surface development of various objects
- ii) Establish the plan/shape of the surface area of objects.

Content

6.1.9P1 Construction of Parallel Lines
- i) Truncated cylinders
- ii) Truncated prisms

iii) True shapes and elevations
iv) Outlines and bending lines\
v) Truncated cones
vi) Truncated pyramids

6.1.9P2 Construction of Radial Lines Development
i) Two lines and elevations
ii) Outlines and bending lines

6.1.9P3 Construction of Lines of Intersections
i) Intersections of similar cylinders, prisms and pyramids
ii) Intersections of dissimilar cylinders and prisms
iii) Intersections of cylinders and pyramids
iv) Development of intersecting solids

6.1.9P4 Construction of Triangulation Development
i) Transition pieces
ii) Simple in – line development between:
iii) Transition pieces of different cross sections
iv) Cylinders and square pyramids

Learning/Teaching Resources
i) Drawing equipment
ii) Drawing instruments
iii) Drawing materials

6.1.10 ELECTRICAL DRAWING

6.1.10P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:
a) identify the standard graphical symbols
b) draw block diagrams of electrical and electronic circuits
c) draw wiring diagrams
d) draw schematic diagram.

Competence

The trainee should have the ability to:
i) Draw electrical and electronics drawings
ii) Correctly interpret electrical and electronics drawings

Content

6.1.10P1 Graphical symbols
British Standards (BS) 3939
i) Kenya Bureau of Standards (KEBS)
ii) Installation/electronics symbols BS 3939
iii) Logic symbols
iv) Symbols
v) Resistors
vi) Switch
vii) Inductor
viii) Coil
ix) Capacitor

x) Lighting point
xi) Electric bell

6.1.10P2 Block diagrams of:
i) Purpose
ii) Motor control circuits
iii) Power supply units
iv) Electric motor final circuit
v) DOL starter
vi) Forward reverse
vii) Operation
viii) Inching operation
ix) Star delta starter
x) Resistance starter
xi) Call and alarm circuits
xii) Single line wiring diagrams

6.1.10P3 Wiring Diagrams for:
i) Lighting systems
ii) Use of graphical symbols
iii) Planning the circuits
iv) Standard circuit representation

6.1.10P4 Schematic Diagrams of:
i) Lighting circuits
ii) Alarm systems
iii) Communication systems
iv) Motor control circuits
v) Amplifiers
vi) Converting block diagrams to schematic and vice-versa

6.1.11ARCHITECTURAL DRAWINGS

6.1.11P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:
a) draw common symbols used in architectural drawings
b) draw layout of electrical installation in buildings
c) draw layout of machines in a workshop
d) design and draw lighting scheme in building.

Content

6.1.11P1 Symbols
i) windows
ii) doors
iii) water closet
iv) walls
v) staircase
vi) beams

6.1.11P2 Electrical Installation
i) conduct runs
ii) lighting points
iii) power points

6.1.11P3 Machine Layout
i) Ducts systems
ii) Trunking System

6.1.11P4 Lighting Schemes
i) Drawings
ii) Spacing

Competence

The trainee should have the ability to:
iv) Draw electrical functional architectural drawing

v) Interpret architectural drawing

6.1.12ELECTRONIC DRAWING

6.1.12P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) prepare Printed Circuit Board (PCB) for practical use
b) draw chassis drawing and fasteners
c) draw electronics circuit diagrams.

Competence

The trainee should have the ability to:

i) Prepare printed circuit board for electronics circuits
ii) Draw chassis drawing and fasteners
iii) Interpret printed circuit board for electronics circuits
iv) Interpret chases drawing and fasteners

Content

6.1.12P1 PCB Drawing

i) Drilling drawing
ii) Assembly of components
iii) Chassis drawing
iv) Types
v) Designs
vi) Box, VT and I pattern

6.1.12P2 Chassis Drawing and Fasteners

6.1.12P3 Drawing Electronic Circuit Diagrams

i) Point and point diagrams
ii) Base line diagram
iii) Highway diagram
iv) Lineless diagrams

Learning/Teaching Resources

i) Printed Circuit Boards (PCB)
ii) Electronic components
iii) resistors
iv) transistors
v) inductors
vi) Manuals
vii) Etching equipment

6.1.13 COMPUTER RELATED DRAWINGS

6.1.13P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) use computer to carry out linear designs solutions
b) use computer to carry out 2D and 3D designs
c) carry out isometric designs

d) use computer to draw electrical and electronic drawings
e) use computer to simulate electronic circuits.

Content

6.1.13P1 Linear design solutions
i) Auto cad
ii) Archi cad

6.1.13P2 2d and 3d designs
- WIZs

6.1.13P3 Isometric designs
i) NW isometric
ii) NE isometric
iii) SE isometric