5.1.0 TECHNICAL DRAWING

5.1.01 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.

5.1.02 GENERAL OBJECTIVES

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

a) Understand the importance of engineering drawing.
b) Demonstrate ability to use engineering drawing techniques.
c) Interpret electrical and electronic drawings.
d) Understand common symbols used in architectural drawings.

5.1.03 MODULE SUMMARY AND TIME ALLOCATION

TECHNICAL DRAWING

Code	Sub-Module Unit	Content	Time Hrs
5.1.1	General Communication	• Importance of engineering drawing • Print alphabetical letters and numbers • Identification, use and care for various drawing instruments and materials • Setting up a drawing paper • Drawing quality lines	2
5.1.2	Plane Geometry	• Construction of various geometrical shapes • Construction of tangents to circles • Construction of Loci • Reduction and enlargement • Construction of shapes of equal area	6
5.1.3	Pictorial Drawing	• Isometric drawings of given solid objects • Oblique drawings of given solid objects	6

		• Perspective drawing	
5.1.4	Orthographic Projection	• Third angle projection • First angle projection	6
5.1.5	Free Hand Sketching	• Sketching techniques	2
5.1.6	Dimensioning	• Dimensioning of orthographic views and pictorial • Interpreting drawings in engineering	4
5.1.7	Sectioning	• Sectional views • Sectioning exception • Sectional views in first and third angle orthographic projections	6
5.1.8	Assembly Drawing	• Sectional assembly drawing • Dimensions for assembly drawings	6
5.1.9	Solid Geometry	• Construction of parallel lines • Construction of radial lines development • Construction of lines of intersections • Construction of triangulation development	6
5.1.10	Electronic Drawing	• Graphical symbols British Standards (BS) 3939 • Block diagrams • Wiring diagrams • Schematic diagrams	6
5.1.11	Architectural Drawings	• Symbols • Electrical installation • Machine layout • Lighting schemes	8
5.1.12	Computer Related drawing	• Linear design solutions • 2D and 3D Dimension designs • Isometric designs • Using circuit make to make electronics circuits • Simulation of electronics circuits	8

		• Using micro soft visio to draw electronics circuits	
Total time			**66**

5.1.1 GENERAL COMMUNICATION

Practice

5.1.1P0 *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) draw quality lines
e) print alphabetical letters and numbers

5.1.1C Competence

The trainee should have the ability to:

i) identify, select, care and maintain drawing equipment
ii) identify drawing paper sizes correctly use drawing lines
iii) neatly print
iv) alphabetical letters and numbers

Content

5.1.1P1 Importance of engineering drawing

i) artistic drawings
ii) scaled drawings
iii) sketches
iv) site plans

5.1.1P2 Identification, use and care for various drawing instruments and materials

i) drawing boards
ii) instruments
iii) drawing machines
iv) scales
v) pencils (all type and grades)
vi) drawing papers
vii) tracing papers

5.1. 1P3 Setting up a drawing paper

i) Instruments
ii) layout and preparation
iii) boarder lines
iv) title block

5.1.1P4 Drawing quality lines

i) boarder line
ii) outlines
iii) hidden lines
iv) centre lines

5.1. 1P5 Free hand printing

i) letters
ii) numbers

5.1.2 PLANE GEOMETRY

5.1.2P0 *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

5.1.2C *Competence*
The trainee should have the ability to construct various geometrical shapes
i) construct scales
ii) apply measuring scales in the electrical trade

Content

5.1.2P1 Construction of various geometrical shapes

5.1.2P2 Construction of tangents to circles
i) Inscribed circles
ii) Subscribed circles
iii) Bisection of lines
iv) Bisection of angles

5.1.2P3 Construction of Loci
i) Ellipses
ii) Involutes
iii) Cycloids
iv) Cams
v) Parabola
vi) Hyperbola
vii) Archimedia spiral,
viii) Cycloid
ix) Epicycloids

5.1.2P4 Reduction and enlargement of figures

5.1.2P5 Construction of given figures to other shapes of equal areas

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.3 **PICTORIAL DRAWING**

5.1.3P0 *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) perspective drawings of given solid objects

5.1.3C *Competence*
The trainee should have the ability to make

drawings of solid objects using various methods.

Content

5.1.3P1 Drawing isometric drawings of given solid objects
- i) receding lines
- ii) Isometric box (boxing method of construction)
- iii) Isometric circles (4 centre method)
- iv) Exercises on isometric drawings for cavalier and cabinet

5.1.3P2 Drawing oblique drawings of given solid objects
- Oblique box
- Circles and arcs
- Picture plane
- Horizon line

5.1.3P3 Perspective drawings of given solid objects
- Vanishing points
- Stationary points
- Line of site
- Single line perspective
- Two line perspective
- Front elevation
- Plan elevation
- Drawing exercises

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials
- Models of solid objects

5.1.4 ORTHOGRAPHIC PROJECTION

5.1.4P0 *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

5.1.4P1 Third angle projection
- i) Placement of views
- ii) Front
- iii) Plan
- iv) End
- v) Projections symbols

5.1.4P2 First angle projection
- i) Placement of views
- ii) Front
- iii) Plan
- iv) End

v) Projections
Symbols
vi) Drawing exercise

5.1.4C *Competence*
The trainee should have the ability to produce various views of solid objects.

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.5 **FREE HAND SKETCHING**

5.1.5P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to make pictorial sketches of common electrical tools and accessories.

Content
5.1.5P1 Sketching techniques
Neatness
Proportionality
Hand tools
Electrical/electronics components
Accessories
Symbols

5.1.5C *Competence*
The trainee should have the ability to:
i) Neatly make pictorial sketches of electrical tools and accessories
ii) Use free hand sketching to communicate issues in electrical trade

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials
- Electrical tools
- Electrical accessories, components and equipment

5.1.6 **DIMENSIONING**

5.1.6P0 *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

Content
5.1.6P1 Dimensioning of orthographic views

and pictorial drawings
i) Overall dimensions
ii) Major dimensions
iii) Circles and arcs
iv) Lines

5.1.6P2 Interpreting drawings in engineering
Detailed dimensions
Architectural drawing dimensions

5.1.6C *Competence*
The trainee should have the ability to:
i) dimension various engineering drawing
ii) interpret dimensions for architectural drawings

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.7 **SECTIONING**

5.1.7P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
a) identify various sectional views
b) identify sectioning exceptions
c) draw sectional views in first angle and 3rd angle orthographic projections

5.1.7C *Competence*
The trainee should have the ability to show sectional views of various objects

Content

5.1.7P1 Identification of various sectional views
i) Full sections
ii) Half sections
iii) off set sections
iv) Revolved section
v) Removed section
vi) Slugged section

5.1.7P2 Identification of sectioning exception
i) Webs
ii) Shafts
iii) Keys and key ways
iv) Bolts and washers
v) Rivets and pins
vi) Hatching lines

5.1.7P3 Drawing sectional views in first and third angle orthographic projections
i) Full sectioned drawings
ii) Half sectioned drawings
iii) Cutting plans

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.8 **ASSEMBLY DRAWING**

5.1.8P0 *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

5.1.8C *Competence*
The trainee should have the ability to assemble and make drawings for sectional objects

Content
5.1.8P1 Sectional assembly drawing
i) Hatching lines
ii) Sectioning of different lines
iii) Hidden details (not
iv) required)
v) Oven all dimensions
vi) Parts list
5.1.8P2 Dimensions for assembly drawings

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.9 **SOLID GEOMETRY**

5.1.9P0 *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

5.1.9C *Competence*
i) Make surface development of various objects
ii) Establish the plan/shape of the surface area of objects.

Content
5.1.9P1 Construction of Parallel line.
Truncated cylinders
Truncated prisms
True shapes and elevations
Outlines and bending
Truncated cones

Truncated pyramids

5.1.9P2 Construction of radial lines development
Two lines and elevations
Outlines and bending lines

5.1.9P3 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

5.1.9P4 Construction of triangulation development
i) Transition pieces
ii) Simple in – line development
iii) Transition pieces of different cross sections
iv) Cylinders and square pyramids

Learning/Teaching Resources
- Drawing equipment
- Drawing instruments
- Drawing materials

5.1.10 **ELECTRONIC DRAWING**

5.1.10P0 By the end of the sub-module unit, the trainee should be able to:
a) prepare Printed Circuit Board (PCB) for practical use
c) draw chassis
d) drawing and fasteners
d) draw electronics
e) circuit diagrams

5.1.10C *Competence*
The trainee should have the ability to
i) prepare printed circuit board for electronics circuits
ii) draw chases drawing and fasteners
iii) interpret printed circuit board for electronics circuits
iv) interpret chases drawing and fasteners

Content

5.1.10P1 PCB drawing
(i) Drilling drawing
(ii) Assembly of components
(iii)Chassis drawing
(iv)Types

(v) Designs

5.1.10P2 Chassis drawing and fasteners

5.1.10P3 Drawing electronic circuit diagrams

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

Learning/Teaching Resources

- PCB
- electronic components
- resistors
- transistors
- inductors
- manuals

5.1.11 **ARCHITECTURAL DRAWING**

Theory

5.1.11P0 *Specific Objectives*

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

a) Identify symbols used in drawing
b) Draw electrical installation works
c) Draw machine layouts
d) Draw lighting schemes

5.1.11C *Competence*

The trainee should have the ability to

i) identify symbols
ii) draw electrical installations
iii) draw machine layouts
iv) draw lighting schemes

Content

5.1.11P1 Symbols used in drawing

– Structural
– Finished surfaces
– Walling unit
– Fixtures
– Surface texture

5.1.11P2 electrical Installation

i) Background surface
ii) Material used

5.1.11P3 machine layouts

i) Safety lines
ii) Components
iii) Safety gadgets

5.1.11P4 lighting schemes

i) Switches
ii) Circuits
iii) sockets

Learning/Teaching Resources

- *Drawing equipment*
- *Drawing instruments*
- *Drawing materials*

5.1.12 **COMPUTER RELATED DRAWINGS**

5.1.12P0 *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 circuit maker to make electronics drawings
e) use circuit maker to simulate electronics circuits
f) use micro soft Visio draw electrical and electronic circuits.

Content

5.1.12P1 Linear design solutions
- -Auto cad
- -Archi cad

5.1.12P2 2d and 3d designs WIZs

5.1.12P3 Isometric designs
- -NW isometric
- -NE isometric
- -SE isometric

5.1.12P4 Circuit maker electronic drawings

5.1.12P5 Circuit maker electronic circuits

5.1.12P6 Microsoft Visio

Learning/Teaching Resources

- Pentium 4 computers
- 512 MB – RAM
- CAD manuals
- Soft wares- auto CAD, circuit maker, Microsoft Visio