

11.1.0 TECHNICAL DRAWING

11.1.1 Introduction

This module unit involves ability to select, use, care and maintain drawing equipments and materials, construct lines and geometric shapes, use of scales and grids in perspective drawings, draw surface developments and intersection of solids, draw architectural environments, convert pictorial drawings to orthographic views and vice versa, install and use different CAD packages.

This module unit is intended to equip the trainee with necessary knowledge, skills, values and attitudes that will enable him/her to use drawing equipments and materials for sketching and producing different types of scaled drawings.

This module unit intends to enable the trainee to read and interpret simple drawings.

11.1.2 General Objectives

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

- Understand the principles of Technical Drawing
- Communicate effectively using drawings and symbols.
- Appreciate different types of drawings
- Acquire basic skills necessary for producing working drawings
- Read and interpret drawings

11.1.3 Unit Summary and Time Allocation

Code	Sub-Module Unit	Content	Total Time
11.1.01	Introduction to Technical Drawing	<ul style="list-style-type: none">Drawing instrumentsUse of instrumentsPaper sizesCare and maintenancePaper sizeDrawing Paper layoutPrinting numbers and alphabet	
11.1.02	Freehand Sketching	<ul style="list-style-type: none">Sketching TechniquesPictorial sketches	
11.1.03	Orthographic Projections	<ul style="list-style-type: none">Draw objects in first angle projectiondraw given objects in third angle projection	

Code	Sub-Module Unit	Content	Total Time
11.1.04	Points, Lines and Planes	<ul style="list-style-type: none"> • Construction of lines in space • Lines in orthographic projections • True lengths of lines • Construction of planes in orthographic projections • Determination of true shapes of planes 	2
11.1.05	Plane Geometry	<ul style="list-style-type: none"> • Angle construction • Construction of plane shapes • Construction of conic sections • Plotting a loci 	4
11.1.06	Intersection of Lines	<ul style="list-style-type: none"> • Construction of lines in orthographic • Determination of shortest distance • True lengths 	2
11.1.03	Intersection of Lines And Planes	<ul style="list-style-type: none"> • construct line intersecting with planes • determine points of intersections of lines with a plane 	4
11.1.08	Intersections of Two Planes	<ul style="list-style-type: none"> • Intersection of two planes • True angles of intersection 	5
11.1.09	Intersection of Cylinders and Cones	<ul style="list-style-type: none"> • Intersection • Projection lines • True angles⁴ 	5
11.1.10	Development and Interpenetration	<ul style="list-style-type: none"> • Surface Development • Seams Of Interpenetrating Solids 	5
11.1.11	Auxiliary Projections	<ul style="list-style-type: none"> • True Length • True Shape • True Slope • Auxiliary Projection 	4
11.1.12	Pictorial Drawings	<ul style="list-style-type: none"> • Isometric • Axonometric • Oblique 	4
11.1.13	Perspective Drawings	<ul style="list-style-type: none"> • Theory Of Perspective Drawing • Horizon And Vanishing 	5

Code	Sub-Module Unit	Content	Total Time
		Points • Scales • Types • Grids • Interior And Exterior	
11.1.14	Shades and Shadows	• Definitions • Illumination • Shadows And Shades	6
11.1.15	ART	• Tools And Materials • Visual Organization • Image/Perception	12
Total			66

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11.1.01 **INTRODUCTION TO TECHNICAL DRAWING Theory**

- 11.1.01T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- identify drawing instruments
 - use drawing instruments
 - care and maintenance of drawing instruments
 - identify and generate paper sizes
 - identify different types of lines and their application
 - layout of drawing paper
 - print numbers and alphabetic on a drawing

- 11.1.01C *Competence*
The trainee should have the ability to:
- Select good quality drafting equipment
 - Drawing using drawing equipment
 - Care and maintain equipment
 - Generate different paper sizes

- 11.1.01T1 *Content*
Drawing instruments
- T-square, drawing board

- Set squares (300 – 600, 450)
- Protractors, dividers, pair of compasses
- Rulers, scale rules, erasers

11.1.01T2 Correct use of the instruments

11.1.01T3 Correct care and maintenance of the instrument

11.1.01T4 Paper sizes

- A0,
- A1,
- A2,
- A3,
- A4
- how to generate the paper sizes
- Use of ammonia process
- Photocopying

11.1.01T5 Types of lines

- Dark (Bold)
- Continuous lines
- Light/thin continuous lines
- Short dashes
- Long dashes followed by short dashes

11.1.01T6 Layout of drawing paper

- title block
- notes to drawings

11.1.01T7 Printing numbers and letters

- title blocks
- notes to drawings

Suggested Teaching/ Learning Resources

- Engineering Graphics Text books

*Suggested Teaching/
Learning Activities*

- Show and describe different drawing equipment
- Generate different sizes of paper
- Draw different types of lines
- Print letters and numbers

11.1.02 FREE HAND SKETCHING

Theory

- 11.1.02T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- a) use sketching techniques to produce drawings, lines and boxes in free hand
 - b) use construction lines and boxes to produce pictorial sketches

- 11.1.02C *Competence*
The trainee should have the ability to:
- i) apply free hand techniques
 - ii) use construction lines to produce pictorial sketches

- 11.1.02T1 *Content*
Sketching techniques
- construction lines
 - box-in-method
 - scaled grid

- 11.1.02T2 *Pictorial sketches*
- hand tools
 - blocks
 - building components
 - scenery

Suggested Teaching/Learning Resources

- Drawing equipment
- Shaped blocks
- Drawing equipment

11.1.03 ORTHOGRAPHIC PROJECTION

Theory

- 11.1.03T0 *Specific Objectives*
By the end of the sub-module, the trainee should be able to:
- a) explain given objects in first angle projection
 - b) draw given objects in first angle projection
 - c) draw given objects in third angle projection

- 11.1.03C *Competence*
The trainee should have the ability to:
- i) Draw a given object in first angle projection
 - ii) Draw a given object in third angle projection

11.1.03T1	<i>Content</i> Principle of orthographic projection
11.1.03T2	First angle projection
11.1.03T3	Third angle projection
11.1.03T4	Pictorial drawings
11.1.03T5	Plan view
11.1.03T6	Front elevation
11.1.03T7	End elevation

suggested

Teaching/Learning

Resources

- Solid figures
- Design text
- Draw and design
- KIE Book II
- Engineering drawing by K. Morling

11.1.04 POINTS, LINES AND PLANES

Theory

- 11.1.04P0 *Specific Objectives*
By the end of the sub-module, the trainee should be able to:
- a) construct lines in space
 - b) construct lines in orthographic projector
 - c) determine the true lengths of lines
 - d) construct planes in orthographic projection
 - e) determine the true shapes of planes

- 11.1.04C *Competence*
The trainee should have the ability to:
- i) Draw lines, points and planes in orthographic projections
 - ii) Determine true length of a line
 - iii) Determine true shape of a plane
 - iv) Determine intersection of lines

Content

- 13.1.04P1 Construction of lines in space
- planes
 - angle of inclination
 - true lengths
- 13.1.04P2 Lines in orthographic projections
- 13.1.04P3 True lengths of lines
- 13.1.04P4 Construction of planes in orthographic projections
- 13.1.04P5 Determination of true shapes of planes

Suggested Teaching/Learning Resources

- Engineering Graphics Text books

11.1.05 PLANE GEOMETRY

Theory

- 11.1.05T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:

	<ul style="list-style-type: none"> a) construct different angles b) construct triangles c) construct circles d) construct rectangles e) construct parallelogram f) construct polygons g) construct various conic sections h) plot loci of points on sliding i) plot loci of point on link mechanism 		<p><i>Suggested Teaching/Learning Resources</i></p> <ul style="list-style-type: none"> - Drawing instruments - Draw/design by KJE Bk 1
11.1.05C	<p><i>Competence</i></p> <p>The trainee should have the ability to:</p> <ul style="list-style-type: none"> i) Construct plane geometric figures ii) Plot loci of points on moving parts 		
11.1.05T1	Construction of different angles		
11.1.05T2	Construction of triangles		
11.1.05T3	Construction of circles and rectangles		
11.1.05T4	Construction rectangles		
11.1.05T5	Parrallegram		
11.1.05T6	Construction of polygons		
11.1.05T7	construction of conic section		
11.1.05T8	Sliding and rolling forms		
	<ul style="list-style-type: none"> - helix - cycloid - archimedian spiral 		
11.1.05T9	Link mechanisms loci		
11.1.06		INTERSECTION OF LINES	
11.1.06T0		<p>Theory</p> <p><i>Specific Objectives</i></p> <p>By the end of the sub-module unit, the trainee should be able to:</p> <ul style="list-style-type: none"> a) construct intersecting lines in orthographic review b) determine the shortest distance between intersecting lines c) construct true length of a given object 	
		11.1.06C	<p><i>Competence</i></p> <p>The trainee should have the ability to:</p> <ul style="list-style-type: none"> i) Construct intersecting lines in orthographic views ii) Determine shortest distance between intersecting lines
		11.1.06T1	<p><i>Content</i></p> <p>Intersecting lines in orthographic views</p>
		11.1.06T2	Shortest distance in intersecting lines

Suggested Teaching/Learning Resources

- Drawing papers
- Drawing instruments

11.1.08

INTERSECTION OF TWO PLANES

Practice

11.1.07

INTERSECTION OF LINES AND PLANES

Theory

11.1.08T0

Specific Objectives

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

11.1.07T0

Specific Objectives

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

- construct line intersecting with planes
- determine points of intersections of lines with planes

- construct an intersection of two planes
- determine the true angles of intersection between the two planes

11.1.08C

Competence

The trainee should have the ability to:

11.1.07C

Competence

The trainee should have the ability to:

- Construct intersecting lines with planes
- Determine angles of intersection of lines with planes

- Construct intersection lines of two planes
- Construct angles of intersection between two planes

Content

11.1.08T1

Intersection of two planes

11.1.08T2

True angles of intersection between two planes

11.1.07T1

Content

Intersecting lines with planes

11.1.07T2

determination of true angles of intersection of lines with planes

Suggested

Teaching/Learning Resources

- Drawing instruments
- Drawing papers

Suggested

Teaching/Learning Resources

- Drawing instruments
- Drawing papers

11.1.09P1

INTERSECTION OF CYLINDERS AND CONES

Practice

- 11.1.09P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- construct intersection of cylinders and domes
 - determine the true angles between cylinders and domes

- 11.1.09C *Competence*
The trainee should have the ability to construct intersection of cylinders and domes

- 11.1.09P1 *Content*
Construction of intersection of cylinders and domes
- 11.1.09P2 *Content*
Determination of true angles between cylinders and domes

Suggested Teaching/Learning Resources

- Manila papers
- Drawing instruments
- Drawing papers

11.1.10 DEVELOPMENT AND INTERPENETRATION

Practice

- 11.1.10P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- draw surface development of

interpenetrating solids

- draw curves of intersection of interpenetrating solids
- draw curves of interpenetrating prisms

- 11.1.10C *Competence*
The trainee should have the ability to:
- Draw surface development of interpenetration solid
 - Draw curves
 - Draw beams of interpenetration solids

- 11.1.10P1 *Content*
Develop surface of interpenetrating solids
- 11.1.10P2 *Content*
Interpenetration of solids
- cylinders to cylinder
 - cylinders to cone
 - cylinder to prism
- 11.1.10P3 *Content*
Prism to prism

Suggested Teaching/Learning Resources

- Manila paper
- Cylindrical objects
- Drawing instruments
- Drawing paper

11.1.11 **AUXILIARY PROJECTIONS**

Practice

Specific Objectives

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

- a) construct true lengths of lines
- b) construct true shape of planes
- c) determine true slope of lines
- d) determine true shape of planes
- e) construct auxiliary projector's of solids

Competence

The trainee should have the ability to:

- i) Construct true lengths of lines
- ii) Construct true shape of plane
- iii) Determine true slope of lines and slope
- iv) Project aux-views

Content

True lengths of lines

- first auxiliary
- second auxiliary

True shapes of planes

Determination of true slopes of lines

true shapes of planes

Auxiliary projections of solids

- auxiliary plans
- auxiliary elevations

Suggested Teaching/Learning Resources

- Drawing instruments
- Drawing materials

11.1.12 **PICTORIAL DRAWINGS**

Practice

Specific Objectives

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

- a) explain the various types of axonometric views and drawings
- b) convert given orthographic views into axonometric drawings
- c) Explain the use of oblique drawings

Competence

The trainee should have the ability to convert orthographic views into pictorial drawings

Content

axonometric

orthographic views to

axonometric

use of oblique drawing

Suggested Teaching/Learning Resources

- Draw and design by KIE Book II

	- Architectural draftsmanship by R. Fraisia	11.1.13P1	<i>Content</i> Theory of perspective drawing	
11.1.13	PERSPECTIVE DRAWINGS	11.1.13P2	Inter-relationship - picture plane - station point - horizon point - vanishing point	11-
	Practice	11.1.13P3	Use of scaling in perspective drawing	
11.1.13P0	<i>Specific Objectives</i> By the end of the sub- module unit, the trainee should be able to:	11.1.13P4	Types of perspective drawings - one point - two point - three point - multi-point	11 11 11 11
	a) explain the theory of perspective drawing	11.1.13P5	Measuring points	
	b) determine the interrelationship of picture plane station point of horizon and vanishing points	11.1.13P6	Perspective grids	
	c) use scales in perspective	11.1.13P7	Draw exterior and interior perspective	11
	d) describe types of perspective drawings		<i>Suggested Teaching/Learning Resources</i> - Drawing equipment	11
	e) use measuring points in perspective drawing			
	f) use perspective grids	11.1.14	SHADES AND SHADOWS	
	g) draw exterior and interior perspective drawing	11.1.14P0	Practice <i>Specific Objectives</i> By the end of the sub- module unit, the trainee should be able to:	
11.1.13C	<i>Competence</i> The trainee should have the ability to:		a) define shades and shadows	
	i) use of scales in perspective drawing		b) use illumination on perspective/presenta- tion drawings	
	ii) Use of grids in perspective drawings		c) use straight lines shadows in drawings	
	iii) Draw interior perspective drawing		d) use shades and shadows for curved elements in drawings	
	iv) Draw exteriors perspective drawing			

- 11.1.14C *Competence*
The trainee should have the ability to:
- i) Use illumination in perspective drawing
 - ii) Use shades and shadows for curved elements

- Content*
- 11.1.14P1 Use of illumination
 - 11.1.14P2 Straight line-shadows
 - 11.1.14P3 Shades
 - 11.1.14P4 Shadows for curved elements

11.1.15 ART

Practice

- 11.1.15T0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- a) define art
 - b) name tools and materials used in art design
 - c) explain the principles of visual organization
 - d) explain the principles of visual organization
 - e) explain the principles of visual communication
 - f) draw architectural environments in given media to achieve desired image and perception
 - g) describe the interrelationship

- h) between drawing and utilization paint architectural environment in given media to achieve desired image and perception

- 11.1.15C *Competence*
The trainee should have the ability to:
- i) define art
 - ii) name tools and materials for art
 - iii) explain principles of visual organization
 - iv) draw architectural environments to achieve desired image and perspective
 - v) describe the inter-relationship between drawing and visualization paint architectural environments to achieve desired image and perception

Content

- 11.1.15T1 Art in terms of visual art
11.1.15T2 Tools and materials
- pencils
 - paper
 - markers
 - pen
 - drawing instruments
 - opaque paints
 - colour paints
 - cellaring devices
 - erasers

- cutting knives
- curves
- templates
- 11.1.15T3 Visual organization principles
- 11.1.15T4 Space, form and structure
- 11.1.15T5 Design elements
- 11.1.15T6 Visual effects and design
- 11.1.15T7 Interrogational effects and design
 - architectural environments in given media
 - drawing from observation (still life)
 - drawing from memory
 - drawing from imagination

- 11.1.15T8 Paint architectural environments
 - colours
 - oil painting
 - spray painting
 - painting composition from

vi)

Suggested Teaching/Learning Resources

- Art tools
- Art material
- Drawing instrument
- Opaque paints
- Penknives
- Curves
- Peinpletes

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