

10.1.0 BASIC ENGINEERING DRAWING

10.1.1 Introduction

This module unit is designed to equip the trainee with the necessary knowledge, skills and attitude to enable the trainee interpret various component drawings related to Mechanical Engineering. The module unit is intended to provide the trainee with the fundamentals of mechanical engineering drawing using the traditional equipment.

The knowledge gained will be used in designing various products in structural fabrication, production line and tool room processes.

10.1.2 General Objectives

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

- a) communicate effectively using drawings and symbols
- b) understand the principles of mechanical engineering drawings
- c) read and interpret engineering drawings
- d) appreciate the role of drawing in mechanical production processes

10.1.3 Module Unit Summary and Time Allocation

BASIC ENGINEERING DRAWING

Code	Sub-Module Unit	Content	Time Hrs
10.1.01	INTRODUCTION TO ENGINEERING DRAWING AND DESIGN	<ul style="list-style-type: none">• Drawing instruments• Drawing Office• Drawing paper	6
10.1.02	Paper Layout	<ul style="list-style-type: none">• Paper layout• Lettering• Numbering• Types of lines	6
10.1.03	Plane Geometry	<ul style="list-style-type: none">• Straight lines• Common angles• Triangles• Quadrilaterals• Polygons• Circles	6
10.1.04	Blending of Lines and Arcs	<ul style="list-style-type: none">• Straight lines• Arcs• Circles	6
10.1.05	Tangents	<ul style="list-style-type: none">• Circles and tangents• Common tangents	6

		<ul style="list-style-type: none"> • External and Internal tangents 	
10.1.06	Pictorial & Orthographic Projections	<ul style="list-style-type: none"> • Pictorial and • Orthographic • Isometric oblique • Cavalier, cabinet • 1st angle projection and • 3rd angle 	21
10.1.07	Lines In Space	<ul style="list-style-type: none"> • True length • Traces of the straight line given the plan and elevation. • True angle between the VP and the oblique plane • True shape of a lamina 	12
10.1.08	Solid Geometry	<ul style="list-style-type: none"> • Solid Geometry • Surface development • Intersection of geometrical objects • Auxiliary views 	12
10.1.09	Conic Sections	<ul style="list-style-type: none"> • Ellipse • Parabola • Hyperbola 	12
101.10	Loci and Mechanisms	<ul style="list-style-type: none"> • Loci of plane figures • Loci of rigid link mechanisms 	12
Total Time			99

10.1.01 INTRODUCTION TO ENGINEERING DRAWING AND DESIGN

- Square grid and isometric grid

Suggested learning Resources

- 10.1.01P0 *Specific Objectives*
By the end of the sub-module unit, the trainee should be able to:
- a) appreciate the need for engineering drawing
 - b) use drawing materials, instruments and equipment correctly

- T-Square
- 45° & 60° set squares
- Drawing board
- Types of pencils
- Drawing set
- Eraser
- Drawing paper
 - Size A0 A1 A2 A3 A4
 - Square grid and isometric grid

10.1.02 PAPER LAYOUT

- 10.1.01C *Competence*
The trainee should have the ability to:
- i) Sharpen pencils
 - ii) Set the compass
 - iii) Select paper sizes layout paper

- 10.1.02P0 *Specific Objectives*
By the end of the sub-module unit the trainee should be able:
- a) layout the paper correctly
 - b) print letters and numbers to the required standard.

Content

- 10.1.01P1 Need for engineering drawing
- 10.1.01P2 Drawing instruments and Equipments
- T-Square
 - 45° & 60° set squares
 - Drawing board
 - Types of pencils
 - Drawing set
 - Eraser
 - Drawing paper
 - Size A0 A1 A2 A3 A4

- 10.1.02C *Competence*
The trainee should have the ability to:
- i) Set out the drawing paper on the drawing board
 - ii) Draw boarder lines and title block
 - iii) Print numbers and letters correctly.

Content

- 10.1.02P1 Paper layout
- Boarder lines

	<ul style="list-style-type: none"> - Outlines - Masking the paper on the board - Construction lines - Centre lines - Dimension lines - Guidelines - Title block 		
10.1.02P2	Printing letters and numbers <ul style="list-style-type: none"> - Upper case - Lower case 		
	<i>Suggested learning Resources</i> Drawing paper Drawing board		
10.1.04	PLANE GEOMETRY		
10.1.04T0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to: <ol style="list-style-type: none"> a) construct lines and angles b) construct plane geometric figures 		
10.1.04C	<i>Competence</i> The trainee should have the ability to: <ol style="list-style-type: none"> i) Construct lines and angles ii) Divide a straight line into any number of equal parts iii) Construct plane figures 		
		10.1.04P1	<i>Content</i> Construction of lines and angles
		10.1.04P2	Plane geometric figures <ul style="list-style-type: none"> - Triangles - Quadrilaterals - Polygons - Circles
			<i>Suggested learning Resources</i> Plane geometric figures <ul style="list-style-type: none"> - Triangles - Quadrilaterals - Polygons - Circles
		10.1.05	BLENDING OF LINES AND ARCS
		10.1.05P1	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to: <ol style="list-style-type: none"> a) blend straight lines and arcs b) determine the centre of an arc given its radius which blends with a line and a circle. c) find the centre of an arc of a given radius which blend with the two circles.
		10.1.05C	<i>Competence</i> The trainee should have the ability to:

	i) Blend lines and curves		two un equal circles.
	ii) Determine the centre of an arc	10.1.06C	<i>Competence</i>
	iii) Blend circles with arcs and other circles		The trainee should have the ability to:
			i) Draw a tangent to a circle
10.1.05P1	<i>Content</i> Straight lines and arcs		ii) Draw common internal and external tangents two circles
10.1.05P2	Determination of the centre of an Arc blending with a line and a circle		
		10.1.06P1	<i>Content</i> Tangent to a circle
10.1.05P3	Circles of an arc blending with two circles	10.1.06P2	Common tangents to two equal circles
		10.1.06P3	Common interior tangents to two equal circles
	<i>Suggested learning Resources</i> Drawing instruments and Equipments	10.1.06P4	Common external tangent to two unequal circles
10.1.06	TANGENTS	10.1.06P5	Common internal tangent between two unequal circles
10.1.06P0	<i>Specific Objectives</i> By the end of the sub-module unit the trainee should be able to construct a:		<i>Suggested learning Resources</i> Drawing instruments and Equipments
	a) tangent to a circle from a point outside	10.1.07	PICTORIAL & ORTHOGRAPHIC PROJECTIONS
	b) common tangent to two equal circles		
	c) common interior tangents to two equal circles	10.1.07P0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:
	d) common external tangent to two unequal circles		a) identify two types of projection
	e) common internal tangent between		

	b) construct objects in isometric and oblique projection		- Drawing equipment
	c) convert pictorial to orthographic and vice versa	10.1.08	LINES IN SPACE
	d) dimension the drawing correctly.	10.1.08P0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:
10.1.07C	<i>Competence</i> The trainee should have the ability to:		a) draw the projection of a line not parallel to any of the principal planes
	i) Construct pictorial views in isometric and oblique projections		b) find the true length of a line not parallel to any of the principal planes
	ii) Change pictorial drawings into orthographic and vice versa		c) determine the angle made between the line and the front vertical plane (FVP) and the horizontal plane.(H.P).
	iii) Dimension a given drawing		
	<i>Content</i>		
10.1.07P1	Types of projection		
	- First-angle and Third-angle projections		
10.1.07P2	Construction of Isometric projections	10.1.08C	<i>Competence</i>
10.1.07P3	Conversion of pictorial drawings into isometric and oblique projection		The trainee should have the ability to draw the true shape of projection lines
	- Cabinet		
	- Cavalier		<i>Content</i>
10.1.07P4	Dimensioning	10.1.08T1	Non Principal Planes
	- Rules for dimensioning drawing		- True length
			- Traces of the straight line given the Plan and elevation.
			- True angle between the VP and the oblique plane
	<i>Suggested Learning Resources</i>		
	- Textbooks		
	- Models		

	- True shape of a lamina		
10.1.08T2	True length of a line	10.1.09P1	<i>Content</i> Solid figures
10.1.08T3	Determination of angles between FVP and HP		- Cylinders - Cones - Pyramids
	<i>Suggested Learning Resources</i>	10.1.09P2	Surface development of solid figures
	- Textbooks		- Box - Cylinder - Pyramid - Cone
	- Models	10.1.09P3	Intersection of Geometrical objects
	- Drawing equipment		- Lines of intersection - Curves of intersection
10.1.09	SOLID GEOMETRY		
	Theory	10.1.09P4	Auxiliary views Auxiliary views of truncated objects True shape of the cut portion
10.1.09P0	<i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to:		
	a) construct geometric solids	10.1.10	CONIC SECTIONS
	b) develop different type of solids	14.1.11P0	<i>Specific Objectives</i> By the end of the sub-module unit the trainee should be able to
	c) draw the development of intersecting objects		a) draw an ellipse using various methods
	d) draw auxiliary views		b) parabola using various methods c) hyperbola using various method
10.1.09C	<i>Competence</i> The trainee should have the ability to:		
	i) Construct various solid figures	10.1.10P1	<i>Content</i> Ellipse
	ii) Draw surface development of truncated figures		- Focus - Minor axis - Major axis
	iii) Draw Auxiliary views		

10.1.10P2	<ul style="list-style-type: none"> - Directrix - Vertex Parabola	10.1.11C	<i>Competence</i> The trainee should have the ability to design link mechanisms for engineering components.
10.1.10P3	<ul style="list-style-type: none"> - Focus - Directrix - Eccentricity Hyperbolas		
	<ul style="list-style-type: none"> - Focus - Directrix - Eccentricity 	10.1.11P1	<i>Content</i> Loci of plane figures <ul style="list-style-type: none"> - Circle - Ellipse - Parabola - Cycloid - Epi-cycloid - Hypo-cycloid
	<i>Suggested Learning Resources</i> <ul style="list-style-type: none"> - Textbooks - Models - Drawing equipment 	10.1.11P2	Involutes
		10.1.11P3	Archimedean spiral
10.1.11	LOCI AND MECHANISMS	10.1.11P4	Loci of rigid link mechanisms <ul style="list-style-type: none"> - The sliding ladder - The piston-crank and connecting rod link - The four bar link
14.1.11P0	<i>Specific Objectives</i> By the end of the sub-module unit the trainee should be able: <ol style="list-style-type: none"> a) define the locus of a point b) draw the locus of a point in relation to a circle c) draw the locus of a point for a given mechanism. 		<i>Suggested Learning Resources</i> <ul style="list-style-type: none"> - Piston-crank and connecting rod model - Textbooks - The internet - Drawing equipment