10.0 APPLIED GEOMETRY

10.01 INTRODUCTION

The syllabus for this subject comprises of plane geometry, solid geometry and technical drawing. It is a support subject for all technical artisan courses. It is expected that the trainee will develop ability to communicate his ideas within his selected field and correctly interpret simple working drawings.

Throughout the course emphasis will be given to accuracy, neatness and good line work as this habit will influence accuracy in setting out practical task in selected field. The International Organization of Standardization SI units and conventions will be used throughout the subject.

10.02 GENERAL OBJECTIVES

At the end of the course unit, the trainee should be able to:-

a) express his ideas through the use of freehand sketches and simple scaled drawings;

b) read and interpret simple working drawings;

c) set out practical work from a given sketch or scaled working drawings.

TOPIC	SUB-TOPIC	TIME
10.1.1.S General Communication	• Introduction • Use and care of drawing instruments • Line symbols and lettering • Measurement and dimensioning • Two dimensional drawings • Scales	14 Hours
10.1.2.S Plane Geometry 1	• Triangles • Quadrilaterals • Polygons • Circles	10 Hours
10.1.3.S Solid Geometry 1	• Development of surfaces of truncated regular solids • True shapes of sections on regular solids	14 Hours
10.1.4.S Pictorial Drawings 1	• Free hand sketching • Isometric drawing • Oblique drawing	14 Hours
10.1.5.S Orthographic Projection 1	• 1st and 3rd angle orthographic projections • Orthographic views of regular solids • Orthographic views of irregular solids	14 Hours

10.1.1.S GENERAL COMMUNICATION (14 HOURS)

10.1.1.1.S INTRODUCTION

10.1.1.1.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) explain the term applied geometry;
b) state the use of drawing as a means of communication.

10.1.1.1.S11 Explanation

i) The term applied geometry,
ii) Compare effective (artistic) drawing with formal applied geometry.

10.1.1.1.S12 Use of drawings in artisan trades

i) Component drawing,
ii) Article drawing,
iii) Sketch drawing,
iv) Pattern drawing.

10.1.1.2.S USE AND CARE OF DRAWING INSTRUMENTS

10.1.1.2.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) identify basic drawing instruments;
b) correctly and safely use drawing instruments;
c) maintain and properly store drawing instruments.

10.1.1.2.S11 Identification of Drawing Instruments

i) Grades of pencils,
ii) Types and sizes of drawing boards,
iii) Types and sizes of tee square,
iv) Types and sizes of set squares,
v) Types and sizes of drawing paper,
vi) Templates.

10.1.1.2.S12 Use of drawing Instruments

i) Placing and paper layout on drawing board,
ii) Correct and safe methods of sharpening pencils,
iii) Drawing horizontal, vertical and inclined lines using Tee-square and set squares,
iv) Drawing circles and arcs using a pair of compasses.

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10.1.1.2.S13 Maintenance and Storage of Instruments and Drawings

i) Importance of cleanliness and careful handling of instruments and drawings;
ii) Proper storage of drawings and instruments.

10.1.1.3.S LINES, SYMBOLS AND LETTERING

10.1.1.3.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) draw various types of lines;
b) carry out free hand lettering to a recognized standard;
c) identify and use basic symbols.

10.1.1.3.S11 Types of Lines

i) construction lines,
ii) dotted lines,
iii) centre lines,
iv) outlines.

10.1.1.3.S12 Lettering

i) upper case,
ii) lower case,
iii) numbering.

10.1.1.3.S13 Symbols

Conventional representation of;
i) different items,
ii) different materials,
iii) cross sections,
iv) referencing.

10.1.1.4.S MEASUREMENT AND DIMENSIONING

10.1.1.4.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) use measuring instruments accurately;
b) dimension drawings.

10.1.1.4.S11 Measuring

i) Linear measurements using tapes and rulers,

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ii) Angular measurements using set-squares and protractors,
iii) Circular measurements using pairs of compasses, dividers and calipers.

10.1.1.4.S12 Dimensioning

Different methods of showing dimensions on drawings:
   i) Linear dimensioning,
   ii) Angular dimensioning,
   iii) Circular dimensioning.

10.1.1.5.S TWO DIMENSIONAL DRAWING

10.1.1.5.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
   a) make two dimensional drawings using free hand sketching;
   b) trace a given drawing;
   c) draw two dimensional drawings using instruments.

10.1.1.5.S11 Free Hand Sketching

   i) Use of square grid papers to draw triangles.

10.1.1.5.S12 Tracing

   i) Tracing of given two dimensional drawings.

10.1.1.5.S13 Drawing using Instruments

   i) Drawings of simple two dimensional figures, i.e. triangles, quadrilaterals, polygons and circles to familiarise with the use of drawing instruments.

10.1.1.6.S SCALES

10.1.1.6.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
   a) use scale rules;
   b) draw to a given scale;
   c) convert drawings from one scale to another.

10.1.1.6.S12 Scaling
   i) Extraction of measurements from given scaled drawings,
   ii) Reproduction of given drawings to scales of 1:2, 1:5, 1:10, 1:20,
   iii) Conversion of drawing from one scale to another.

10.1.2.S PLANE GEOMETRY I (10 HOURS)

10.1.2.1.S TRIANGLES

10.1.2.1.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
   a) define a triangle;
   b) identify various types of triangles;
   c) construct various triangles.

10.1.2.1.S11 Types of Triangles

   i) definition,
   ii) identification;
      • equilateral,
      • isosceles,
      • scalene,
      • right angled,
      • obtuse angled,
      • acute angled.
   iii) construction of the triangles from given data.

10.1.2.2.S QUADRILATERALS

10.1.2.2.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
   a) define a quadrilateral;
   b) identify various types of quadrilaterals;
   c) construct various quadrilaterals.

10.1.2.2.S11 Definition of quadrilateral
10.1.2.2.S12 Identification of quadrilateral;
   i) square,
   ii) rectangle,
   iii) rhombus,
   iv) rhomboid,
   v) trapezium,
   vi) trapezoid,

10.1.2.2.S13 Construction of quadrilaterals from given data

10.1.2.3.S POLYGONS

10.1.2.3.S1 Specific Objectives
At the end of this topic, the trainee should be able to:-
a) define a polygon;
b) identify various types of polygons;
c) construct regular polygons.

10.1.2.3.S11 Definition of Polygon

10.1.2.3.S12 Identification of polygons
i) pentagon;
ii) hexagon;
iii) heptagon;
iv) octagon.

10.1.2.3.S13 Construction of regular polygons:
i) given the length of side,
ii) given the diameter of the circumscribing circle.

10.1.2.4.S CIRCLES

10.1.2.4.S1 Specific Objectives
At the end of this topic, the trainee should be able to:-
a) identify all parts of a circle;
b) construct tangents to circles;
c) inscribe circles to triangles & squares;
d) circumscribe circles to triangles;
e) draw segments from given data.

10.1.2.4.S11 Parts of a circle
i) definition of a circle;
ii) parts of a circle:
  • circumference,
  • diameter,
  • arc,
  • segment,
  • tangent,
  • quadrant

10.1.2.4.S12 Tangents to circles
i) From a point on the circumference,
ii) From a point outside the circle,

iii) touching two equal circles,
iv) touching two unequal circles.

10.1.2.4.S13 Inscribed and Circumscribed Circles to;
i) triangles,
ii) squares.

10.1.2.4.S14 Segments of a circle;
i) Methods of drawing segments of various sizes.

10.1.3.S SOLID GEOMETRY I (14 HOURS)

10.1.3.S1 Specific Objectives
At the end of this topic, the trainee should be able to:-
a) develop surfaces of regular solids;
b) develop surfaces of truncated regular solids;
c) construct true shapes of sections on regular solids.

10.1.3.S11 Development of surface of regular solids;
i) prisms,
ii) pyramids,
iii) cylinders,
iv) cones.

10.1.3.S12 Development of truncated regular solids

10.1.3.S13 True shape of sections;
i) regular.

10.1.4.S PICTORIAL DRAWING I (14 HOURS)

10.1.4.S1 Specific Objectives
At the end of this topic, the trainees should be able to:-
a) draw three dimensional sketches of straight edge object;
b) construct isometric drawings of simple straight edge object using instruments;
c) construct oblique drawings of simple straight edge objects using instruments.

10.1.4.S11 Free hand sketching

10.1.4.S12 Isometric drawing

10.1.4.S13 Oblique drawing

    i)   cavallier,
    ii) cabinet.

10.1.5.S ORTHOGRAPHIC PROJECTION I (14 HOURS)

10.1.5.S1 Specific Objectives

At the end of this topic, the trainees should be able to:-

    a) differentiate between 1st angle and 3rd angle orthographic projections;
    b) draw geometrical solids in 1st angle orthographic projection;
    c) draw geometric solids in 3rd angle orthographic projection.

10.1.5.S11 Projections

    i)   1st angle,
    ii) 3rd angle.

10.1.5.S12 Regular solids

    i)   prisms,
    ii)   pyramids,
    iii) cylinders,
    iv) cones.

10.1.5.S13 Irregular solids

    i)   shaped rectangular blocks,
    ii) shaped circular blocks.

SECOND YEAR (66 Hours)

TOPIC	SUB-TOPIC	TIME
10.2.6.S Plane Geometry II	• Ellipse • Loci • Curved figures	16 Hrs
10.2.7.S Solid Geometry II	• Intersection of regular solids • Locating the lines and curves of intersection • Development of intersecting surfaces	12 Hrs
10.2.8.S Pictorial Drawings II	• Isometric • Oblique • Conversion from Orthographic to pictorial	18 Hrs
10.2.9.S Orthographic Projections II	• 1st and 3rd angle projections • Simple assembly drawing	20 Hrs

10.2.6.S PLANE GEOMETRY II (16 HOURS)

10.2.6.1.S ELLIPSE

10.2.6.1.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) define the term ellipse;
b) construct an ellipse.

10.2.6.1.S11 Definition

10.2.6.1.S11 Construction
i) trummel method,
ii) concentric circles method,
iii) rectangle method.

10.2.6.2.S LOCI

10.2.6.2.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) define the term loci;
b) define the locus of a moving point.

10.2.6.2S11 Definition

10.2.6.2.S12 Construction;
i) circle,
ii) cycloid,
iii) involute,
iv) archimedean spiral,
v) loci of moving mechanism.

10.2.6.3.S CURVED FIGURES

10.2.6.3.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) blend straight lines with curves;
b) sketch by free hand an object with curved features in two dimensions;
c) construct curved features on both two and three dimensional drawings.

10.2.6.3.S11 Blending of straight lines with curves
i) free hand sketching.

10.2.6.3.S12 Construction of
i) isometric circles,
ii) oblique circles,
iii) cylinders,
iv) prisms.

10.2.7.S SOLID GEOMETRY II (12 HOURS)

10.2.7.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) project the points of intersection of regular solids;
b) develop the surfaces of intersecting solids.

10.2.7.S11 Projection of lines of intersection
i) locating the lines and curves of intersection.

10.2.7.S12 Development of intersecting surfaces
i) prisms,
ii) cylinders,
iii) cones.

10.2.8.S PICTORIAL DRAWINGS II (18 HOURS)

10.2.8.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
a) construct isometric drawings of solids having sloping faces and curved features;
b) construct oblique drawings of solids having sloping faces and curved features;
c) construct isometric and oblique dawings of conic solids;
d) convert from given orthographic projection to pictorial drawing.

10.2.8.S11 Isometric drawing of cylinders

10.2.8.S12 Oblique drawing of cylinders

10.2.8.S13 Isometric and oblique drawing of conic solids

10.2.4.S14 Conversion of orthographic projection to isometric and oblique drawings.

10.2.9.S ORTHOGRAPHIC PROJECTION II (20 HOURS)

10.2.9.S1 Specific Objectives

At the end of this topic, the trainee should be able to:-
   a) draw simple working drawings in orthographic projection;
   b) assemble simple drawings.

10.2.9.S11 Ist and 3rd angle projections

   i) plan view,
   ii) front elevation,
   iii) end elevation,
   iv) horizontal sections,
   v) vertical sections,
   vi) hidden detail.

10.2.9.S12 Simple assembly drawings;

   i) Relationship of different parts in an article.

EQUIPMENT LIST FOR A CLASS OF TWENTY	NO. REQUIRED
1. Drawing room	1
2. Drawing desks/tables	21
3. Drawing boards (A2)	21
4. Tee squares	21
5. Set square 45°/45°	21
6. Set square 30°/60°	21
7. Protractors	21
8. Compasses	21
9. Rulers—300 mm	21
10. Scale rules	21
11. Pencils HB	21
12. Pencils 2H	21
13. Erasers—soft pencils type	
14. Plain drawing paper, A2, A3, A4	
15. Squared grid paper	
16. Templates (french curves)	
17. Pencil sharpeners	
18. Tracing paper	
19. Drawing board clips or masking tape	
20. Chalkboard instruments	
• compass	
• set squares 30°/45°	
21. Suitable storage facilities for drawings and equipment.	

11.0 MOTOR VEHICLE MECHANICS

11.01 Introduction

The aim of the Motor Vehicle Mechanics trade theory is to help the trainee understand the working principles and methods of rectifying faults in any type of motor vehicle. This will assist him to handle the trade practice efficiently and will take 10% of the total trade subject time.

11.02 General Objectives

At the end of this Subject the trainee should have:-

a) developed safety awareness that is required in a motor vehicle shop;
b) the ability to interpret simple sketches of vehicle systems and components;
c) equipped himself with knowledge for proper use and care of motor vehicle tools and equipment;
d) understood how each part of motor vehicle components work;
e) the ability to explain the procedure of procuring spare parts and materials;
f) the knowledge of organizing and managing a small workshop.

1ST YEAR TRADE THEORY
(79 HOURS)

TOPICS	SUB-TOPICS	TIME (HOURS)
11.1.T Introduction	• History of automobile • Occupational information	2
11.1.2.T Safety	• Personal safety • Tools safety • Material safety • First Aid • Fire control	4
11.1.3.T Tools and Equipment	• Marking out tools • Measuring tools • Cutting tools • Fastening tools • Jacks and cranes	6
11.1.4.T Vehicle Layout	• Main units • Position of units • Sketching of the layout	4
11.1.5.T Engine	• Types • Major engine parts • Defects • Sketching of engines parts	10
11.1.6.T Transmission	• Main units • Functions of components	6
11.1.7.T Suspension	• Types • Sketching • Function	6
11.1.8.T Wheels (Tyres, Rims, Tubes)	• Types • Care	3