ENGINEERING DRAWING

ENME 158

Lecture : 2 **Year : I**
Tutorial : 0 **Part : II**
Practical : 4

Course Objectives:

To develop basic projection concepts with reference to points, lines, planes and geometrical solids. Also, to develop sketching and drafting skills to facilitate communication.

1 Instrumental Drawing, Technical Lettering Practices and Techniques (1 hour)

1.1 Equipment, materials and drawing sheets
1.2 Description of drawing instruments, auxiliary equipment and drawing materials
1.3 Techniques of instrumental drawing
1.4 Pencil sharpening, securing paper, proper use of T- squares, triangles, scales dividers, compasses, erasing shields, French curves, inking pens
1.5 Line: Types and uses, thickness

2 Dimensioning (1 hour)

2.1 Fundamentals and techniques
2.2 Size and location dimensioning, SI conversions
2.3 Scales: Types and representative factor
2.4 Use of scales, measurement units, reducing and enlarging drawings
2.5 Placement of dimensions: Aligned and unidirectional, chain, parallel/baseline and combined type
2.6 Tolerance dimensioning

3 Geometrical Construction (2 hours)

3.1 Plane geometrical construction: Proportional division of lines, trisection of angles, smooth arc and line tangents
3.2 Methods for drawing regular polygons and standard curves such as ellipses, parabolas, hyperbolas, involutes, spirals, cycloids and helices (Cylindrical and conical), ogee curve
3.3 Techniques to reproduce a given drawing (By construction)

4 Basic Descriptive Geometry (4 hours)

4.1 Introduction to orthographic projection, principal planes, four quadrants or angles
4.2 Projection of points on first, second, third and fourth quadrants
4.3 Projection of lines: Parallel to one of the principal planes, inclined to one of the principal plane and parallel to other, Inclined to both principal planes, traces of a line
4.4 Projection planes: Perpendicular to both principal planes, parallel to one of the principal planes and Inclined to one of the principal planes, perpendicular to other and Inclined to both principal planes
4.5 True length of lines: Horizontal, inclined and oblique lines
4.6 Rules for parallel and perpendicular lines
4.7 Point view or end view of a line
4.8 Shortest distance from a point to a line
4.9 Edge view and true shape of an oblique plane
4.10 Angle between two intersecting lines
4.11 Intersection of a line and a plane, visible portion of line
4.12 Angle between a line and a plane
4.13 Dihedral angle between two planes
4.14 Shortest distance between two skew lines
4.15 Angle between two non-intersecting (Skew) lines

5 Multi View (Orthographic) Projections (8 hours)

5.1 Orthographic projections
  5.1.1 First and third angle projection
  5.1.2 Principal views: Methods for obtaining orthographic views, projection of lines, angles and plane surfaces, analysis in three views, projection of curved lines and surfaces, object orientation and selection of views for best representation, full and hidden lines
  5.1.3 Orthographic drawings: Making an orthographic drawing, visualizing objects (Pictorial view) from the given views
  5.1.4 Interpretation of adjacent areas, true-length lines, representation of holes, conventional practices
5.2 Sectional views: Full, half, offset, broken (Partial), rotated/aligned, revolved, removed (Detail) sections, phantom of hidden section, specifying cutting planes for sections, convention practices
5.3 Auxiliary views: Basic concept and use, drawing methods and types, symmetrical and unilateral auxiliary views, auxiliary sectional views

6 Developments and Intersections (7 hours)

6.1 Introduction and projection of solids with points transfer
6.2 Developments: General concepts and practical considerations, triangulation method for approximate development of surfaces of a right/oblique; Prism, cylinder, pyramid, cone, prism and cylinder cut by oblique planes,

frustum/truncated pyramid and cone, transition pieces for connecting different shapes and sphere

6.3 Intersections: Lines of intersection of geometric surfaces, piercing point of a line and a geometric solid, intersection lines of two planes, intersections of – prism and prism, cylinder and prism, cylinder and cylinder, pyramid and prism, cone and prism, pyramid and cylinder, cone and cylinder

7 Pictorial Drawings (7 hours)

7.1 Classifications: Advantages and disadvantages

7.2 Isometric view

- 7.2.1 Axonometric projection
- 7.2.2 Isometric projection and isometric drawing (View)
- 7.2.3 Isometric and non-isometric lines; Isometric and non-isometric surfaces
- 7.2.4 Angles in isometric drawing
- 7.2.5 Circles and circular arcs in isometric and non-isometric surfaces (Slopes)
- 7.2.6 Irregular curves in isometric drawing
- 7.2.7 Isometric sectional views

7.3 Oblique drawing

- 7.3.1 Procedure for making an oblique drawing
- 7.3.2 Rules for placing objects in oblique drawing
- 7.3.3 Angles, circles and circular arcs in oblique drawing

7.4 Perspective projection

- 7.4.1 Terms used in perspective projection
- 7.4.2 Parallel and angular perspective
- 7.4.3 Selection of station point
- 7.4.4 Perspective projection of right prism and pyramid solid

Assignments

1. Geometrical construction
2. Descriptive geometry
3. Multi-view Projection I
4. Multi-view Projection II
5. Surface development and intersection
6. Isometric drawing
7. Oblique drawing and perspective projection

Practical (60 hours)

1. Drawing sheet layout, freehand lettering, scale, common graphical symbols, sketching of parallel lines, circles, dimensioning
2. Geometrical construction (Sketch and instrumental drawing)
3. Descriptive geometry I (Sketch and instrumental drawing)
4. Descriptive geometry II (Sketch and instrumental drawing)
5. Multiview drawings I (Sketch and instrumental drawing)

6. Multiview drawings II (Sketch and instrumental drawing)
7. Multiview, sectional drawings and dimensioning (Sketch and instrumental drawing)
8. Auxiliary view, sectional drawings and dimensioning (Sketch and instrumental drawing)
9. Projection of regular geometrical solids with point transfer (Sketch and instrumental drawing)
10. Surface development of solids I (Sketch and instrumental drawing)
11. Surface development of solids II (Sketch and instrumental drawing)
12. Intersection of solids (Sketch and instrumental drawing)
13. Isometric drawing I (Sketch and instrumental drawing)
14. Isometric drawing II (Sketch and instrumental drawing)
15. Oblique drawing and perspective projection (Sketch and instrumental drawing)

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks Distribution *
1, 2 and 3	4	3
4	4	3
5	8	9
6	7	8
7	7	7
Total	**30**	**30**

* There may be minor deviation in marks distribution.

References

1. Luzadder, W.J., Duff, J.M. (1989). Fundamentals of engineering drawing: With an introduction to interactive computer graphics for design and production (Latest Edition). Prentice-Hall.
2. French, T.E., Vierck, C.J., Foster, R.J. (1993). Engineering drawing and graphic technology (Latest Edition). McGraw-Hill.
3. Giesecke, F.E., Mitchell, A., Spencer, H.C., Dygdon, J.T. (2016). Technical drawing with engineering graphics. Peachpit Press.
4. Bhatt, N.D. (2023). Elementary engineering drawing. Charotar Publishing House.
5. Gill, P.S. (2016). Engineering drawing. S. K. Kataria & Sons.
6. Dhawan, R.K. (2019). A textbook of engineering drawing. S. Chand and Company.
7. Luintel, M.C. (2021). Engineering Drawing I. Heritage Publishers & Distributors.
8. Luintel, M.C. (2020). Engineering Drawing II. Heritage Publishers & Distributors.