Engineering Drawing I
EG 1101 AR

Year: I **Total: 5 hours /week**
Semester: I **Lecture: 1 hour/week**
Tutorial: hours/week
Practical: 4 hours/week
Lab: hours/week

Course description:
This course is designed to provide knowledge and skills on geometrical shapes, and its construction procedure, and interpretation of the views of objects by orthographic projection.

General objectives:
After the completion of this course students will be able to:
1. Handle drawing instruments and materials;
2. Identify Geometrical construction and shape;
3. Describe the scale, its type and construction;
4. Draw different types of engineering curves and
5. Draw and interpret the multi view of solids with scale and dimensioning.

Course Contents:

Theory

Unit 1: Introduction of Engineering Drawing: [2 Hrs.]
1.1 Types of drawing i.e. Engineering drawing and Artistic drawing and Engineering drawing define as Graphical language or universal language of engineering technical persons.
1.2 Introduction of drawing material i.e. drawing as drawing paper, drawing board, adhesive tape, pencil, eraser, sharpener etc.
1.3 Drawing tools like set square, compass divider etc.
1.4 Conventional line and its type and their uses and line weight
1.5 Drawing paper size and simple graphical symbols of civil works (at least 10 symbols).
1.6 Practical exercise of horizontal, vertical, inclined line using the Drawing tools and material with symbols and paper sizes. (Sheet No. 1)

Unit 2: Lettering, scales and dimensions: [4 Hrs.]
2.1. Lettering [1 Hr.]
2.1.1 Introduction of single stroke letter and their ratio between height and breadth.
2.1.2 Introduction of upper- and lower-case letter.
2.1.3 Introduction of Vertical and inclined (*italic*) letter (with inclined angle).
2.1.4 Practical exercise of letter writing using the guide lines of vertical and italic letter, (Sheet No 2).
2.2. Scale [1.5 Hrs.]
2.2.1 Introductions of scale and importance
2.2.2 Types of scale (full, reducing and enlarge)
2.2.3 Construction of scale using the representative factor.
2.3. Dimensioning [1.5 Hrs.]
2.3.1 Introduction of dimensioning.
2.3.2 Terminology of dimensioning i.e. Dimension line, extension line leaders line etc.
2.3.3 Termination of dimension line using arrowhead, slash and dot.

2.3.4 Dimensioning System-Aligned system, unidirectional system and base line dimensioning.
2.3.5 Principles of dimensioning.
2.3.6 Dimensioning pictorial views and orthographic view

Unit 3: Geometrical constructions: [2 Hrs.]

3.1. Geometric primitives (line, triangle, quadrilateral, regular polygons and circle and its name of its parts).

3.2. Division

3.2.1 Division of line – Bi-section of line, tri-section of line, division of line in any number of parts and division of the line in proportionally
3.2.2 Division of circle- Division of circle in three, four, five, six, seven and eight parts.
3.2.3 Division of angle- bi-section and trisection.
3.2.4 Division of triangle and trapezium in any number of equal parts of area.

3.3 Construction of triangle, square and regular polygons.
3.4 Inscribing and describing of circle in/on triangle or polygons.
3.5 Tangency- open and crossed line tangent, Arc tangent –internal, external and combined Arc tangent.

Unit 4: Engineering Curve: [1 Hr.]

Introduction of following curves:

4.1 Involutes
4.2 Spiral
4.3 Cycloid
4.4 Helices

Unit 5: Conic- Section: [1 Hr.]

5.1 Cone and its parts name
5.2 Introduction of sectional plane
5.3 Definition of conic section
5.4 Terminology of conic section after the cut by sectional plane (As ellipse, Parabola and Hyperbola)

Unit 6: Orthographic Projection:

6.1 Introduction of orthographic projection [2 Hrs.]

6.1.1. Theory of projection
6.1.2. Four quadrant, plane of projection
6.1.3. Introduction of co-ordinate or three-dimensional axis
6.1.4. System of orthographic projection
6.1.5. Making of orthographic view
6.1.6. Analysis of object and its view

6.2 Point and line projection [0.5 Hr.]

6.2.1. Notation system on HP, VP and PP
6.2.2. Location of point /line i, e. where it is and projection on plane of projection
6.2.3. Position of line: - Perpendicular to one plane and parallel to the other, parallel to both plane and inclined to one or both planes

6.3 Plane projection [0.5 Hr.]

6.3.1. Perpendicular to one plane and parallel to the other, perpendicular to both planes, perpendicular to one plane and inclined to the other

6.4 Projection of solids **[2 Hrs.]**

6.4.1. Orthographic projection of geometrical solid i.e. prism, cylinder and cone in simple Position. (simple position means axis- perpendicular to one plane (HP) and parallel to (VP) axis parallel to both planes

6.4.2. Orthographic projection of different model or work pieces. (at least 10 to 15 model pieces)

Practical (Class work sheet)

Sheet No 1: **[6 Hrs.]**

1. Draw horizontal, vertical, inclined (45°, 135°, 30°,60°,120°,150°,75°,105° degree) line and circle using the drawing tools**,**
2. Draw line type-visible (boarder), construction, dashed, (thick and thin), centre line, dimension, extension, leader line, section line, wavy line, continuous or short/break up line.

Sheet No 2: **[6 Hrs.]**

1. Practice free hand lettering exercise on upper and lower-case vertical letter using horizontal and vertical guide line (at least one set).
2. Practice free hand lettering exercise on upper and lower-case inclined letter with numerical using the horizontal and vertical guide line (at least one set).
3. Practice free hand lettering exercise on upper case letter using horizontal guide line of different height letter of 10 to 3mm height.
4. Draw symbols of general civil /electrical/ plumbing work.
5. Perform paper size scheduling work (A0 to A4 size).

Sheet No 3: **[3 Hrs.]**

1. Perform dimensional practicing exercise on aligned, unidirectional and base line dimension
2. Perform scale construction

Sheet No 4: **[9 Hrs.]**

1. Perform Line- bisection, trisection, line division any number of parts, with proportional division, circle division in three, four five, six, seven and eight parts, area of triangle and trapezoid division any number of equal parts.
2. Construct triangle by given sides, making equilateral triangle/square and regular Polygons (pentagon, hexagon, heptagon etc.)
3. Find the centre of Arc, making the circle touching the three points. Describing the circle on triangle, inscribe the circle in right angle triangle, Equilateral triangle, and scalene triangle and inscribing the circle in a sector.
4. Draw tangent from any point on circle, open and crossed line (belt) tangent. Arc Tangent-Internal, External and combined.

Sheet No 5: **[6 Hrs.]**

Draw:

1. Involutes- Line, triangle and circular involutes with tangent.
2. Spiral construction (mentioning the pole, vector radius, vector angle and Convolution)
3. Cycloid – Cyclonical curve with tangent
4. Helices- Cylindrical helix with pitch angle, conical helix.

Sheet No 6: **[6 Hrs.]**

Draw:

1. Ellipse-Concentric circle, oblong (Rectangle), Foci and Eccentricity method.
2. Parabola-Rectangle, offset, Tangent and Eccentricity method.
3. Hyperbola- Rectangle and Transverse axis method.

Sheet No 7: **[6hrs]**

Perform/draw:

1. Point projection- Point projection by given location by first and third angle projection (At least two exercise)
2. Line projection-perpendicular to one plane and parallel to other plane, parallel to both planes, parallel to both planes inclined to one or both planes.

Sheet No 8: **[3 Hrs.]**

Perform/draw**:**

1. Plane of projection-Perpendicular to one plane and parallel to other, perpendicular to both the planes, perpendicular to one plane and inclined to other (At least three exercise)

Sheet No 9: **[3 Hrs.]**

Perform/draw:

1. Solid projection-Orthographic projection of simple geometrical solid in first and third angle projection.

Sheet No 10: **[12 Hrs.]**

1. Analyze the view and draw orthographic projection of flat, inclined and circular surfaced model (At least 15 exercises) of the given objects.

References:

1. Luzzadar W. I Fundamental of Engineering drawing. Prentice-Hall of India
2. S. Bogolyubov and A. Voinov, Engineering drawing. Mir Publishers, Moscow.
3. S. K Bogolyubov, Exercises in Machine Drawing. Mir publishers, Moscow.
4. K. Venugopal Engineering Drawing and Graphics, New age international (p) Ltd. India
5. Gill. P. S. Engineering Drawing, S. K. Kataria and sons India.
6. M. B. Shah and B.C. Rana, Engineering Drawing, Pearson India,
7. N. D. Bhatta and Panchal V.M. Engineering Drawing Charotar publishing House India.