LAB Planning for Semester - I & II (Academic year: 2013-14)

Teaching scheme

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<th>Subject</th>
<th>LECTURE (hours / Week)</th>
<th>PRACTICAL (hours / Week)</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Engineering Graphics</td>
<td>02</td>
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Evaluation scheme

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<th>Marks</th>
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<td>GTU</td>
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<td>Theory Progressive Assessment</td>
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<td>(20 marks-Internal exam)</td>
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<td>(10 Active Learning Assignment)</td>
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<td>Practical Viva</td>
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<td>Practical Progressive Assessment</td>
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<td>(Continuous Assessment)</td>
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SYLLABUS

ENGINEERING GRAPHICS

1. Introduction to Engineering Graphics, Drawing instruments and accessories, BIS – SP 46. Use of plane scales and Representative Fraction.
2. **Engineering Curves:** Classification of Engineering Curves, Construction of Conics, Cycloid Curves, Involutes and Spirals.

3. **Projections of Points & Lines:** Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length of the line and its inclination with the reference planes.

4. **Projections of Planes:** Concept of different planes, Projections of planes with its inclination to one reference plane and with two reference planes. Concept of auxiliary plane method for projections of the plane.

5. **Projections of Solids & Section of Solids:** Classification of solids. Projections of solids like Cylinder, Cone, Pyramid and Prism with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section.

6. **Orthographic Projections:** Principle of projection, Principal planes of projection, Projections from the pictorial view of the object on the principal planes for View from Front, View from Top and View from Side using first angle projection method and third angle projection method, Full Sectional View.

7. **Isometric Projections and Isometric View or Drawing:** Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.

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**Text Books:**

   
   S.Chand & Company Ltd., New Delhi

   
   S.Chand & Company Ltd., New Delhi
3. Elementary Engineering Drawing By N.D.Bhatt
Charotar Publishing House, Anand

Charotar Publishing House, Anand

**Reference Books:**

1. Engineering Graphics – I and II By Arunoday Kumar
Tech – Max Publication, Pune

2. Engineering Drawing & Graphics using Auto CAD 2000 By T. Jeyapoovan
Vikas Publishing House Pvt. Ltd., New Delhi

S.Chand & Company Ltd., New Delhi

S.K.Kataria & sons, Delhi

5. Engineering Drawing with an Introduction to AutoCAD By D.A.Jolhe

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**LIST OF DRAWING INSTRUMENTS**

1. A2 size Drawing sheet & Sketch Book

2. 45 degree- 200mm & 30-60degree 250mm length set squares

3. Large size compass with interchangeable Pencil & pen legs
4. Transparent Scale -30cm

5. Drawing Pins or clips

6. Pencils

7. Roller Scale

8. Eraser

9. Pro-circle

10. Container
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Sheet No - 1  PRACTICE SHEET & DIMENSIONING SYSTEM

1. TYPES OF LINE

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<th>Sr.</th>
<th>TYPES</th>
<th>ILLUSTRATION</th>
<th>APPLICATION</th>
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<tr>
<td>1</td>
<td>CONTINUOUS THIN</td>
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<td>2</td>
<td>CONTINUOUS THICK</td>
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<td>3</td>
<td>HIDDEN / DASHED</td>
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<td>Refer Book of Engineering Graphics</td>
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<tr>
<td>4</td>
<td>LONG CHAIN THIN</td>
<td></td>
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<tr>
<td>5</td>
<td>LONG CHAIN THICK AT ENDS AND THIN ELSEWHERE</td>
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2. ALPHABATES AND NUMBERS
   a. A B C ... ... X Y Z and DRAWING IS THE LANGUAGE OF ENGINEERS.
   b. 0 1 2 3 4 5 6 7 8 9

3. Systems of Dimensioning (Draw any figure and insert dimensions)
   a. Aligned System
   b. Unidirectional System

   ![Aligned System](image1)
   ![Unidirectional System](image2)

4. Division of Line
   a. Divide 70 mm into 6 equal parts.
   b. Divide 90 mm into 7 equal parts

5. Draw all Regular Polygons on same axis. Square, Pentagon, Hexagon, Heptagon, Octagon.

   [Draw All problems in Lab Sketch Book and in Drawing Sheet.]

Sheet No - 2  ENGINEERING SCALE (PLAIN SCALE)
1. Define Representative Fraction. Construct a plain scale of R. F. 1:50 to show meters and decimeters and long enough to measure up to 8 metres. Indicate 6.8 m distance on scale.

2. Construct the plain scales to show kilometers and hectometers when 25mm is equal to 1 km and long enough to measure up to 6 km. find the RF and show a distance of 3 Km and 4 Hectometer on the scale.

3. A map of size 500cm X 50cm wide represents an area of 6250 Square Kms. Construct a plain scale to measure kilometers, hectometers and decameters and long enough to measure up to 7 km. indicate on it a) 5.3 km b) 60hectometers.

4. Construct a plain scale of 1:60000 to read kilometers and hectometers and long enough to show 7.5 km. Show on this scale the distance 0.4km,3.9 km and6.2 km.

5. A rectangular garden of area 196 square meter is shown on a map by a similar rectangle of 4 square cm. Construct a plain scale to read up to single meter and long enough to measure up to 9.8 decameters. Show the distances of (a) 2.2 decameters (b) 5.7 decameters and (c) 9.7 decameters.

[Draw All problems in Lab Sketch Book and in Drawing Sheet.]

Sheet No – 3ENGINEERING SCALE (DIAGONAL SCALE)

1. A rectangular plot of land measuring 1.28 hectares is represented on a map by a similar rectangle of 8 sq. cm. Calculate RF of the scale. Draw a diagonal scale to read single meter. Show a distance of 438m on it.

2. The length of Khandala tunnel on Mumbai-Pune Express way is 330 m. On the road maps it is shown by 16.5 cm long line. Construct a scale to show meters and to measure up to 400 m. Show the length of 289 m long on the expressway.
3. Distance between Ahmedabad and Bombay is 500Km. It is represented on a railway map by 10 cm. Construct a diagonal scale to measure kilometers. Show on scale the distance between Ahmedabad and Surat which is 237 Km. And the distance between the Ahmedabad and Vadodara is 110Km.

4. Draw a full-size diagonal scale to show 0.1 millimetre and long enough to measure up to 5 centimetres. Show on this scale the following distances. (a) 0.1 millimetre (b) 2.35 centimetres and (c) 4.89 centimetres.

5. A tunnel on the Konkan Railway route has a size of 640m X 10m X 10m. It is represented on a model by the volume of 27 cubic cm. Find RF. Devise a diagonal scale of this RF to read up to 300 m. Show the distances of 299m, 171m and 9m on it.

[Draw All problems in Lab Sketch Book and in Drawing Sheet.]

Sheet No – 4 ORTHOGRAPHIC PROJECTIONS

1. Draw the front view, top view and Right hand side view of the object given in Figure 1. Use Third angle projection method.
2. Draw the following view for Figure 2 using First Angle projection method (a) Elevation viewing from X (b) Top view (c) Side view from Right.
Sheet No – 5

SECTIONAL ORTHOGRAPHIC PROJECTIONS

1. Draw the following views using first angle projection method.
   (1) Sectional Elevation from X (2) Top view (3) Right hand side view.

2. Draw the following views using Third angle projection method.
   (1) Sectional Elevation from X (2) Top view (3) Right hand side view.

[Draw All problems in Lab Sketch Book and in Drawing Sheet.]
[Draw All problems in Lab Sketch Book and in Drawing Sheet.]

Sheet No -6  ENGINEERING CURVES-I

1. Draw an ellipse of major diameter 80 mm and minor diameter 50 mm, half by concentric circle method and half by oblong method.  
   (GTU-Jun 2010)

2. Construct the ellipse if the conjugate axes are 120mm and 90mm with an inclined angle of 75°. Draw the major axis and minor axis of the ellipse. Draw the tangent and the normal to the ellipse at given point.

3. The major axis of ellipse is 120 mm and the minor axis is 80 mm. Draw an ellipse by Arc of Circle method. And find the distance between the the focuses.

4. Draw a parabola in the parallelogram of 60 mm x 40 mm and included angle is 60°.

5. The distance between Directrix and focus point is 70 mm. Draw the curves having eccentricity 2/3, 1 and 3/2. Name the curves. And draw Normal & Tangent of its.  
   (GTU-Sep 2009)

6. Construct the parabola by tangent method if the base is 80mm and the axis is 50mm.

7. Draw Parabola with base 105 mm and axis length 98mm with Rectangle method.

8. Draw a Hyperbola with Rectangular method with point P0 (50,40).Draw Normal and Tangent of its.

9. Draw a Hyperbola with Oblique method. The asymptotes are at 75° with point P0 (50,40). Draw Normal and Tangent of its.

10. A wheel of diameter 50mm rolls over the straight line for one complete rotation. Draw the path traced by the point P which is initially at the point of the contact between the wheel and the straight line. Name the curved.  
    (GTU-March 2009)
11. A wheel of diameter 60 mm is rotating without slipping on another wheel of diameter 160 mm for one complete revolution. Draw a path traced by a point which is at the contact point of both the circle at the starting point. Also draw the path, if the smaller circle is rotating inside the bigger circle. Name the curves. And draw Normal and Tangent of its.

(GTU-Jan 2009)

[Draw All problems in Lab Sketch Book and only ODD No. of problems in Drawing Sheet.]

Sheet No -7 ENGINEERING CURVES-II

1. A string is unwound to a length of 120 mm from a drum of diameter 30 mm. Draw the locus of the free end of the string which is held tight during unwinding.

(GTU-Jun 2009)

2. Construct a Involute of circle of 30mm diameter for one turn. Darw Tangent and Normal to the involute at any point of it.

3. Construct Involute of Square of side 25mm and Hexagon of side 20mm. Also draw Normal & Tangent of it.

4. Draw an involute of a circle arc which subtends an angle of 90° at the centre of the circle of diameter of 120 mm.

5. A line segment of length 10 mm is wounded by a string for five revolutions. Draw a path traced by the end point and name the curve.

(GTU-Jan 2010)

6. A point P moves towards another point O,75 mm from it, and reaches it during 1 ¼ revolution around it in clockwise direction. Its movements towards O is uniform with its movements around it. Draw the curve traced out by the point P and name it.

(GTU-Jan 2011)

7. Construct an Archimedean spiral of one and half convolution given the greatest and shortest radius as 84mm and 00mm respectively. Draw the tangent and normal at point 60mm away from the pole.

(GTU-June 2012)

8. Draw a spiral of minimum radius 25 mm and maximum radius 75 mm. Draw Normal & Tangent of it.

9. Construct the Logarithmic Spiral of one convolution. The length of the shortest radius vector is 10mm. The ratio of the length of successive radius vectors is 9/8 for vertical angle 30°. Draw tangent and normal to the spiral at any point.
[Draw All problems in Lab Sketch Book and only ODD No. of problems in Drawing Sheet.]

Sheet No.-8

**PROJECTIONS OF POINTS AND LINES**

1. Draw the projection of the following points on the same ground line, keeping the projectors 25mm apart.
   
   - In the H.P. and 20mm behind the V.P.
   - 40mm above the H.P. and 25mm in front of the V.P.
   - In the V.P. and 40mm above the H.P.
   - 25mm below the H.P. and 25mm behind the V.P.
   - 15mm above the H.P. and 50mm behind the V.P.
   - 40mm below the H.P. and 25mm in front of V.P.

2. A line CD 90 mm long has its Point C is 12 mm above the H.P. and 18 mm in front of the V.P. A line CD is inclined at 45° to HP and 30° to VP. Draw the projection of line and find out its plan length, elevation length and its apparent inclination with H.P. and V.P.

3. A line AB, 80 mm long is inclined at 45° to HP and 30° to VP. Its midpoint C is in VP and 15 mm above HP. The end A is in the third quadrant and B in the first quadrant. Draw the projections of the line.
   
   (GTU JAN-2010)

4. A line CD has its end C is 15mm above H.P. and 10mm in front of V.P. The end D is 60mm above H.P. The distance between the end projectors is 50mm. The line is inclined to H.P. by 25°. Draw the projections and find its inclination with V.P. and true length of line CD and draw also traces.
   
   (GTU MARCH-2010)

5. A line AB, 60mm long, makes an angle of 60° with the H.P. and lies in an A.V.P. which makes an angle of 45° with the V.P. Its end A is 10 mm away from both H.P. and V.P. Draw the Projection of AB and determines (i) its inclination with V.P. and (ii) its traces. Assume the line in the first quadrant.

6. A line PQ, 80 mm long has its end P 15 mm above the H.P. Line makes an angle of 30° with the H.P. and 45° with the V.P. End Q of the line is 10 mm in front of V.P. Draw the projections of the line considering it in first quadrant.
   
   (GTU SEP-2009)

7. A line PQ 70 mm long has its end P in VP and end Q in HP. Line is inclined to HP by 60° and VP by 30° and it is 20mm away from Profile Plane. Draw the projection and find Traces of line PQ.
   
   (GTU JAN-2010)

8. A line AB, 90 mm long inclined at 45° to the H.P. and its top view makes an angle of 60° with the V.P. The end A is in the H.P. and 12 mm in front of the V.P. Draw it’s front view and find its true inclination with the V.P.
9. A line AB, 75 mm long, has its end A 20 mm below H.P. and 25 mm behind V.P. The end B is 50 mm below H.P. and 65 mm behind V.P. Draw the projections of line AB and finds its inclinations with H.P. and V.P.

[Draw All problems in Lab Sketch Book and only ODD No. of problems in Drawing Sheet.]

Sheet No - 9 PROJECTIONS OF PLANE

1. ABCDE is a regular pentagonal plate of 40 mm sides, has its corner A on the H.P. the plate is inclined at 30° to the H.P. such that the side CD is parallel to both the reference planes. Draw the projection of plate. (GTU JUN-2009)

2. A pentagon of 40 mm side is resting on one of its corners on the VP. The edge opposite to that corner makes an angle of 30° to the HP. The surface of the pentagon is inclined at 45° to the VP. Draw its projections. (GTU MARCH-2010)

3. A circular plane of 60 mm diameter is resting on H.P. on a point A of its circumference. The plane is inclined at 30° to the H.P. The diameter AB of the plane makes an angle of 45° with the V.P. Draw the projection of the circular plane. (GTU MARCH-2009)

4. A circular plate of negligible thickness and 50 mm diameter appears as an ellipse in the front view, having its major axis 50 mm long and minor axis 30 mm long. Draw its top view when the major axis of the ellipse is horizontal.

5. A regular hexagonal plane of 30 mm side has one of its corners on the H.P. The surface of the plane is inclined at 30° to H.P. Draw the projection of the plane when diagonal passing through the corner on H.P. makes an angle of 45° to the V.P.

6. A square plate of side 60 mm is held on a corner on H.P. Plate is inclined to the H.P. such that the plan of it is rhombuses with a diagonal of 30 mm. Determine the angle it makes with H.P. The other diagonal is inclined at 45° V.P. Draw the projection of plate. (GTU JUN-2009)

7. An isosceles triangular plane XYZ having its base XY = 50 mm and altitude 60 mm is resting on HP on its base XY with its surface making an angle of 45° to HP. The base XY which is in HP makes an angle of 60° to VP. Draw projection of plane. (GTU JAN-2009)

8. A thin rectangular plate of 60 x 30 mm has its shorter side in the V.P. and inclined at 30° to the H.P. Project its top view, if its front view is a square of 30 mm long sides.

9. ABCD is a rhombus of diagonals AC = 100 mm and BD = 70 mm. Its corner A is in the HP. And the plane is inclined to the H.P. such that its plan appears to be a square and the plan of the diagonal AC makes angles of 20° to the V.P. Draw the projections of the plane and find its inclination with H.P. (GTU JAN-2011)

10. An isosceles triangular plate ABC has its base 45 mm and altitude 60 mm. It is so placed that the front view is seen as an equilateral triangle of 45 mm side and (i) base is inclined at 45° to HP, (ii) side is inclined at 45° to HP. Draw its plan when its corner A is on HP. (GTU JAN-2010)
Sheet No – 10 PROJECTIONS OF SOLID

1. A hexagonal pyramid, base 25 mm side and axis 55 mm long, has one of its slant edges on the H.P. A plane containing that edge and the axis is perpendicular to the H.P. and inclined at 45° to the V.P. Draw its projections when the apex is nearer to V.P. than the base.

2. A square pyramid, side of base 50 mm and height 64 mm, is freely suspended from one of the corners of the base. Draw its projection when vertical plane containing the axis makes an angle of 45° with VP. (GTU JAN-2009)

3. A pentagonal prism of side 30 mm & axis 60 mm is resting on one of the corner of its base on the H.P. The longer edge containing that corner is inclined at 45° to the H.P. The axis of the prism makes an angle of 30° to the V.P. Draw the projections of the solid. (GTU JUN-2009)

4. Draw the Projection of a cube side 40 mm rests on one of its corners on the HP with the solid diagonal perpendicular to the VP. Draw its projection.

5. A cone of diameter 50 mm and height 60 mm, is resting on H.P. on a point of its periphery of base with (i) the axis is making 30° with the H.P and 45° with the V.P. (ii) the axis is making an angle of 30° with the H.P. and the plan of the axis making 45° with the V.P. Draw the projections of the cone.

6. A cylinder of base diameter 50 mm and axis 70 mm rest in the VP, has its inclination to the 30° to the VP and front view of the axis is inclined at 30° to the ground line XY. Draw the projection of the cylinder.

7. A square pyramid, side of base 50 mm and axis length 60 mm is kept on H.P. on one of its base edges in such a way that its axis makes an angle of 45° with H.P. If the base edge which is on H.P. makes an angle of 45° with V.P., draw the projections when apex is 30 mm away from V.P. (GTU JAN-2009)

8. A hexagonal prism is resting on one of its side of base 30 mm, such that axis 60 mm is inclined at 60° to the HP and the side on which it is resting is inclined at 30° to the VP. Draw its projection. (GTU JUN-2009)

9. A circular cone is of 60 mm base diameter and 80 mm long generator. It is resting on the H.P. with one of the points of its base on it and the apex 55 mm above it. Draw the projections of the cone when the plan of the axis is inclined at 45° to the VP. Measure the inclination of cone with the HP. (GTU JAN-2010)

10. A pentagonal pyramid of 35 mm base edge and 70 mm height is resting on the HP with one of its triangular surfaces perpendicular to the HP, and parallel and nearest to VP. Draw its projections. (GTU APR-2010)
Sheet NO -11SECTION OF SOLID

A triangular prism, with a base side of 50mm and an axis length of 70mm, is resting on a rectangular face on the HP, the axis being parallel to the VP. An AIP inclined at 45° to the HP cuts the prism. The cutting plane intersects the axis at a distance of 30mm from one end of the prism. Draw Front View, Sectional Top view and Sectional Side View of the prism.

(GTU APR-2010)

A cone, base diameter 60mm and axis length 60mm is kept on H.P on its base. It is cut by a plane in such a way that the true shape of the section is an isosceles triangle of base 40mm. Draw front view and sectional top view.

(GTU SEP-2009)

A solid made of half cone, diameter of base 60 mm, and half hexagonal pyramid, side of base 30 mm, is having 60 mm height. It is resting on HP on its base with middle edge of base perpendicular to VP. It is cut by an AIP inclined at 30o to HP, passing through a point on axis 12 mm above the base. Draw elevation, plan and true shape of the section.

(GTU JAN-2010)

A square pyramid, base 40mm side and axis 65mm long, has its base on the H.P. and all the edges of the base equally inclined to the V.P. It is cut by a section plane perpendicular to the V.P. inclined at 45° to the H.P. and bisecting the axis. Draw its sectional top view, sectional side view and true shape of the section.

(GTU JUN-2009)

A pentagonal pyramid is resting on H.P. on its base with one of its edges of the base from V.P & parallel to V.P. It is cut by an A.I.P. bisecting the axis, the distance of the section plane from the apex being 20mm. Draw the elevation and sectional plan of the pyramid and the true shape of the section. Find the inclination of the section plane with the H.P.

A tetrahedron of 70mm long edges is lying on H.P. on one of its faces, with an edge of that face perpendicular to the V.P. It is cut by a section Plane perpendicular to both the reference plane in such a way that the true shape of section is an isosceles triangle of 45 mm height. Draw elevation, Plan and Side View when smaller cut Piece of the object is assumed to be removed.

A cone with base circle diameter 60 mm and axis length 75 mm is kept on its base on the ground. It is cut by a sectional plane perpendicular to HP and inclined at 60° to VP at a distance of 8 mm away from the top view of axis. Draw sectional elevation and true shape of the section.

(GTU JAN-2009)

A cylinder, diameter of base 70mm and height 90mm, is resting on HP on the its generators with the axis remaining parallel to VP. It is cut by an A.V.P. inclined to VP to 30° and passing through a point on the axis 50mm from its one end. Draw the projections with the section.

A cone having the diameter of base 80mm and the height 90 mm is resting with its base on the HP. It is cut by A.I.P. inclined at 45° to the HP. The cutting plane passes through the mid points of the axis of the cone. Draw the elevation, the sectional plan and the true shape of the Section.

(GTU MARCH-2009)
Sheet NO - 12  ISOMETRIC PROJECTIONS AND ISOMETRIC VIEW

1. Figure - 1 shows two views of an object. Draw isometric projection using isometric scale.

2. Figure - 2 shows front view and top view of an object. Draw isometric view.

3. Draw the isometric view for the orthographic projection given below in Figure - 3.

4. Figure-4 Show Elevation and plan of bracket, Draw Isometric Projection of the bracket and also draw the Isometric Scale.

[Draw All problems in Lab Sketch Book and in Drawing Sheet.]