

ENGINEERING DRAWING WITH CAD

Course Title :	Engineering Drawing With CAD	Course Code	ME-107
Year	1	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	30:0:60	Credits	2
Methodology	Lecture + Practice	Total Contact Periods:	90
CIE	60 Marks	SEE	40 Marks

COURSE OUTCOMES (CO)

Sl. No	Course Outcome
CO1	Explain scope of engineering drawing, use instruments correctly, apply BIS standards, and prepare neat sheets with simple figures.
CO2	Demonstrate proper lettering, apply BIS dimensioning codes, use aligned/unidirectional systems, and produce clear annotated drawings.
CO3	Operate CAD software, use precision tools, and construct polygons, conic sections, and engineering curves digitally.
CO4	Generate CAD projections of points, lines, and planes, create orthographic views, and apply layers for line conventions.
CO5	Draw CAD projections of solids, create sectional views with cutting planes, and apply hatching conventions digitally.
CO6	Create isometric and oblique drawings in CAD, develop surfaces of solids, and prepare flattened layouts with layers and hatching.

EXAM PATTERN

C0	Exam	Drawing
CO-1 & 2	Mid-1	Manual drawing
CO- 3 & 4	Mid-2	CAD based drawing
CO -5 & 6	SEE	CAD based drawing

COURSE CONTENT

Unit 1: Importance of Engineering Drawing & Instruments

Duration :9 Periods

- Scope & Objectives: Engineering drawing as universal communication tool; role in design & manufacturing; need for BIS standards (SP-46).
- Pencils (grades), erasers, scales, set squares, compass, divider, protractor, French curves; mini drafter for parallel/inclined lines; care & maintenance.
- Concept of reduced/enlarged scales; representative fraction (RF); recommended BIS scales.
- Sheet Sizes & Layout: Standard sizes A0–A5; borders & margins; title block contents (name, roll no., subject, scale, date); neatness & preservation.
- Line Types: Visible, hidden, center, dimension lines; BIS conventions.
- Practice : Practice: Prepare neat A4/A3 sheet with border & title block, draw borders/margins/lettering, use drafter for parallel/inclined lines, circles with compass, construct plain/diagonal scales, practice line types, and draw simple figures (square, rectangle, triangle, circle with inscribed polygon).

Unit 2. Lettering & Dimensioning

Duration : 18 Periods

- Freehand lettering and numbering: types of lettering, guidelines, practicing letters and numbers of sizes (7mm, 10mm, 14mm), use of stencils.
- Dimensioning practice: purpose, BIS code, dimension lines, extension lines, leader lines, arrows, notes, rules.
- Placing dimensions: aligned and unidirectional systems, chain, parallel, progressive, coordinate methods.
- Dimensioning features: circles, arcs, angles, tapers, chamfers, narrow spaces.
- **Practice:** lettering and dimensioning exercises manually with drafter.

UNIT 3. Geometric Constructions & Curves

Duration : 18 Periods

- **Basics of CAD Environment:**
 - Starting CAD software, user interface, coordinate system.
 - Drawing environment setup (units, limits, layers).
 - Basic geometric commands: line, circle, arc, polygon, ellipse.
 - Modify commands: erase, copy, move, rotate, scale, trim, extend, mirror.
 - Display control: zoom, pan, regen.

- Object snaps (e.g., endpoint, midpoint, center, tangent, intersection, etc.) and construction aids (grid, polar tracking, ortho mode, dynamic input, construction lines).
- **Geometric Constructions in CAD:**
 - Division of a line into equal parts.
 - Tangent constructions: tangent lines to circles, tangent arcs between lines and circles, tangent arcs touching two circles.
 - Polygon construction: regular polygons of given side length.
 - Conical curves: ellipse, parabola, hyperbola – construction using CAD commands (ellipse, spline).
 - Special curves: involute, cycloid, helix – engineering applications (gear tooth, screw threads, springs).
- **Practice in CAD:**
 - Create simple 2D figures using draw and modify tools.
 - Save, open, and manage drawing files.
 - Layer management and text insertion.
 - Construct curves using ellipse, polygon, spline, and helix commands.

UNIT 4. Projection of Points, Lines, Planes & Orthographic Projections

Duration : 18 Periods

- **Projection of Points:** on two planes (HP, VP) using CAD.
- **Projection of Lines:** parallel to both planes, perpendicular to one plane, inclined to one plane and parallel to the other.
- **Projection of Planes:** perpendicular to HP and parallel to VP; perpendicular to HP and inclined to VP, and vice versa.
- **Orthographic Projections:**
 - Meaning, concept of front, top, side views; first angle projection.
 - Positioning of three views; use of miter line.
 - Hidden lines representation; minimum views to describe an object.
- **Practice in CAD:**
 - Generate orthographic views using CAD tools.
 - Apply layers for visible, hidden, and center lines.
 - Use CAD commands for projection and view generation.

5. Projection of Solids & Sectional Views

Duration : 18 Periods

- **Projection of Regular Solids:** cube, prism, cylinder, cone, pyramid.
 - Axis perpendicular to one plane.
 - Axis parallel to VP and inclined to HP, and vice versa.
- **Sectional Views:**
 - Need, cutting plane line, purpose, selection of cutting plane.
 - Section of solids: solids inclined to one plane and parallel to the other.

- **Hatching:** conventions (angle and spacing).
- **Practice in CAD:**
 - Draw projections of solids using CAD commands.
 - Create sectional views with cutting planes.
 - Apply hatch patterns digitally.

UNIT 6. Pictorial Drawings & Development of Surfaces

Duration : 9 Periods

- **Pictorial Drawings in CAD:**
 - Isometric and oblique drawings using CAD tools.
 - Iso axis, isometric scale, isometric and non-isometric lines.
 - Isometric drawing of rectangles, circles (using isocircle), and simple objects in CAD using isoplane mode and offset methods.
 - Oblique drawings: setting up oblique projection in CAD, drawing simple objects with correct orientation.
- **Development of Surfaces in CAD:**
 - Concept of true length and its importance in surface development.
 - Development of simple solids (cube, prism, cylinder, cone, pyramid).
 - Types of development: parallel line and radial line methods.
- **Practice in CAD:**
 - Prepare isometric and oblique drawings using CAD (isoplane mode, isocircle).
 - Construct flattened layouts for surface development digitally.
 - Apply layers and hatching conventions to distinguish surfaces.

Learning Outcomes

Unit 1: Importance of Engineering Drawing & Instruments (9 Periods)

- Understand scope and objectives of engineering drawing as a communication tool.
- Identify and correctly use basic drawing instruments and maintain them.
- Apply BIS standards for sheet sizes, borders, title blocks, and line conventions.
- Construct and interpret reduced/enlarged scales and representative fraction.
- Prepare neat drawing sheets with proper layout and simple geometric figures.

Unit 2: Lettering & Dimensioning (18 Periods)

- Demonstrate freehand lettering and numbering with correct proportions and sizes.
- Apply BIS codes for dimensioning using proper lines, arrows, and notes.
- Use aligned and unidirectional dimensioning systems effectively.
- Dimension circles, arcs, angles, tapers, chamfers, and narrow spaces accurately.
- Produce neat lettering and dimensioning exercises manually.

Unit 3: Geometric Constructions & Curves (18 Periods)

- Operate CAD software effectively by setting up units, limits, and layers.
- Apply basic CAD commands (draw, modify, display control) to create and edit geometry.
- Use object snaps and construction aids to ensure precision in drawings.
- Construct geometric figures such as polygons, tangents, and divisions of lines using CAD tools.
- Generate conical curves (ellipse, parabola, hyperbola) and special curves (involute, cycloid, helix) in CAD with engineering applications.
- Manage drawing files, layers, and text insertion to produce professional CAD drawings.

Unit 4: Projection of Points, Lines, Planes & Orthographic Projections (18 Periods)

- Demonstrate projection of points, lines, and planes on reference planes using CAD.
- Apply orthographic projection principles to generate front, top, and side views in CAD.
- Use CAD tools to position views correctly with miter line construction.
- Represent visible, hidden, and center lines using appropriate CAD layers.
- Identify the minimum number of views required to describe an object clearly.
- Produce accurate orthographic drawings using CAD commands and conventions.

Unit 5: Projection of Solids & Sectional Views (18 Periods)

- Create CAD projections of regular solids (cube, prism, cylinder, cone, pyramid) in different orientations.
- Apply sectional view concepts using cutting planes in CAD.
- Generate sectional views of solids inclined to one plane and parallel to the other.
- Use CAD hatch patterns to represent material sections according to conventions.
- Integrate projection and sectional view techniques to produce complete engineering drawings digitally.

Unit 6: Pictorial Drawings & Development of Surfaces (9 Periods)

- Construct isometric and oblique drawings of simple objects using CAD tools.
- Apply isoplane mode and isocircle commands to create isometric rectangles, circles, and objects.
- Set up oblique projection in CAD and draw objects with correct orientation.
- Develop surfaces of solids (cube, prism, cylinder, cone, pyramid) digitally using parallel line and radial line methods.
- Prepare flattened layouts of surfaces in CAD with true length representation.
- Apply layers and hatching conventions to distinguish surfaces in pictorial and development drawings.

CO-POMATRIX

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	-	3	3	1

CO2	2	2	2	3	1	2	2
CO3	3	2	2	3	-	1	2
CO4	3	3	3	3	1	2	1
CO5	2	3	3	3	1	2	1
CO6	2	2	3	3	-	3	2

MIDSEM-IEXAM

SN	Unit name	R,U(QNo's)	A(QNo's)	Remarks
1	Unit-1	1,2	5	Manual drawing
2	Unit-2	3,4	6	

MIDSEM-2EXAM

SN	Unit name	R,U(QNo's)	A (QNo's)	Remarks
1	Unit-3	1,2	5	CAD based practice &Exam
2	Unit-4	3,4	6	

SEE

SN	Unitname	Questions to beset for SEE		Remarks
		R,U(QNo's)	A (QNo's)	
1	Unit-1,2	1,2		CAD based practice &Exam
2	Unit-3,4	3,4		
3	Unit-5,6		5,6	

REFERENCE BOOKS

1. *Engineering Drawing* by Kapil Dev – Asian Publisher
2. *Engineering Drawing* by Basant Agarwal & C.M. Agarwal – McGraw-Hill
3. *Engineering Drawing* by N.D. Bhatt – Charotar Publishing House Pvt. Ltd.
4. *A Textbook on Engineering Drawing* by P. Kannaiah, K. L. Narayana, K. Venkata Reddy
5. *Engineering Drawing + AutoCAD* by K. Venugopal – New Age International, New Delhi

ONLINE RESOURCES

1. [NPTEL Courses](#)
2. [NPTEL Engineering Drawing Course](#)
3. Engineering Drawing – Slideshare ([slideshare.net in Bing](#))
4. Engineering Drawing – PowerPoint Presentation ([powershow.com in Bing](#))
5. Basic Engineering Drawing – Solved Questions (PowerPoint) ([powershow.com in Bing](#))

BOARD DIPLOMA EXAMINATION, (C-26)
DME – I YEAR, ME-107, MID SEMESTER - I
ENGINEERING DRAWING WITH CAD

Time: 1 Hour]

[Total Marks: 20

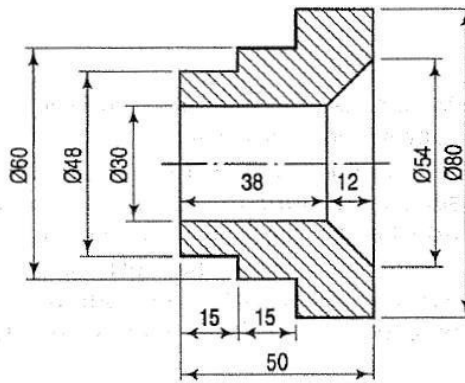
PART-A

04x02=08

Instructions: 1. Answer **ALL** questions.

2. Each question carries **TWO** marks.

1. Write freehand the following, using single stroke vertical capital letters of height 12 mm.
'NECESSITY IS THE MOTHER OF INVENTION'
2. Redraw the following figure in Uni-Directional system of dimensioning.



3. To divide a straight line of 70 mm into 6 equal parts.
4. Bisect a given line AB of length 75 mm.

PART-B

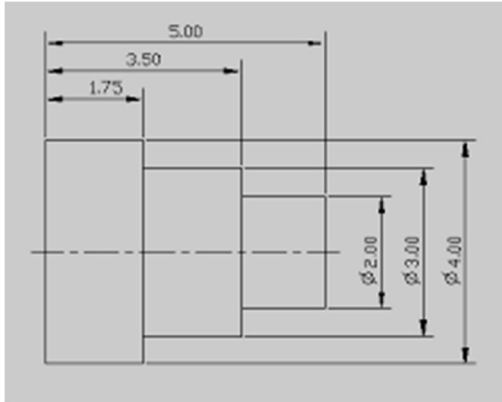
02x06=12

Instructions :

1. Answer **ALL** questions.

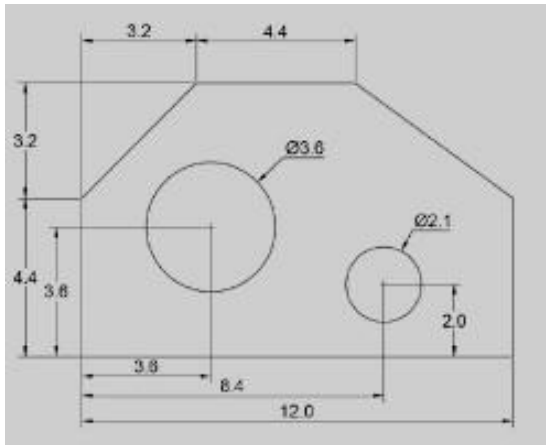
2. Each question carries **SIX** marks.

- (a) Redraw the following figure with chain dimensioning.



(Or)

5. (b) Redraw the following figure in aligned system of dimensioning.



6. (a) Construct a regular pentagon of base side 30 mm in general method.

(Or)

6. (b) Draw an arc of radius 30 mm touching the given straight line AB of length 70 mm and passing through a point 'P' which is 55 mm above the line AB.

BOARD DIPLOMA EXAMINATION, (C-26)
DME – I YEAR, ME-107, MID SEMESTER - II
ENGINEERING DRAWING WITH CAD

Time: 1 Hour]

[Total Marks: 20

PART-A

04x02=08

Instructions: 1. Answer **ALL** questions.
2. Each question carries **TWO** marks.

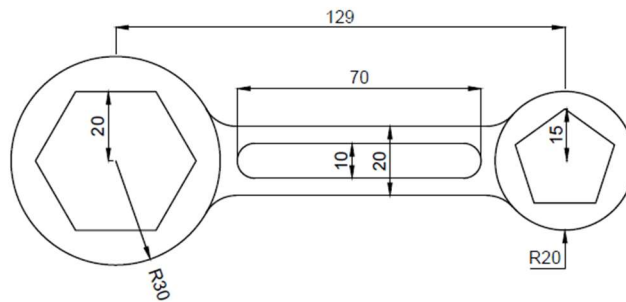
1. Draw a pentagon of side 60mm and calculate its area by using any CAD software.
2. Draw a line of 10mm and divide it into four equal parts.
3. Create four layers, name the layers and assign different properties like line color, line type, and line weight to different layers.
4. Write the procedure to draw isometric drawings.

PART-B

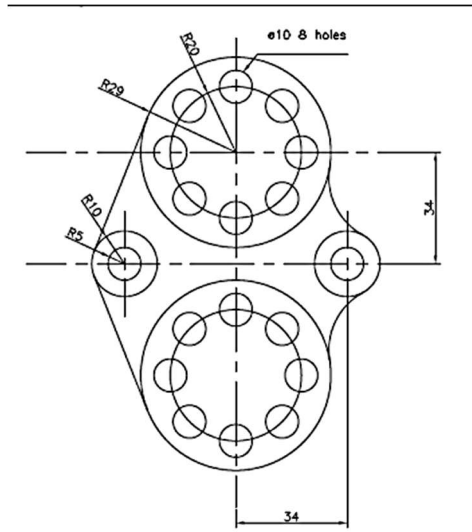
NOTE: Answer any one question

1 X 12 = 12 marks

1. Draw the following using Layers. Use different layers to different line types, text, dimension and main figure.



2. Draw the following using Layers. Use different layers to different line types, text, dimension and main figure.



BOARD DIPLOMA EXAMINATION, (C-26)
DME – I YEAR, ME-107, SEMESTER END EXAM
ENGINEERING DRAWING WITH CAD

Time: 2 Hour]

[Total Marks: 40

PART-A

NOTE: Answer all questions

4X 4 =16marks.

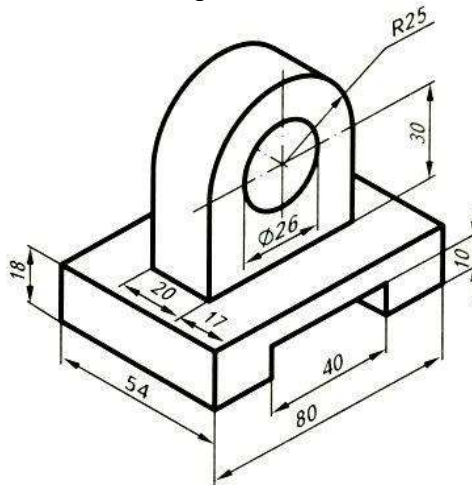
1. Draw a hexagon of 60mm side and add dimensions to it.
2. Create a rectangular array of 10mm diameter circles in 4 rows, 4 columns with 20mm space between each row and column.
3. Create four layers, name the layers, and assign different properties like line color, line type, and line weight to different layers.
4. Write the procedure to create and insert a block.

PART-B

NOTE: Answer any one questions

1X 24 =24marks

5. (a) Draw the following 3D object using CAD software. 20+4marks
b. List the commands in sequence and also write the procedure



6. (a) Draw the following 3D object using CAD software. 20+4marks
b. List the commands in sequence and also write the procedure

