PROGRAMME NAME/S: COMMON TO ALL ENGINEERING PROGRAMS
Semester : FIRST
Course Title : ENGINEERING GRAPHICS-I (Common to all Engineering Branches)
Course Code :

I. RATIONALE:

Engineering graphics is the language of engineers. The concepts of graphical language are used in expressing the ideas, conveying the instructions, which are used in carrying out the jobs on the sites, shop floor etc. This course is useful in developing drafting and sketching skills in the students. It covers the knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian Standards related to engineering drawing. The curriculum aims at developing the ability to draw and read various engineering curves, projections and dimensioning styles. The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas into sketches. The course also helps to develop the idea of visualizing the actual object or part on the basis of drawings and blue prints. This preliminary course aims at building a foundation for the further courses related to engineering drawing and other allied courses in coming semesters.

II. INDUSTRY/EMPLOYER EXPECTED OUTCOME:

Prepare engineering drawing manually using prevailing drawing instruments.

III. COURSE LEVEL LEARNING OUTCOMES (COS):

Students will be able to achieve & demonstrate the following COs on completion of course-based learning.

CO1- Able to use drawing instruments and adopt the standards. e.g. Drawing Office Practice, Lines & Lettering
CO2- Knowledge of draw geometrical figures and engineering curve.
CO3- Acquire knowledge of proper location and method of dimensioning.
CO4- Able to understand the function of scales and types.eg. Plain scale and diagonal scale.
CO5-Apply principles of orthographic projections for drawing given pictorial views.
CO6- Draw isometric views of given component or from orthographic projections.
CO7- Use various drawing codes, conventions and symbols as per IS SP-46 in Engineering Graphics.
CO8- Basics of Auto CAD.

IV. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Sr. No.	Theory Learning Outcomes (TLOs) aligned to COs.	Learning content mapped with Theory Learning Outcomes (TLOs) and COs.	Suggested Learning Pedagogies.	No Of Lecture	CO
1	**TLO 1.1** Prepare drawing using drawing instruments. **TLO 1.2** Use IS SP-46 for Dimensioning. **TLO 1.3** Use different types of lines. **TLO 1.4** Draw regular geometrical figures. **TLO 1.5** Draw figures having tangency constructions.	**UNIT-I Drawing Office Practice, Lines & Lettering (02 Sheets)** 1.1 Understanding Graphics instruments and their uses, Sizes and layout of standard graphic sheets and graphic boards. 1.3 Different types of lines in engineering graphics as per BIS specifications. 1.4 Free hand lettering (alphabet and	Model Demonstration	4	CO1

		numerals) lower case and upper case. 1.5 single stroke vertical and inclined at different standard series of 2.5, 3, 5, 7, 10, and 15 mm heights.			
2	**TLO 2.1** Introduction of Necessity of dimensioning, Types of dimensioning. **TLO2.2** Define Methods of placing dimensioning. **TLO2.3** Draw dimensioning, Dimensioning of overall sizes, circles, thread holes, chamfered.	**UNIT-II Dimensioning (02 Sheets)** 2.1 Necessity of dimensioning, Types of dimensioning (chain, parallel and progressive dimensioning). 2.2 Size and location dimensioning Methods of placing dimensioning (Aligned and unidirectional system), use of leader lines. General principles of dimensioning. 2.3 Dimensioning of overall sizes, circles, thread holes, chamfered surfaces, angles, tapered surface holes equally spaced on PCD, counter sunk hole counter bored holes, cylindrical parts, narrow space and gaps, radii, curves and Arches.	Demonstration	4	CO2
3	**TLO 3.1** Explain different engineering curves with areas of application. **TLO 3.2** Draw different conic sections. **TLO 3.3** Draw involute and cycloidal curves. **TLO3.4** Draw helix and spiral curves from given data. **TLO 3.5** Plot Loci of points from given data.	**UNIT-III Geometrical Constructions and Conic Section(04 Sheets)** 3.1 Simple geometrical Constructions; Constructions of regular polygons (triangle, square, pentagon, hexagon) and circle. 3.2 Conic Section: - Ellipses (concentric circle method and Intersecting Arcs method, Directrix and focus method), Parabola (rectangle and tangent method). 3.3 Directrix and focus method) Hyperbola (Directrix and focus method, Transverse axis and focus method), Cycloids, Epicycloids, Hypocycloids, involutes of regular polygons and circles. 3.4 Helix: (conical, parallel, Spiral). 3.5 Plot Loci of points from given data.	Model Demonstration/ Video Demonstrations/ chalk duster or board method.	6	CO3, CO5
4	**TLO 4.1** Introduction and uses of different types of scales. **TLO 4.2** Prepare Plain Scale. **TLO 4.3** Prepare Diagonal Scale.	**UNIT-IV Scale (02 Sheets)** 4.1 Scale – their need and importance, Definition of representative fraction (R.F), find RF of given scale, full scale, enlarged and reduced scale. 4.2 Construction of plain and diagonal scales and marking	Model Demonstration/ Video Demonstrations	8	CO3, CO4

		distance on scales constructed-exercises			
5	**TLO 5.1** Explain methods of Orthographic Projections. **TLO 5.2** Draw orthographic views of simple 2D entities containing lines, circles and arcs only. **TLO 5.3** Draw the orthographic views from given pictorial views. **TLO 5.4** Use of IS code IS SP-46 for dimensioning Technique. **TLO 5.5** Projection of point and line (different condition). **TLO 5.6** Explain methods of Projection of plane. **TLO5.7** Projection of solid with different positioning condition of solid). Note: - (follow First angle and Third angle projection system only.)	**UNIT-V Principle of Projection (06 Sheets)** 5.1 Principle of orthographic projection and introduction to first angle projection and third angle projection their symbols 5.2 Orthographic views of simple 2D entities containing lines, circles and arcs only. 5.3 Conversion of pictorial views into Orthographic views from given pictorial views and draw them as following first and third angle projection method. 5.4 Projection of points situated in different quadrants, Projection of lines, Lines inclined to one plane and parallel to the other and vice versa (all quadrants); Line inclined to both reference planes (HP and VP) and limited to both ends in same quadrant. 5.5 Projection of Planes triangular, square, rectangular, pentagonal, hexagonal and circular), Planes perpendicular to one reference plane and parallel to other, planes inclined to one reference plane and perpendicular to other or vice versa (1st & 3rd quadrants), 5.6 Projection of solids, such as Prism, Pyramid (triangular, square, rectangular, pentagonal hexagonal), Cone, Cube, Cylinder Tetra hydron, Frustum with axis perpendicular to one reference plane and axis inclined to one reference plane and parallel to other reference plane. Orthographic views of given pictorial views (1st and 3rd angle)	Model Demonstration / chalk duster or class board method)	12	CO3, CO5, CO4

6	**TLO 6.1** Introduction to Isometric projections/views, Isometric and natural scale. **TLO 6.2** Isometric views and projections. **TLO 6.3** Conversion of Orthographic views into Isometric views.	**UNIT-VI Isometric Projections (02 Sheets)** 6.1 Fundamentals of Isometric projections/views (Theoretical instructions) and Isometric Scales. 6.2 Isometric views/projections of different types of planes, Isometric views/projections of different types of solids, Isometric views/projections of combination of regular solids like cylinder, cone, cube, prism and pyramid. 6.3 Conversion of Orthographic projections view into Isometric views.	Demonstration/chalk and duster method/video lectures	10	CO3, CO6
7	**TLO 7.1** Civil engineering sanitary fitting symbols. **TLO 7.2** Electrical fitting symbols for interior Installations. **TLO 7.3** Electronic symbols.	**UNIT-VII Symbols and Conventions (02 Sheets)** 7.1 Civil engineering sanitary fitting symbols. 7.2 Electrical fitting symbols for layout interior installations. 7.3 Electronic symbols.	Demonstration	4	CO7
8	**TLO 8.1** Introduction of different components of AutoCAD main window. **TLO 8.2** Open a new/existing file in AutoCAD. **TLO 8.3** Set/edit various parameters in a new/given file.	**UNIT-VIII Basic of Auto CAD (This unit is practical-oriented; theoretical concepts are covered during practical sessions, as outlined in the practical list below.)** 8.1 Computer Aided Drafting concept, Hardware and various CAD software available. System requirement and understanding the interface. Components of AutoCAD software window Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify toolbar, cursor cross hair. Command window, status bar, drawing area, UCS icon. 8.2 File features: New file, Saving the file, opening an existing drawing file, Creating Templates, Quit. 8.3 Setting up new drawing: Units, Limits, Grid, Snap. Undoing and re doing action. Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, Dimensioning, Inserting text Applying constraints - horizontal, vertical, parallel, concentric,	Demonstration Video Demonstrations	-	CO8

		perpendicular.			

V. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES

Sr. No.	Laboratory Learning Outcome (LLO)	Laboratory Experiment / Practical / Tutorial Title	No. of Hours	Relevant COs
1	**LLO 1** Understand AutoCAD environment and interface	Start AutoCAD software. Identify and explain components of the AutoCAD window (Title bar, Toolbars, UCS, Command line, Status bar, etc.).	3 hrs	CO8
2	**LLO 2** Manage files and templates in AutoCAD	Create a new drawing file, save with a specific name, open an existing file, and create drawing templates.	1 hrs	CO8
3	**LLO 3** Set up new drawing parameters	Set drawing units, limits, grid spacing, snap settings. Use undo and redo options effectively.	3 hrs	CO8
4	**LLO 4** Draw basic 2D objects using AutoCAD tools	Use draw commands to create Line, Circle, Arc, Polygon, Ellipse, Rectangle, and Multiline.	3 hrs	CO8
5	**LLO 5** Add dimensions and text annotations	Use dimensioning tools and insert text using single-line and multi-line text commands.	3 hrs	CO8
6	**LLO 6** Apply geometric constraints in AutoCAD	Apply constraints such as horizontal, vertical, parallel, perpendicular, and concentric to a 2D sketch.	3 hrs	CO8

Note: A minimum of any four practicals must be attempted compulsorily. A total of 20 sheets are mandatory from Units 1 to 7. Evaluation of these sheets may also be done by the practical examiner.

VI. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING):

Exercises of different problems related to these units are made in drawing sheets as assignment and check as well as guided by the subject faculty regularly. (Minimum 20 assignments are to be submitted by a student)

VII. LABORATORY EQUIPMENT/INSTRUMENTS/TOOLS/SOFTWAREREQUIRED:

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Drawing Table with Drawing Board of Full Imperial/A1size.	All
2	Models of object for orthographic/isometric projections	7,8,9,10,11,12,14,
3	Models/Charts of objects mentioned in unit no.5	7,8,9,10,11,12,13
4	Set of various industrial drawings being used by industries.	All
5	Set of drawings sheets mentioned in section 6.0 could be developed by experienced teachers and made used available on the MSBTE portal to be used as reference/standards.	All
6	Drawing equipment and instruments for class room teaching-large size: a. T-square or drafter (Drafting Machine). b. Set squires (450 and 300-600) c. Protector. d. Drawing instrument box (containing set of compasses and dividers). Drawing Sheets, Drawing pencils, Eraser, Drawing pins /clips.	All
7.	**Computer Systems** with licensed AutoCAD software installed (latest version recommended)	All LLOs (for hands on practice)

VIII. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table):

Sr. No.	Unit	Unit Title	Aligned COs	Learning Hours (L+T)	Weightage %
1	I	Drawing Practice, Types of Lines & Lettering	CO1	4	10
2	II	Dimensioning	CO2	4	7
3	III	Geometrical Constructions	CO3, CO5	6	13
4	IV	Scale	CO3, CO4	8	15
5	V	Principle of Projections (Projection of points, lines, plane, solid)	CO3, CO5, CO4	12	20
6	VI	Isometric Projections	CO3, CO6	10	18
7	VII	Symbols and Conventions	CO7	4	07
8	VIII	Basic Auto CAD(Practical Only)	CO8	16(LAB ONLY)	10
Grand Total				**64**	**100**

IX. SUGGESTED COS-POS MATRIX FORM:

Course Outcomes (COs)	Programme Outcomes (POs)						
	PO-1 Basic and Discipline Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**
CO1	3	2	2	-	-	2	-
CO2	3	2	2	-	-	2	-
CO3	3	2	2	-	-	2	-
CO4	3	2	2	-	-	2	-
CO5	3	2	2	2	-	2	-
CO6	3	3	2	2	-	2	-
CO7	3	2	2	-	-	2	-
CO8	2	2	2	2	-	2	-
Legends: -High:03, Medium:02, Low:01							

X. SUGGESTED LEARNING MATERIALS/ BOOKS:

Sr. No.	Author	Title	Publisher with ISBN Number
1	Bureau of Indian Standards.	Engineering Drawing Practice for Schools and Colleges IS: SP-46	Third Reprint, October 1998 ISBN No. 81-7061-091-2
2	Bhatt N. D.	Engineering Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-17-8
3	Bhatt N.D.; Panchal V.M	Machine Drawing	Charotar Publishing House, 2010 ISBN No. 978-93-80358-11-6
4	Jolhe D.A.	Engineering Drawing	Tata McGraw Hill Edu. New Delhi, 2010, ISBN No. 978-0-07-064837-1
5	Dhawan R.K.	Engineering Drawing	S. Chand and Company New Delhi, ISBN No. 81-219-1431-0
6	Pradhan, S.K. Jain, K. K	Engineering Graphics	Khanna Book Publishing CO(P) LTD, New Delhi, ISBN No. 978-93-91505-50-9

7.	Engineering Graphics With AutoCAD	Kulkarni D.M.; Rastogi, A.P.;	PHI Learning Private Limited-New Delhi (2010), ISBN:978-

XI. LEARNING WEBSITES & PORTALS:

Sr. No.	Link/Portal	Description
1	https://www.youtube.com/watch?v=dmt6_n7Sgcg	Free Hand Sketches
2	https://www.youtube.com/watch?v=_MQScnLXL0M	Orthographic Projection
3	https://www.youtube.com/watch?v=3WXPanCq9LI	Basics of Projection
4	https://www.youtube.com/watch?v=fvjk7PlxAuo	Introduction to Engineering Graphics
5	https://www.youtube.com/watch?v=8j7l1OWhMlE	Isometric Projection