GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT
COURSE CURRICULUM

Course Title: Basics Engineering Drawing
(Code: 3300007)

Diploma Programmes in which this course is offered	Semester in which offered
Automobile Engineering, Ceramic Engineering, Civil Engineering, Environment Engineering, Mechanical Engineering, Mechatronics Engineering, Metallurgy Engineering, Mining Engineering, Printing Technology, Textile Manufacturing Technology, Textile Processing, Transportation Engineering	**First Semester**
Chemical Engineering, Electrical Engineering, Fabrication Technology, Plastic Engineering	**Second Semester**

1   RATIONALE:

Engineering drawing is an effective language of engineers. It is the foundation block which strengthens the engineering & technological structure. Moreover, it is the transmitting link between ideas and realization. It is an attempt to develop fundamental understanding and application of engineering drawing. It covers knowledge & application of drawing instruments & also familiarizes the learner about Bureau of Indian standards. The curriculum aims at developing the ability to draw and read various drawings, curves & projections.

The subject mainly focuses on use of drawing instruments, developing imagination and translating ideas. Developing the sense of drawing sequence and use of drawing instruments effectively yields not only with productive preparation of computer aided graphics but also yields with effective industrial applications ranging from marking to performance of operations.

2   LIST OF COMPETENCIES:

The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies:

i.   **Prepare engineering drawings manually with given geometrical dimensions using prevailing drawing standards and drafting instruments. .**
ii. **Visualize the shape of simple object from orthographic views and vise versa.**

3.   TEACHING AND EXAMINATION SCHEME:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	
2	0	4	6	70	30	40	60	**200**

Legends: L-Lecture; **T** – Tutorial/Teacher Guided Theory Practice; **P** - Practical; **C** – Credit;
ESE - End Semester Examination; **PA** - Progressive Assessment.

4.   DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes	Sub-topics
Unit – 1 **ENGINEERING DRAWING AIDS**	1.1 Use drawing equipments, instruments and materials effectively.	1.1 Drawing equipments, instruments and materials. (a) Equipments-types, specifications, method to use them, applications. (b) Instruments-types, specifications, methods to use them and applications. (c) Pencils-grades, applications, types of points and applications. (d) Other materials-types and applications.
Unit– 2 **PLANNING, LAYOUT AND SCALLING OF DRAWING**	2.1Follow and apply standard practice as per bureau of I.S. for planning and layout 2.2 Choose appropriate scale factor for the drawing as per given situation	2.1 I.S. codes for planning and layout. 2.2 Scaling technique used in drawing.
Unit– 3 **LINES, LETTERING AND DIMENSIONING**	3.1 Write annotations on a drawing where ever necessary. 3.2Choose appropriate line and dimensioning style for a given geometrical entity.	3.1 Different types of lines. 3.2 Vertical capital and lower case letters. 3.3 Inclined capital and lower case letters. 3.4 Numerals and Greek alphabets. 3.5 Dimensioning methods. (a) Aligned method. (b) Unilateral with chain, parallel, progressive and combined dimensioning.

Unit	Major Learning Outcomes	Sub-topics
Unit– 4 **GEOMETRIC CONSTRUCTION**	4.1 Develop the ability to draw polygons, circles and lines with different geometric conditions.	4.2 Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. 4.3 Geometric construction related with angle like bisect an angle, trisect an angle, etc. 4.4 To construct polygon. a: Triangle b: Square / Rectangle. c: Pentagon with special method. d: Hexagon with special method. 4.5 To draw tangents. 4.6 Geometric construction related with circle & arc.
Unit–5 **ENGINEERING CURVES**	5.1 Able to draw engineering curves with proficiency and speed as per given dimensions.	5.2 Conic sections. (a) Concept and understanding of focus, directrix, vertex and eccentricity and drawing of conic sections. (b) Using various methods, understand construction of : i. Ellipse. ii. Parabola. iii. Hyperbola. 5.3 Cycloidal Curves(Cycloid, Epicycloid, Hypocycloid) 5.4 Involutes. (a) Involutes of a circle (b) Involutes of a polygon 5.5 Spiral (Archimedean spiral only).
Unit– 6 **PROJECTION OF POINTS, LINES AND PLANES**	6.1 Draw the projection of points, lines and planes with different conditions. 6.2 Find out true shape and size of a inclined line or plane	6.1 Reference planes, orthographic projections. 6.2 Concept of quadrant. 6.3 1st angle and 3rd angle projection and their symbols. 6.4 Projection of points. 6.5 Projection of lines – determination of true length and inclinations for following cases. (a) Line parallel to one or both the plane. (b) Line perpendicular to one of the plane. (c) Line inclined to one plane and parallel to another. (d) Line inclined to both the planes. 6.6 Projection of Planes. (a) Types of planes. (b) Projection of planes parallel to one of the reference planes. (c) Projection of plane inclined to one reference plane and perpendicular to another. (d) Projection of planes inclined to both reference planes. Note : Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.

Unit	Major Learning Outcomes	Sub-topics

Unit– 7
 	
ORTHOGRAPHC PROJECTIONS
	7. 1 Draw the orthographic views of object containing lines, circles and arc geometry.
	7.2 Interpret given orthographic views and to imagine the actual shape of the component.
		7.1 Types of projections-orthographic, perspective, isometric and oblique: concept and applications.
		7.2 Various term associated with orthographic projections.
		   (a) Theory of projection.
		   (b) Methods of projection.
		   (c) Orthographic projection.
		   (d) Planes of projection.
		
		7.3 Conversion of simple pictorial views into Orthographic views. Illustrative problems on orthographic projection.
		7.4 B.I.S. code of practice.
		
		Note :
		(1) Problem should be restricted up to four views-Front view/Elevation, Top view/Plan and Side views only.
		(2) Use First Angle Method only.

Unit– 8 **ISOMETRIC PROJECTIONS**	8.1 Draw the isometric view from orthographic views of object/s containing lines, circles and arcs.	8.2 Isometric axis, lines and planes. 8.3 Isometric scales. 8.4 Isometric view and isometric drawing. 8.5 Difference between isometric projection and isometric drawing. 8.6 Illustrative problems limited to objects containing lines, circles and arcs shape only.

5.   SPECIFICATION TABLE WITH HOURS & MARKS (THEORY):

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Engineering drawing aids.	0	00	00	02	02
2.	Planning, layout and scaling of drawing.	0	02	00	03	05
3.	Lines, lettering and dimensioning.	0	00	02	00	02
4.	Geometric construction.	3	00	03	07	10
5.	Engineering curves.	6	02	00	10	12
6.	Projection of points, lines and planes.	8	03	00	14	17
7.	Orthographic projections.	6	00	00	12	12
8.	Isometric projections.	5	00	02	08	10
	Total	**28**	**07**	**07**	**56**	**70**

Legends:
R = Remembrance; U = Understanding; A = Application and above levels.

NOTES:

a: If midsem test is part of continuous evaluation, unit number 4, 5 and 6 (For Unit 6, except projections of planes) are to be considered.

b: Ask the questions from each topic as per weightage of marks. Choice of questions must be given from the same topic.

6. SUGGESTED LIST OF EXERCISES/PRACTICAL/EXPERIMENTS

The exercises/practical/experiments should be properly designed and implemented with an attempt to develop different types of skills leading to the achievement of the competency. Following is the list of exercises/practical/experiments for guidance.

Ex. No.	Unit No.	Practical Exercises	Hours
1	1,2,3	**USE OF DRAWING INSTRUMENTS:** 1. Teacher will demonstrate- a: Use of drawing instruments. b: Planning and layout as per IS. c: Scaling technique. 2. Draw following. Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter. Problem – 2 Types of lines. Problem – 3 Types of dimensioning. Problem – 4 Alphabets & numerical (Vertical & inclined as Per I.S.).	14
2	4	**GEOMETRIC CONSTRUCTION:** Drawing of set of lines with different conditions. (Two problems) Drawing Polygons. (Three Problems) Drawing circles and arcs with different geometric conditions and with line constraints. (Three problems)	06
3	5	**ENGINEERING CURVES – I:** Problem –1: Construction of ellipse using any two methods from arc of circle method, four centre method, rectangular method, eccentricity method and concentric circle method. Problem –2: Construction of parabola with any one method from rectangular method, tangent method and eccentricity method. Problem –3: Construction of hyperbola with any one method from eccentricity method and rectangular method. Problem –4: Construction of spiral. (Refer note c for dimensions).	04
4	5	**ENGINEERING CURVES – II:** Problem – 1: Construction of cycloid. Problem – 2: Construction of hypocycloid & epicycloids. Problem – 3: Construction of involute (circle).	04

		Problem – 4: Construction of involute (polygon). (Refer note c for dimensions).	
5	6	**PROJECTIONS OF POINTS AND LINES:** Draw projection of points-For 10 various conditions.(One problem) Draw projection of lines with different conditions. (Four problems) (Refer note c for dimensions).	06
6	6	**PROJECTIONS OF PLANE:** Draw projection of different planes with different conditions. (triangle, square / rectangular, pentagonal / hexagonal, and circular -one for each). (Four problems) (Refer note c for dimensions).	04
7	7	**ORTHOGRAPHIC PROJECTIONS**: Draw Orthographic projections of different objects. (Two problems) (Draw four views of each object). (Refer note c for dimensions).	08
8	8	**ISOMETRIC DRAWINGS:** Draw isometric drawings from given orthographic views (Three problems) (Refer note c for dimensions).	10
9	All	**PROBLEM BASED LEARNING:** Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding objects, complete the views and draw these views in sketch book.	-
10	All	**SCHOOL WITHIN SCHOOL:** • Explain at least one problem for construction and method of drawing in sheet to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each batch student. • Each student will assess at least one sheet of other students (May be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any.	-

Notes :–

a: **Use both sides of sheet. For example, draw sheet number 2 on back side of sheet number 1, 4 on back of 3, and likewise.**

b: Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.

c: The dimensions of line, axes, distances, angle, side of polygon, diameter, etc. must be varied for each student in batch so that each student will have same problems, but with different dimensions.

d: The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.

e: A hand out containing applicable standards from IS codes including title block as per IS standard should be given to each student by concerned teacher.

f: For 40 marks Practical Marks ESE, students are to be assessed for competencies achieved. Students are to be given data for practical ESE to prepare drawings.

7.   LIST OF STUDENT ACTIVITIES:

Following is the list of student activities to be performed by each student individually:

Activity No.	Details of student activity
1	Sketch the combinations of set squares to draw angles in step of 15^0.(15^0, $30^{0,}$ $45^{0,}$ $60^{0,}$ $75^{0,}$ $90^{0,}$ 105^0, $120^{0,}$ 135^0, $150^{0,}$ $165^{0,}$ 180^0).
2	Solve all problems for all sheets number 1 to 8 in sketch book (with dimensions).
3	List the shapes you are observing around you in real life with place/item. (For ellipse, parabola and hyperbola).
4	Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views).
5	Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of point.
6	List at least two questions individually which you would like to ask for followings: a: Ellipse. b: Involute of circle. c: Perspective projections. d: Use of geometric constructions. e: Quadrants.

8.   SUGGESTED LEARNING RESOURCES:

A. List of Books

Sr.No.	Title of Books	Author	Publication
1	Elements of Engineering Drawing.	N.D. Bhatt	Charotar Publishing House, Anand.
2	Engineering Drawing.	P.J.Shah	S.Chand, New Delhi.
3	Fundamentals of Engineering Drawing.	W.J.Luzzadar	Prentice-hall of India Pvt. Ltd.-New Delhi
4	Fundamentals of Drawing.	K.R.Gopalkrishna	Subhash Publications, Banglore.
5	Engineering Drawing	M.B.Shah, B.C.Rana	Pearsons.
6	Machine Drawing.	V. Laxminarayan & M.L.Mathur	Jain Brother, New Delhi.
7	Fundamentals of Engineering Drawing.	French & Vierck	McGraw-Hill

B. List of Major Equipments/ Instruments :

- Models- full and cut.
- Set of various industrial drawings being used by industries-up dated.
- Drawing equipments and instruments for class room teaching-large size.
- Drawing board-half imperial size.
- T-square or drafter (Drafting Machine).

- Set squires (45^0 and 30^0-60^0)
- Protector.
- Drawing instrument box (containing set of compasses and dividers).
- Drawing sheets.
- Drawing pencils.
- Eraser.
- Drawing pins / clips.
- Roller scale

C. List of Software/Learning Websites:

- rgpv-ed.blogspot.com/2009/02/**engineering-curves**.html
- http://www.slideshare.net/sahilsahil992/conic-section-1819818
- http://www.technologystudent.com/designpro/drawdex.htm
- http://www.engineeringdrawing.org/engg_curves/problem-3-8-engineering-curves/490/
- http://web.iitd.ac.in/~hirani/mel110-part3.pdf
- http://www.studyvilla.com/ed.aspx
- http://www.youtube.com/watch?v=a703_xNeDao
- http://www.youtube.com/watch?v=TCxTP_8ggNc
- http://www.youtube.com/watch?v=JpgFPZILTu8&feature=related
- http://www.youtube.com/watch?v=o1YPja2wCYQ&feature=related
- http://www.youtube.com/watch?v=dJyKV3Ay7vM&feature=fvwrel
- E-learning package from KOROS.
- E-learning package from Cognifront.
- CD with book-Engineering drawing, M.B. Shah-B.S. Rana (Pearson).
- Computer based learning material published by KOROS.

9.   COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty Members from Polytechnics

- o **Prof.K. H. Patel**. Head Dept.of Mech., Engg., Dr. S. & S. Gandhi College of Engineering and Technology, Surat,

- o **Shri.H. R. Sapramer**, Lecturer in Mech. Engineering, Dr. J.N.Mehta Government Polytechnic, Amreli.

- o **Prof.A.M. Talsaniya**, Lecturer in Mech. Engineering, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.

Co-ordinator and Faculty Memberfrom NITTTR Bhopal

- **Prof. Sharad Pradhan**, Associate Professor, Dept. of Mech. Engg., NITTTR, Bhopal.