

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

- **Programme Title:** Diploma in Civil Engineering
- **Semester:** I
- **Course Code:** 3300007
- **Course Title:** Basic Engineering Drawing

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.

- a: Prepare engineering drawings manually using standards.
- b: Use drawing equipments, instruments and materials.
- c: Develop the ability to imagine the shape of simple object from orthographic views and vice-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 | 200 |
| 2 | 0 | 4 | 6 | 70 | 30 | 40 | 60 | |

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; 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 | <ul style="list-style-type: none"> • Use drawing equipments, instruments and materials. | 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 | <ul style="list-style-type: none"> • Follow and apply standard practice as per bureau of I.S. for planning and layout | 2.1 I.S. codes for planning and layout. 2.2 Scaling technique used in drawing. |
| Unit– 3 LINES, LETTERING AND DIMENSIONING | <ul style="list-style-type: none"> • Develop the ability to use lines, lettering and dimensioning. | 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– 4 GEOMETRIC CONSTRUCTION | <ul style="list-style-type: none"> • Develop the ability to draw polygons, circles and lines with different geometric conditions. | 4.1 Geometric construction related with line like bisecting a line, to draw perpendicular with a given line, divide a line, etc. 4.2 Geometric construction related with angle like bisect an angle, trisect an angle, etc. 4.3 To construct polygon. 4.4 Triangle 4.5 Square / Rectangle. 4.6 Pentagon with special method. 4.7 Hexagon with special method. 4.8 To draw tangents. 4.9 Geometric construction related with circle and arc. |
| Unit–5 ENGINEERING CURVES | <ul style="list-style-type: none"> • Develop the ability to draw engineering curves with proficiency and speed. | 5.1 Conic sections. (a) Ellipse. (b) Parabola. (c) Hyperbola. 5.2 Cycloid Curves (Cycloid, Epicycloids, Hypocycloid). 5.3 Involute. (a) Involute of a circle (b) Involute of a polygon 5.4 Spiral (Archimedean spiral only). |
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| Unit | Major Learning Outcomes | Sub-topics |
|---|--|---|
| Unit– 6 PROJECTION OF POINTS, LINES AND PLANES | <ul style="list-style-type: none"> • Draw the projection of points, lines and planes with different conditions. | 6.1 Reference planes, orthographic projections. 6.2 Concept of quadrant. 6.3 1 st angle and 3 rd angle projection. 6.4 Projection of points. 6.5 Projection of lines – determination of true length and inclinations for following cases. <ol style="list-style-type: none"> Line parallel to one or both the plane. Line perpendicular to one of the plane. Line inclined to one plane and parallel to another. Line inclined to both the planes. 6.6 Projection of Planes. <ol style="list-style-type: none"> Types of planes. Projection of planes parallel to one of the reference planes. Projection of plane inclined to one reference plane and perpendicular to another. Projection of planes inclined to both reference planes. <p>Note : Triangle, Square / rectangle, pentagon, hexagon and circle shape should be included in various plane problems.</p> |
| Unit– 7 ORTHOGRAPHIC PROJECTIONS | <ul style="list-style-type: none"> • Draw the orthographic views of object containing lines, circles and arc geometry. | 7.1 Types of projections-parallel, perspective and oblique: concept and applications. 7.2 Various term associated with orthographic projections. <ol style="list-style-type: none"> Principle of projection. Methods of projection. Orthographic projection. Planes of projection. Four quadrants. First angle and third angle projections. Reference line. 7.3 B.I.S. code of practice. <p>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.</p> |
| Unit– 8 ISOMETRIC PROJECTIONS | <ul style="list-style-type: none"> • Develop the concept and ability to draw the isometric view from orthographic views of object/s containing lines, circles and arcs. | 8.1 Isometric axis, lines and planes. 8.2 Isometric scales. 8.3 Isometric view and isometric drawing. 8.4 Difference between isometric projection and isometric drawing. 8.5 Illustrative problems limited to objects containing lines, circles and arcs shape only. |

5. SUGGESTED SPECIFICATION TABLE WITH HOURS AND 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 | 02 | 04 | 06 |
| 2. | Planning, layout and scaling of drawing. | 0 | 00 | 02 | 03 | 05 |
| 3. | Lines, lettering and dimensioning. | 0 | 00 | 02 | 03 | 05 |
| 4. | Geometric construction. | 3 | 00 | 03 | 07 | 10 |
| 5. | Engineering curves. | 6 | 02 | 01 | 07 | 10 |
| 6. | Projection of points, lines and planes. | 8 | 03 | 02 | 07 | 12 |
| 7. | Orthographic projections. | 6 | 02 | 00 | 10 | 12 |
| 8. | Isometric projections. | 5 | 00 | 02 | 08 | 10 |
| | Total | 28 | 07 | 14 | 49 | 70 |

Legends:

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

NOTES:

- a:** If misdeem 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 marks weightage. Optional questions must be asked from the same topic. That is weight age of compulsory attendance part of questions will be equal to marks allotted to each topic.

6. SUGGESTED LIST OF EXPERIMENTS:

This is the list of minimum experiences to be performed.

| Ex. No. | Unit No. | Experiment | Hours |
|---------|----------|---|-------|
| 1 | 1 | <p>USE OF DRAWING INSTRUMENTS:</p> <ol style="list-style-type: none"> Teacher will demonstrate- <ol style="list-style-type: none"> Use of drawing instruments. Planning and layout as per IS. Scaling technique. Draw following. <p>Problem – 1 Drawing horizontal, vertical, 30 degree, 45 degree, 60 & 75 degrees lines using Tee and Set squares/ drafter.</p> <p>Problem – 2 Types of lines.</p> <p>Problem – 3 Types of dimensioning.</p> <p>Problem – 4 Alphabets & numerical (Vertical & inclined as Per I.S.).</p> | 14 |

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|---|---|---|----|
| 2 | 2 | GEOMETRIC CONSTRUCTION: a: Problem – 1 to 2: (Two problems) -Drawing of set of lines with different conditions. b: Problem – 3 to 5: (Three Problems)- Drawing Polygons. c: Problem – 6 to 8: (Three problems)- Drawing circles and arcs with different geometric conditions and with line constraints. | 06 |
| 3 | 3 | ENGINEERING CURVES – I: Problem –1: Construction of ellipse using any two methods. Problem –2: Construction of parabola. Problem –3: Construction of hyperbola. Problem –4: Construction of spiral. (Refer note c for dimensions). | 04 |
| 4 | 4 | ENGINEERING CURVES – II: Problem – 1: Construction of cycloid. Problem – 2: Construction of hypocycloid & epicycloids. Problem – 3: Construction of involute (circle). Problem – 4: Construction of involute (polygon). (Refer note c for dimensions). | 04 |
| 5 | 5 | PROJECTIONS OF POINTS AND LINES: Problem – 1: Projection of points-For 10 various Conditions. Problem – 2 to 5: (Four problems)- Projection of lines with Different conditions. (Refer note c for dimensions). | 06 |
| 6 | 6 | PROJECTIONS OF PLANE: Problem – 1 to 4: (Four problems)- Projection of different planes with different conditions.(one of triangle, one of square / rectangular, one pentagonal / hexagonal, and one circular). (Refer note c for dimensions). | 04 |
| 7 | 7 | ORTHOGRAPHIC PROJECTIONS: Problem – 1 and 2: (Two problems)- Orthographic projections of different two objects. (Draw four views of each object). (Refer note c for dimensions). | 08 |
| 8 | 8 | ISOMETRIC DRAWINGS: Problem – 1 and 2 (Two problems) - Draw isometric drawings from given orthographic views. (Refer note c for dimensions). | 10 |

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| 9 | All | PROBLEM BASED LEARNING: Given the orthographic views of at least three objects with few missing lines, imagine objects and complete the views. Draw these views in sketch book. | - |
| 10 | All | SCHOOL WITHIN SCHOOL: a: 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. b: Each student will assess at least one sheet of other students (May be 5-6 students- to be assigned-defined by teacher) and will note down the mistakes committed by them. Student will also guide the students for correcting the mistakes, if any. | - |

Notes :-

- 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.
- Theory & practice should be in first angle projections and IS codes should be followed wherever applicable.
- 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.
- The sketchbook has to contain data of all problems, solutions of all problems and student activities performed. Students' activities are compulsory to be performed.
- 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.
- 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. SUGGESTED LIST OF STUDENT ACTIVITIES:

Following is the list of student activities.

| S. No. | Activity No. | Details of student activity |
|--------|--------------|--|
| 1 | 1 | Solve all problems for all sheets number 1 to 8 in sketch book (with dimensions). |
| 2 | 2 | List the shapes you are observing around you with place/item. (For ellipse, parabola and hyperbola). |
| 3 | 3 | Take two simple objects. Sketch isometric of them. Also draw orthographic projections of them (all views). |
| 4 | 4 | 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. |
| 5 | 5 | Sketch the combinations of set squares to draw angles in step of 15° . (15° , 30° , 45° , 60° , 75° , 90° , 105° , 120° , 135° , 150° , 165° , 180°). |
| 6 | 6 | List at least two questions which you would like to ask for followings. Each student will prepare these questions in his/her own. <ol style="list-style-type: none"> Ellipse. Involute of circle. Perspective projections. Use of geometric constructions. 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, Bangalore. |
| 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 :

- a: Models- full and cut.
- b: Set of various industrial drawings being used by industries-up dated.
- c: Drawing equipments and instruments for class room teaching-large size.
- d: Drawing board-half imperial size.
- e: T-square or drafter (Drafting Machine).
- f: Set squires (45^0 and 30^0 - 60^0)
- g: Protector.
- h: Drawing instrument box (containing set of compasses and dividers).
- i: Drawing sheets.
- j: Drawing pencils.
- k: Eraser.
- l: Drawing pins / clips.

C. List of Software/Learning Websites:

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

9. COURSE CURRICULUM DEVELOPMENT COMMITTEE

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