SARVAJANIK UNIVERSITY
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Sarvajanik University
Sarvajanik College of Engineering & Technology, Surat
Bachelor of Technology (B. Tech.)

B. Tech. Semester I/II

Subject Name: **Engineering Graphics & Design** **Subject Code: BTME12111**

Type of course: Engineering Science Course
Prerequisite: No prerequisites.
Course Outline: Using Engineering Graphics as a visual language is a standard practice for all engineers. This subject will help students to enhance their visual skills and provide them with tools to communicate their ideas as drawings, using paper and computer.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
1	0	4	3	60	25	15	60	40	200

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Introduction to Engineering Graphics and Scales:** Importance of engineering graphics & design in the field of engineering, use of drawing instruments and accessories for manual drawings, Bureau of Indian Standards (BIS) – Engineering Drawing Practice for Schools & College (SP 46) & other ISO conventions, types & application of lines, numbering & lettering, types of dimensioning system, basic geometric drawing. Scale, importance of scale, size of the scale, types of scale: plain scales and diagonal scales	5 (Lecture)	20%
2.	**Engineering Curves:** Introduction to conic curves and engineering curves. Classification of engineering curves, procedure to construct: conics curves (ellipse, parabola, and hyperbola), cycloid, epicycloid & hypocycloid, involutes and Archimedean spiral.	10 (Lecture)	
3.	**Projections of Points, Lines & Planes:** Introduction to principal planes of projections, projections of the points, projections of line inclined to one reference plane and both reference planes, projections of planes with its	14 (Laboratory sessions)	25%

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	inclined to one reference plane and two reference planes		
4.	**Projections of Solids, Section of Solids:** Classification of solids, projections of solids with its inclined to one reference plane and two reference planes, section of solids and the true shape of the section.	6 (Laboratory sessions)	15%
5.	**Development of Surfaces:** Concept of development of the different surfaces, parallel line development, radial line.	6 (Laboratory sessions)	
6.	**Orthographic Projections:** Introduction to orthographic projections, projections from the pictorial view of the object on the principal planes for view from front, top and sides using first angle projection method and third angle projection method, full sectional view. **Missing Views:** The identification of missing views from the given views. Create the third view from the two available views so that all the details of the object are obtained.	14 (Laboratory sessions)	30%
7.	**Isometric Projections and Isometric View or Drawing:** Isometric scale, conversion of orthographic views into isometric projection, isometric view or drawing.	12 (Laboratory sessions)	
8.	**Computer Aided Drawing (CAD):** Introduction to CAD, drawing commands, modifying /editing commands, annotation and dimensioning commands, concepts of layers, demonstration of various line styles, demonstration of a simple team design project that illustrates geometry and topology of engineered components (creation of engineering models and their presentation in standard 2D drafting and as 3D modeling).	8 (Laboratory sessions)	10%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary from above table.

Percentage Distribution of Marks as per Bloom's Taxonomy (Theory/Practical):

Percentage Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	35	30	5	5	5

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels

Reference Books:

Sr. No.	Title of book /article	Author(s)	Publisher	Year of publication	Publication Edition
1.	Engineering Drawing Practice for Schools & College (SP 46)	--	Bureau of Indian Standards (BIS) National Drawing Code (ISBN 81-7061-091-2)	1998	--
2.	A Textbook of Engineering Drawing	P.J. Shah	S. Chand & Company Ltd, NewDelhi, (ISBN:9788121941822)	2008	--
3.	Engineering Drawing	N.D. Bhatt	Charotar Publishing HousePvt Ltd, Anand (ISBN:9789380358963)	2014	53
4.	Engineering Drawing + AutoCAD	K. Venugopal & Prabhu Raja, V.	New Age international publication, New Delhi	2020	5th
5.	Engineering Drawing	B. Agrawal & C. M. Agrawal	Tata McGraw Hill, New Delhi, (ISBN:978-0-07-066863-8)	2019	3rd
6.	A Textbook of Engineering Drawing	R.K. Dhawan	S. Chand & Company Ltd., New Delhi (ISBN: 9789352837373)	2019	--
7.	Engineering Graphics	Frederick E. Giesecke, Alva Mitchell, Henry C. Spencer, Ivan L. Hill, John T. Dygdon, James E. Novak	Pearson (ISBN: 1292026170)	2013	8th
8.	Engineering Graphics with AutoCAD 2020	James D. Bethune, Boston University	Macromedia Press (ISBN: 9780135562154)	2019	1st

Course Outcomes (CO):

Sr. No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-1	Recognize set of rules and commonly accepted standards, practices and methods used for technical drawings. *(U,R-Cognitive level)*	10
CO-2	Construct basic engineering drawings and models using fundamental projection techniques and drafting instruments. *(U,E,C-Cognitive level)*	30

Sr. No.	CO Statements After learning this subject, students will be able to	Marks % weightage
CO-3	Understand importance of visualization and technical communication skill in the field of engineering. *(A,U,E-Cognitive level)*	25
CO-4	Convert ideas into products using visualization and drafting skills. *(N,C-Cognitive level)*	25
CO-5	Apply the knowledge of computer drafting software to develop 2D and 3D geometry. *(U,N,C-Cognitive level)*	10

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	1	1	0	1	0	1	1	1	2	2	1			
CO-2	2	1	2	1	1	0	1	0	1	1	2	1			
CO-3	2	1	2	1	1	1	1	1	1	1	2	1			
CO-4	3	1	3	1	3	1	2	0	2	3	3	3			
CO-5	3	1	3	1	3	0	3	0	2	3	3	3			
Rationale*	**12**	**5**	**11**	**4**	**9**	**2**	**8**	**2**	**7**	**10**	**12**	**9**			

Rationale: As per above CO-PO mapping, this subject will develop basic engineering knowledge, design and development, technical communication with teamwork, visualization skill set development among the students.

List of Practical:

1. Exercise in sketch book: Draw alphabets and numerical (Vertical only), types of dimensioning methods, different types of line, construction of different polygon, divide the line into equal parts, bisect an angle, bisect a line, divide a circle into 6-8-12 parts and draw a polygon using a universal method.
2. Exercise in sketch book: Solve problems on plain scale, diagonal scale, ellipse, parabola, hyperbola, cycloid, epicycloid & hypocycloid, involutes and Archimedean spiral
3. Exercise in sketch book: Solve problems on orthographic projections using first & third angle projection.
4. Exercise in sketch book: Solve problems on orthographic projections using first & third angle projection.
5. Exercise in sketch book: Solve problems on isometric views.
6. Draw basic 2D sketches like: point, line, rectangle, rhombus, polygon, circle, circular arc using CAD software.

7. Draw basic 3D geometries like: cube, cuboid, prism, pyramid, sphere, hemisphere, cone, cylinder and tetrahedron using CAD software.

Term work submission:

1. Prepare drawing sheets of the following:
   (a) Engineering curves.
   (b) Projection of point & line.
   (c) Projection of plane, projection of solid, section of solid.
   (d) Development of surfaces.
   (e) Orthographic projection.
   (f) Isometric projection.

2. Submit printouts of CAD work.

Student Activities:

1. Collect maps, production drawing, building drawing & layouts and they will list out the following: (a) Types of lines used (b) Numbering and lettering styles used (c) Dimensioning system used.
2. Collect a component/circuit/plan specific to their branch and draw the orthographic views using CAD software.
3. Collect one production drawing/construction drawing/plumbing drawing and draw an isometric view from the orthographic view by using CAD software.
4. Prepare a 3D model using CAD software and construct same in 3D printer

Instrument's required:

1. All standard drawing instruments.

Equipment's available:

1. Drawing Tables
2. Computers
3. 3D Printer

List of Open Source/learning website:

1. https://nptel.ac.in/courses/112/103/112103019/
2. https://nptel.ac.in/courses/112/105/112105294/

List of Software:

AutoCAD (Institute version only)