

## **ENGINEERING GRAPHICS (Code No. 046)**

### **CLASS - XII (2021-22)**

The subject of 'Engineering Graphics' has become an indispensable tool for Engineers, Technocrats, Architects, Draftsmen, Surveyors, Designers and many other professionals in the recent times. It is used to convey the ideas and information necessary for the construction or analysis of machines, structures and system, graphically. It is expected that the knowledge gained through the study of different topics and the skills acquired through the prescribed practical work will make the learners to meet the challenges of academic, professional courses and daily life situations after studying the subject at Senior Secondary Stage.

#### **Objectives:**

The study of the subject of Engineering Graphics at Senior School Level aims at helping the learner to:

- develop clear concept and perception of different objects.
- develop a clear understanding of plane geometry, solid geometry and machine drawing so as to apply the same in relevant practical fields such as technology and industry.
- develop the skill of expressing two-dimensional and three-dimensional objects into professional language and vice versa.
- acquire speed and accuracy in use of drawing instruments.
- acquire the ability to readily draw neat sketches, often needed in "On-job situations".
- use technology (CAD) in developing isometric and orthographic projections of simple objects.

**COURSE STRUCTURE**  
**CLASS XII (2021-22)**

**TERM – 1**

S.No.	Unit	Marks	Periods
I	<b>ISOMETRIC PROJECTION OF SOLIDS</b> 1. Isometric Projections of Solids 2. Isometric Projections of Combination of Solids	25	40
II	<b>Machine Drawing (Machine Parts)</b> 3. Machine Parts – Drawing with instruments	10	20
	<b>Practical</b>	15	20
	<b>Total Marks</b>	<b>50</b>	<b>80</b>

**THEORY**

**I. ISOMETRIC PROJECTION OF SOLIDS**

**40 Periods**

Unit 1: Construction of isometric scale showing main divisions of 10mm and smaller divisions of 1mm, also showing the leading angles.

Isometric projection (drawn to isometric scale) of solids such as cube; regular prisms and pyramids (triangular, square, pentagonal and hexagonal); cone; cylinder; sphere; hemisphere; keeping the base side of the solid parallel or perpendicular to HP/VP. The axis of the solid should be either perpendicular to HP / VP or parallel to HP and VP.

20 Periods

Unit 2: Combination of any two above mentioned solids keeping the base side parallel or perpendicular to HP/VP and placed centrally together (Axis of both the solids should not be given parallel to HP).

20 Periods

**Note:** Hidden lines are not required in isometric projection.

**II. Machine Drawing (Machine Parts) (as per SP 46: 2003)**

**20 Periods**

Unit 3: Drawing to full size scale with instruments.

Introduction of threads: Standard profiles of screw threads - Square, Knuckle, B.S.W., Metric (external and internal); Bolts – Square head, Hexagonal head; Nuts – Square head, Hexagonal head; Plain washer; combination of nut and bolt with or without washer for assembling two parts together.

**PRACTICALS**

**20 Periods**

(i) To perform the following tasks (for One only) from the given views of the prescribed machine blocks from 1 to 5 from **ANNEXURE-I**.

Value-Points

1. Copy the given views

1

2.	Drawing the missing view with hidden lines	1
3.	Sketching the Isometric view without hidden edges	3
4.	To make the machine block of the above in three dimensions. (not to scale but approximately proportionately drawn with any medium i.e. thermocol, soap-cake, plasticine, clay, wax, orchsis (available with florists), etc.)	3
(ii)	Computer Aided Design (CAD) – Project (5 sheets) Project on the simple solids (Prism, Pyramids etc.) or machine blocks as prescribed in part-I by using the CAD software.	3
(iii)	(a) Sessional work relating to machine blocks as prescribed.	2
	(b) Viva-voce	2

### ACTIVITY

Industrial Visits (one) to any industry/ manufacturing plant to acquaint the students with the present - day methods & technology for better conceptual understanding can be done by virtual tour of the factory/plant in present situation. The following links are given as an example for same:

**COURSE STRUCTURE****CLASS XII (2021-22)****TERM – 2**

<b>S.No.</b>	<b>Unit</b>	<b>Marks</b>	<b>Periods</b>
III	<b>Machine Drawing (Machine Parts)</b> 4. Machine Parts – Free Hand Sketches	7	10
IV	<b>Machine Drawing (Assembly and Dis-assembly)</b> 5. Bearings 6. Rod joints 7. Tie-rod and Pipe joint	28	50
<b>Practical</b>		15	20
<b>Total Marks</b>		<b>50</b>	<b>80</b>

**III. Machine Drawing (Machine Parts) (as per SP 46: 2003)****10 Periods**

## Unit 4: Free-hand sketches

Conventional representation of external and internal threads; Types of studs – Plain stud, Square-neck stud, Collar stud; Types of rivets – Snap head, Flat head, Pan head (without tapered neck), 60° Counter Sunk Flat head.

**IV. Machine Drawing (Assembly and Dis-assembly) (as per SP 46: 2003)****50 Periods**

(Internal choice will be given between an Assembly drawing and a Dis-Assembly drawing).

## Unit 5: Bearings

- (i) Open-Bearing
- (ii) Bush- Bearing

## Unit 6: Rod-Joints

- (i) Cotter-joints for round-rods (Sleeve and cotter joint)
- (ii) Cotter-joints for square rods (Gib and cotter-joint)

## Unit 7: Tie-rod and Pipe-joint

- (i) Turnbuckle
- (ii) Flange pipe joint

**Note:**

1. *In all Assembly drawings, half sectional front view will be asked. Side/End view or Top View/Plan will be drawn without section.*
2. *In all Dis-assembly drawings, only two orthographic views (one of the two views may be half in section or full in section) will be asked of any two parts only.*
3. *(a) In all sectional views, hidden lines/ edges are not to be shown.  
(b) In all full views, hidden/edges are to be shown.*

## PRACTICALS

**20 Periods**

- (i) To perform the following tasks (for One only) from the given views of the prescribed machine blocks from 6 to 10 from **ANNEXURE-I**.

	Value-Points
1. Copy the given views	1
2. Drawing the missing view with hidden lines	1
3. Sketching the Isometric view without hidden edges	3
4. To make the machine block of the above in three dimensions. (not to scale but approximately proportionately drawn with any medium i.e. thermocol, soap-cake, plasticine, clay, wax, orchsis (available with florists), etc.)	3
(ii) Computer Aided Design (CAD) – Project (5 sheets) Project on the simple solids (Prism, Pyramids etc.) or machine blocks as prescribed in part-I by using the CAD software.	3
(iii) (a) Sessional work relating to machine blocks as prescribed.	2
(b) Viva-voce	2

## ACTIVITY

Industrial Visits (one) to any industry/ manufacturing plant to acquaint the students with the present - day methods & technology for better conceptual understanding can be done by virtual tour of the factory/plant in present situation. The following links are given as an example for same:

## ANNEXURE -- 1



