

ENGINEERING GRAPHICS

Class-XI



CENTRAL BOARD OF SECONDARY EDUCATION

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FOREWORD

One of the integral aspects of the world around us is design. As children we draw, paint and visualise our own unique designs of homes, ceatures, their clothes and our make believe world. As we grow older, we gradually become aware of the existence of design vis a vis our room, furniture, clothes, etc. We have also seen important historical buildings such as the Taj Mahal, India Gate, Qutub Minar, Red Fort etc. they all have a unique design.

Today, in the age of globalization and consumerism, we are inundated with images of new cars, aeroplanes, space crafts and the like. Design is crucial to each of the these unique things. Indeed, everything that we use and are surrounded with, has a unique and intrinsic design: be it the house one lives in, the gadgets one uses, the design of the fabric that we use for our clothes, the cut or design of the clothes that we wear and so on. Each of the above has been designed by a specialist – an architect, an engineer, a textile designer, a fashion designer and so on. In the making of each of these engineering drawing is the medium.

Thus Engineering Drawing is the language of all engineers, architects, textile designers, fashion designers and many others. This is used right from conceiving the design of any product, be it consumer or industrial, up to the mass production stage and beyond for renovation and redesign. The subject of Engineering Drawing finds its use in Architecture, Engineering, Fashion Design, Interior Decoration, Textile Design, etc.

With the advent of computers in all spheres of knowledge, Engineering Drawing has also become compatible with computers. With the application of CAD (Computer Aided Design), the subject is now known as Engineering Graphics. CAD enables a product to undergo design changes necessiated by factors such as functionality, aesthetics, ease-of-handling, strength, obsolescence, etc. Using CAD, prototypes can be tested, design changes examined and comparative study made in no time. Requirements such as the amount of material needed, its dimensions and costing are done instantly. This has made Engineering Graphics indispensable.

The subject is taught at the Senior Secondary level as prescribed by the syllabus of the CBSE. Though many good books by Indian and foreign authors are available, and recommended hither to, for the first time, the CBSE has undertaken the task of writing the textbook for class XI and class XII customizing to the exact requirement of our prescribed syllabus, with the assistance of a team of experienced experts and teachers drawn from its affiliated schools and Government technical institutions of repute. The books have been written with an interactive approach, evolving the subject matter from known-to-unknown, relating it to everyday life situations, motivating children to learn the advanced aspects of the unit, reinforcing the acquired knowledge by repacitulation, drilling exercise, etc.

In this textbook of Engineering Graphics for class XI, students will learn about Plane Geometry, Solid Geometry and Machine Drawing, which includes Orthographic Projections, Isometric Projections and Development of Surfaces. All these units form the foundation of the subject.

I would like to place on record my deep appreciation for all the subject experts and practicing teachers who have put in their sincere efforts in the development of this textbook. Appreciation is also due to Mrs. C. Gurumurthy, Director (Academics) and Dr. (Smt.) Srijata Das, Education Officer for planning and execution of the work and bringing out this publication.

It is hoped that students and teachers will benefit by making the best use of this publication. Suggestions from the users for further improvement of the textbook will be highly appreciated.

VINEET JOSHI
Chairman, CBSE

भारत का संविधान

उद्देशिका

हम, भारत के लोग, भारत को एक (सम्पूर्ण प्रभुत्व-संपन्न समाजवादी पंथनिरपेक्ष लोकतंत्रात्मक गणराज्य) बनाने के लिए तथा उसके समस्त नागरिकों को: सामाजिक, आर्थिक और राजनैतिक न्याय, विचार, अभिव्यक्ति, विश्वास, धर्म और उपासना की स्वतंत्रता, प्रतिष्ठा और अवसर की समता प्राप्त कराने के लिए, तथा उन सब में

व्यक्ति की गरिमा और² (राष्ट्र की एकता और अखण्डता) सुनिश्चित करने वाली बंधुता बढ़ाने के लिए दृढ़संकल्प होकर अपनी इस संविधान सभा में आज तारीख 26 नवम्बर, 1949 ई० को एतद्वारा इस संविधान को अंगीकृत, अधिनियमित और आत्मार्पित करते हैं।

1. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से) "प्रभुत्व-संपन्न लोकतंत्रात्मक गणराज्य" के स्थान पर प्रतिस्थापित।
2. संविधान (बयालीसवां संशोधन) अधिनियम, 1976 की धारा 2 द्वारा (3.1.1977 से) "राष्ट्र की एकता" के स्थान पर प्रतिस्थापित।

भाग 4 क

मूल कर्तव्य

5.1 क. मूल कर्तव्य—भारत के प्रत्येक नागरिक का यह कर्तव्य होगा कि वह—

- (क) संविधान का पालन करे और उसके आदर्शों, संस्थाओं, राष्ट्र ध्वज और राष्ट्रगान का आदर करे;
- (ख) स्वतंत्रता के लिए हमारे राष्ट्रीय आंदोलन को प्रेरित करने वाले उच्च आदर्शों को हृदय में संजोए रखे और उनका पालन करे;
- (ग) भारत की प्रभुता, एकता और अखंडता की रक्षा करें और उसे अक्षुण्ण रखें;
- (घ) देश की रक्षा करें और आह्वान किए जाने पर राष्ट्र की सेवा करें;
- (ङ) भारत के सभी लोगों में समरसता और समान भ्रातृत्व की भावना का निर्माण करें जो धर्म, भाषा और प्रदेश या वर्ग पर आधारित सभी भेदभाव से परे हों, ऐसी प्रथाओं का त्याग करें जो स्त्रियों के सम्मान के विरुद्ध हैं;
- (च) हमारी सामाजिक संस्कृति की गौरवशाली परंपरा का महत्व समझें और उसका परिरक्षण करें;
- (छ) प्राकृतिक पर्यावरण की जिसके अंतर्गत वन, झील, नदी और वन्य जीव हैं, रक्षा करें और उसका संवर्धन करें तथा प्राणि मात्र के प्रति दयाभाव रखें;
- (ज) वैज्ञानिक दृष्टिकोण, मानववाद और ज्ञानार्जन तथा सुधार की भावना का विकास करें;
- (झ) सार्वजनिक संपत्ति को सुरक्षित रखें और हिंसा से दूर रहें;
- (ञ) व्यक्तिगत और सामूहिक गतिविधियों के सभी क्षेत्रों में उत्कर्ष की ओर बढ़ने का सतत प्रयास करें जिससे राष्ट्र निरंतर बढ़ते हुए प्रयत्न और उपलब्धि की नई ऊँचाईयों को छू लें।

THE CONSTITUTION OF INDIA

Preamble

We, The people of India, having solemnly resolved to constitute India into a¹ (**Sovereign Socialist Secular democratic republic**) and to secure to all its citizens :

Justice, Social, Economic and Political;

Liberty of thought, expression, belief, faith and worship;

Equality of status and of opportunity; and to promote among them all

Fraternity assuring the dignity of the individual and the² (unity and integrity of the Nation); **In our Constituent Assembly** this twenty-sixth day of November, 1949, do **hereby adopt, enact and give to ourselves this constitution.**

1. Subs. by the Constitution (Forty-second Amendment) Act, 1976, sec. 2, for "Sovereign Democratic Republic (w.e.f. 3.1.1977)".
2. Subs. by the Consitution (Forty-second Amendment) Act, 1976, sec. 2, for "Unity of the Nation (w.e.f. 3.1.1977)".

Chapter IV A FUNDAMENTAL DUTIES

Article 51-A

Fundamental Duties—It shall be the duty of every citizen of India—

- (a) to abide the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the rich natural environment including forests, lakes, rivers, wild life and to have compassion for living creatures;
- (h) to develop the specific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

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CBSE Advisors

Sh. Vineet Joshi, Chairman

Smt. C. Gurumurthy, Director (Academic)

Convenor

Dr. R.P. Chaurasia, Former Vice Principal, Bhartiya Vidya Bhavan, Delhi

Development Team

Dr. R.P. Chaurasia, Former Vice Principal, Bhartiya Vidya Bhavan, Delhi

Dr. S.M. Kapoor, Former Incharge, MMSS School, Delhi

Sh. Arvind Chauhan, Modern School, Vasant Vihar, New Delhi

Sh. Hitesh Gupta, G.B. Pant, Sarvodaya Bal Vidyalaya, Srinivas Puri, New Delhi

Mrs. G.M. Prema, Shyama Prasad School, Lodhi Road, New Delhi

Mrs. Soumya N.M., Delhi Kannada School, Lodhi Road, New Delhi

Editors

Dr. R.P. Chaurasia, Former Vice Principal, Bhartiya Vidya Bhavan, Delhi

Sh. Amrit Pal Singh, Asstt. Director, National Power Training Institute (North Region), Badarpur, New Delhi

Member Coordinator

Dr. Srijata Das

Education Officer, CBSE, Delhi

CONTENTS

Foreword	iii
Acknowledgements	vi

S.No.	Chapters	Page No.
1.	Lines, Angles, Letters, Dimensioning and Rectilinear Figures	1-71
2.	Circles, Semi Circles and Tangents	72-80
3.	Special Curves	81-88
4.	Orthographic Projection	89-169
5.	Sections of Solids	170-225
6.	Orthographic Projections of Simple Machine Blocks	226-261
7.	Isometric Projection	262-285
8.	Development of Surfaces	286-301

