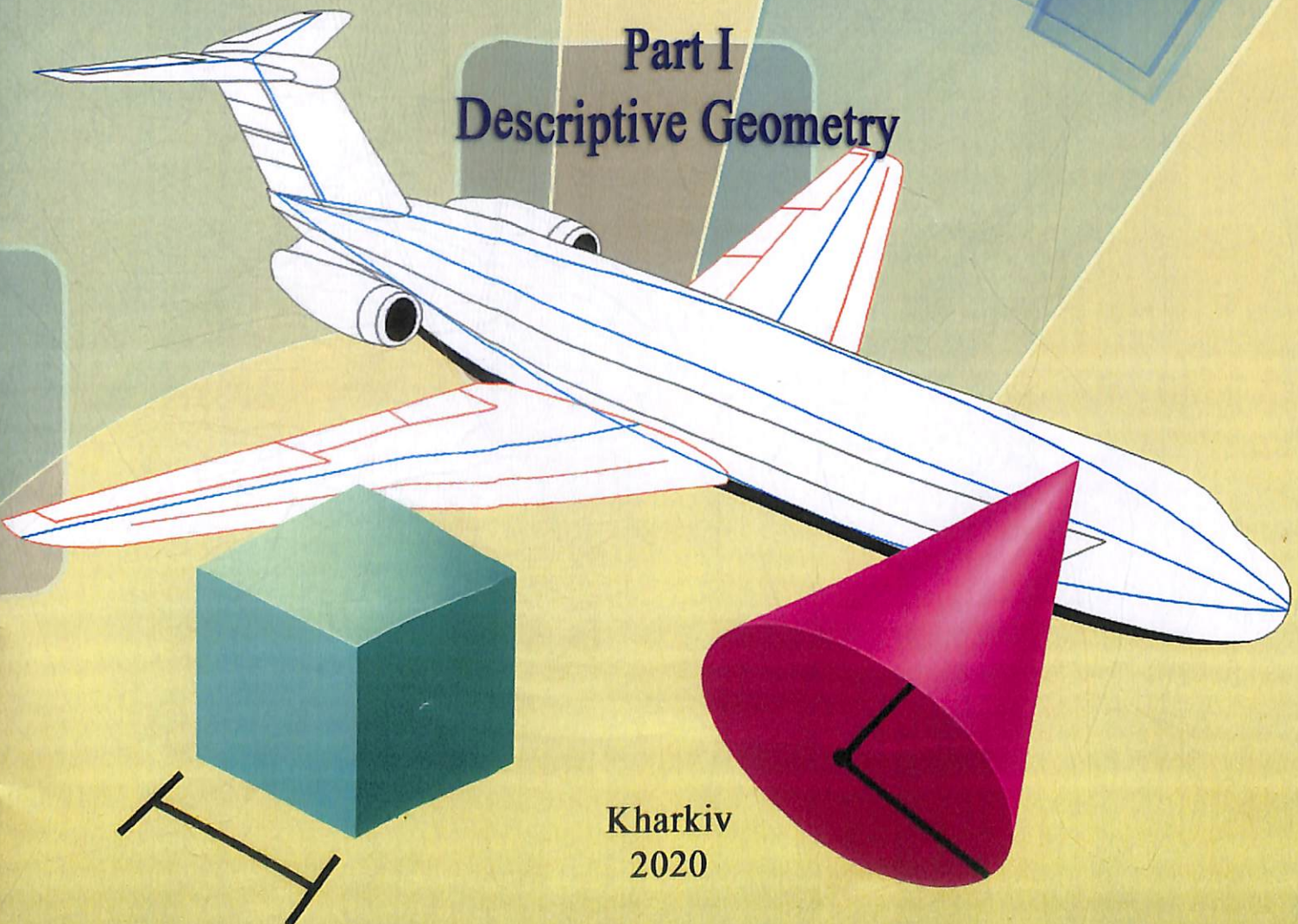


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MINISTRY OF DEFENCE UKRAINE  
IVAN KOZHEDUB KHARKIV NATIONAL UNIVERSITY  
OF AIR FORCE

# ENGINEERING AND COMPUTER GRAPHICS

Part I  
Descriptive Geometry



Kharkiv  
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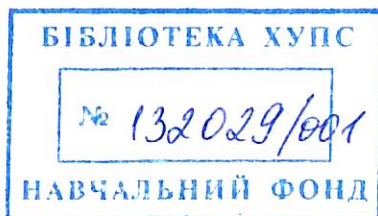
I. Kovtonyuk, O. Sivik

# ENGINEERING AND COMPUTER GRAPHICS

Part I

Descriptive Geometry

Lecture notes



Kharkiv

2020

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*Рекомендовано до друку вченою радою  
Харківського національного університету  
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**Ковтонюк І.**

К56 Інженерна та комп'ютерна графіка : конспект лекцій / І. Ковтонюк,  
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Конспект лекцій написаний відповідно до першого змістового модуля робочої навчальної програми дисципліни "Інженерна та комп'ютерна графіка" та містить систематичне викладання загального курсу нарисної геометрії.

Максимально деталізовано викладання основних положень нарисної геометрії в геометричних побудовах і проєкційних зображеннях.

Посібник призначений для іноземних студентів, курсантів і студентів Харківського національного університету Повітряних сил ім. Івана Кожедуба та може бути використаний студентами та курсантами інших військових та цивільних навчальних закладів, інженерно-технічними працівниками і професорсько-викладацьким складом.

The lecture notes are written in accordance with the first content module of the working curriculum of the discipline "Engineering and Computer Graphics" and contains a systematic teaching of the general course of descriptive geometry.

Outline of basic principles of descriptive geometry in geometric constructions and projection images is as detailed as possible.

The manual is intended for foreign students, cadets and students of Kharkiv National University of the Air Force. Ivan Kozhedub and can be used by students and cadets of other military and civilian educational institutions, engineering and technical staff, and teaching staff.

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## INTRODUCTION

The educational discipline "Engineering and Computer Graphic" is complex and consists of three modules: M1 is Descriptive Geometry (first term); M2 is Engineering Graphic (second term) and M3 Computer Graphic (third term). Three modules are the organic whole, where one part develops and complements the other one.

Descriptive Geometry is grammar of engineering graphic and studies theoretical bases of geometrical design of three-dimensional objects by the method of projection images. Subject of a Descriptive geometry is spatial forms and their relations. A Descriptive geometry equips a student with the method of projections, which is basis of other divisions of graphic cycle and apply practically all technical disciplines. Mostly this method is used by theoretical mechanics, theory of mechanisms and machines, higher mathematics, resistance of materials, detail of machines.

As a result of learning the module "Descriptive Geometry" a student must:

- to know theoretical bases of construction of images of points, lines, planes, separate types of the crooked lines and surfaces;
- able to decide tasks on mutual belonging and mutual crossing of geometrical figures, also on determination of natural size of separate geometrical figures.

Engineering and Computer drawing is a two dimensional representation of three dimensional objects. In general, it provides necessary information about the shape, size, surface quality, material, manufacturing process, etc., of the object. It is the graphic language from which a trained person can visualize objects.

Drawings prepared in one country may be utilized in any other country irrespective of the language spoken. Hence, engineering drawing is called the universal language of engineers. Any language to be communicative, should follow certain rules so that it conveys the same meaning to everyone. Similarly, drawing practice must follow certain rules, if it is to serve as a means of communication.

The ability to read drawing is the most important requirement of all technical people in any profession.

As compared to verbal or written description, this method is brief and more clear. Some of the applications are : building drawing for civil engineers, machine drawing for mechanical engineers, circuit diagrams for electrical and electronics engineers, computer graphics for one and all.

The subject in general is designed to impart the following skills.

- 1) ability to read and prepare engineering drawings;
- 2) ability to make free - hand sketching of objects;
- 3) power to imagine, analyze and communicate;
- 4) capacity to understand other subjects.

Descriptive geometry is the science and technique for exact graphic representation of the forms of objects and of their position in space.

Descriptive geometry provides us with a means for definitely locating points in space; for determining the length, direction, and curvature of lines; for determining the extent, type, and inclination of planes; and for determining the shape, size, and position of solids.

Techniques provided by descriptive geometry often give rapid and accurate graphic solutions to problems which would yield only slowly to mathematical methods. Also, while presenting these techniques and explaining them, the science indirectly develops the ability to visualize forms and dispositions in space, an ability necessary in dealing with solid realities of the three-dimensional world.