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Engineering Computer Graphics As A General Technical Discipline

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ABSTRACT

The article considers the possibilities of modern graphic programs in the teaching of engineering disciplines. In addition, the purpose of the subject is studied engineering computer graphics.

Keywords: Computer graphics, graphic disciplines, the purpose of the subject, 3D.

INTRODUCTION

In connection with the progressive development of technology, the question of the need for students to acquire practical skills in the use of computer technology in solving professional problems arises sharply. Engineering graphics is the first General technical discipline, which plays a significant role in the formation of the future engineer. The widespread introduction of computers into production gradually leads to the replacement of traditional technology for the creation of design and technological documentation on computer records management. Therefore, the study of the use of computer technology training in the study of the course "Engineering graphics" and determine the optimal combination of them with traditional methods of training is an urgent problem.

One of the requirements of the time is the effective use of information and communication technologies in teaching subjects. The use of information and communication technologies leads to changes in the content of teaching and teaching activities. However, such changes can give positive results only when teaching with the use of advanced pedagogical technologies. [1]

By means of learning commonly understood as objects created by man and natural environment used in the educational process as carriers of educational information and tools activities teacher and students to achieve the goals of training, education and development. [2]

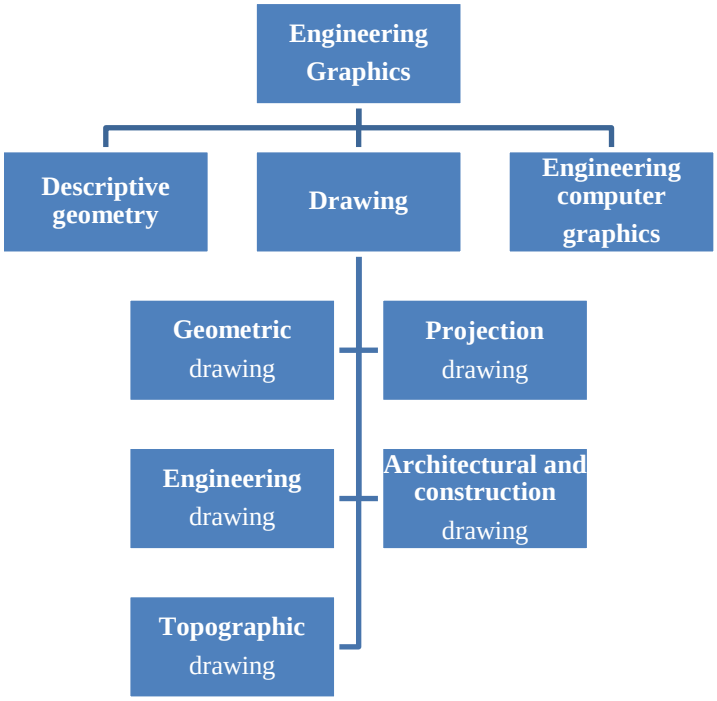
Computer tools have radically changed the approaches to teaching methods: visualization can improve the observation and understanding of such invisible processes and phenomena as magnetic and electric fields, the structure of molecules, chemical reactions, etc. [3]

The development of computer technology – the advent of personal computers and computer-aided design-has defined a new direction in engineering graphics-computer graphics (pic 1). This academic discipline regulated the use of computers in the educational process of engineering and graphic disciplines. [4]

Theoretical foundations of computer graphics based on fundamental knowledge of computer science and descriptive geometry. [5]

There are two functions of computer graphics: illustrative and cognitive. The illustrative function makes it possible to embody in the visual design only what already known and exists either in the surrounding world or as the idea of the researcher. The cognitive function, on the other hand, is to acquire new knowledge by means of an image, to reveal the essence of a phenomenon, or at least to contribute to the intellectual process of obtaining an idea of that phenomenon. [6]

Computer graphics in the study of graphic disciplines becomes a new, progressive, convenient tool for creating drawings and other design documentation.



Picture 1. Structure of engineering graphics.

Unlike flat images, a computer 3D model, for its study, can be rotated on the screen at different angles, viewed from different sides (top, bottom, side), perform cuts to analyze the internal surfaces. Computer 3D models, in the process of studying, can disassembled into separate elements, and assembled into a single product.

The possibilities of computer technologies should not only link theory with practice; automate some types of mechanical, routine work in the classroom on descriptive geometry and engineering graphics. Also contribute to the cognitive and creative activity of students, contribute to the fullest realization of the intellectual potential of students, give them the opportunity to modern means clearly and fully display emerging ideas. Computer learning technologies should be integrate into traditional methods of knowledge acquisition in order to improve the efficiency of the learning process. [7]

Currently, the methodology of teaching geometric and graphic training can be divide into three categories. To the first can be attributed sequential training: descriptive geometry-engineering graphics-machine (computer) graphics. This systematic procedure for studying the discipline has proven itself well and is often use in universities. The second is the transition to full computerization of graphic training. However, this approach is more applicable to students who have a certain "baggage" of knowledge and drawing skills. Otherwise, this approach is simplifies, as it contributes to the formation of not intellectually developed specialist, able to work creatively and solve any professional problems, and specialist narrow focus, dependent on the computer. The most acceptable in today's conditions is the third category: parallel training of descriptive geometry, engineering and computer graphics. [8]

The system of computer graphics provides several components: maintenance (hardware - computer and various graphic devices); software and mathematical support (algorithms and machine programs for solving graphic and geometric problems, software for controlling graphic devices, etc.); methodical part (methods of working with graphic systems, as well as the search for the most rational design processes and research).

Computer graphics refers to complex synthetic resources. Its emergence and development was the result of the

merger of graphics with modern instrumental and technological solutions, presenting the engineer with new tools and opportunities for the implementation of innovative ideas. [9]

The use of applied graphics programs as an "electronic Cullman" when performing graphic works allows not only to increase the accuracy of geometric constructions, while maintaining the content side. However, also promotes formation at students of knowledge, abilities and skills in use of the computer at performance of settlement and graphic works on practical occupations and during house independent work.

The purpose of this course is to:

- teaching students graphic literacy;

- obtaining the skills necessary to perform and read drawings of simple objects for various purposes and solutions with their help of certain tasks of different levels;

- study of the main issues of the design and construction automation system (CAD);

- create, edit and design drawings when working on personal computers.

Computer graphics and modeling allow the use of computer technology to build drawings. The main objectives of teaching the discipline are:

- visual-the study of the theoretical foundations of the construction of images on a complex drawing;

- geometric-graphic-study of graphic algorithms for rational solution of metric and positional problems;

- spatial-logical-development of skills of spatial representation and research on the drawing of various forms;

- constructive-graphic-training in the application of descriptive geometry methods, taking into account the specialization of training to solve various technical problems associated with geometric design, calculation and analysis.

- formation of graphic literacy and graphic culture;

- formation of skills of independent individual work with the computer graphic program AutoCAD;

- development of skills of design and design activity.

Rules of construction and design of the drawing absolutely do not depend on the technology of its execution: "manual" and electronic drawings must comply with the same standards. [10]

Drawings and drawings as natural formations do not exist. These images have an artificial nature - they are the works of human hands, feelings and mind. Man creates them to convey information about the objects depicted and gives them the role of a kind of graphic models of his perception, understanding and representation of these objects.

In its form, drawing is a graphical model of perception and understanding of the object, drawing-a geometric model of understanding and scientific definition of the object.

Today there are two directions of creation of computer graphics:

1. Use of graphics packages, computer-aided design systems, three-dimensional graphics and animation packages.

2. The use of programming languages to create graphic images and animations, using the implementation of computer graphics algorithms.

The first direction allows you to get a better result with relatively low labor costs. The difficulty is the lack of quantity and quality of methodical literature, constant updating of graphic tools, high requirements for computer technology, inaccessible to most schools.

The second direction can used on almost any type of computer for which, there is a high-level programming language implementation. The use of programming in the creation of computer graphics is more time-consuming compared to the use of graphics packages. But, allows more effective use of computer modeling as a means of knowledge.

Most graphic editors and computer-aided design systems are organize on a single principle-the execution of certain actions is reduce to the development of individual commands. The main commands are the following:

- drawing graphic primitives;

- editing of graphic primitives (copying, moving, erasing, scaling, etc.);

- set line templates;

- monitor screen control (zoom in and out, move around the working area of the screen);

- input and output of information (saving in files, downloading a file, printing).

For the convenience of using commands, they are usually combine into specialized menus, which often have the form of panels consisting of individual buttons with icons.

Students are introduce to two approaches to design. In the first approach to the design of the computer is use as an "electronic Cullman", facilitating the work of the designer. This approach is bases on two-dimensional geometric modeling.

The second approach to the automation of design activity is bases on the intra machine representation of a geometric object, a common database, which contributes to the effective functioning of software systems of computer-aided design of a particular product. The drawing here plays a supporting role, and the methods of its creation are based on the methods of displaying the spatial geometric model, which is a more visual way of representing the original and a more powerful and convenient tool for solving geometric problems.

Performing practical work, students acquire basic skills in the program AutoCAD; they have formed the concept of three-dimensional modeling of the model.

Students perform drawings of parts containing mates, polygons, division of a circle into equal parts containing simple and stepped sections, create a solid-state model of the part and perform automated creation of images of the solid-state model.

Working with the computer, the student gets the feeling that he manages his own learning activities. This very important psychological factor provides a more active training regime. According to the new understanding, the teacher plays the role of the Director, directing the student, creates the prerequisites for the implementation of the student's activities, which actualizes this activity.

As the most important tools of knowledge now are computers and their software, and the main method of knowledge for educational purposes - modeling, in particular computer modeling.

Three-dimensional solid-state modeling is a fascinating journey into the world, where the creative ideas of the designer get on the computer screen striking in authenticity and realism embodiment. It seems that it is necessary to stretch out a hand, and you can touch something that recently existed only in your imagination.

Thus, obtaining visual images in CAD is the result of the implementation of appropriate geometric devices, the use of which with the development of information technology is becoming increasingly important. For effective use of various graphic environments, solutions of complex design problems it is necessary to rely on the theoretical basis, which provides descriptive geometry.

At the same time, training of future specialists should carried out on rather simple typical examples with a gradual increase in the level of complexity of tasks. Performing the same tasks manually and using CAD demonstrates to students the broad possibilities and advantages of the latter.

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