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Studying Descriptive Geometry with Help of KOMPAS

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Annotation: *the article discusses the study of descriptive geometry using KOMPAS. Descriptive geometry is one of the fundamental disciplines of engineering education, where spatial figures are studied from their projection images. Tasks of descriptive geometry are solved graphically. Knowledge of the basic rules and theorems allows us to solve complex tasks by dividing the process of solving them into a series of elementary operations of the same type.*

Engineering graphic education is aimed at shaping the skills of working with the most complex, from the point of view of human perception, the image of an object - a projection drawing containing numerous conventions and simplifications. The technical difficulties of creating such an image contributed to the development of automation of design and engineering works, and the emergence of modern graphic packages became the apex of this process. The evolution of the instrumental capabilities of computer-aided design systems proceeded in the opposite direction to the stages of graphic education: from using a computer as a tool for constructing a two-dimensional drawing of a product through a three-dimensional geometric model to an information virtual model.

The development of hardware and software for working with graphic information has led to the fact that the computer has become the main tool for creating, storing and processing images. If we analyze the types of graphic information that are used in engineering activities to implement information support for the product life cycle from concept to disposal, then at each stage various types of electronic documents will be relevant. Among them are such as traditional project documentation, information virtual product model and presentation information. In this regard, graphic education at a technical university should be directed to the formation of a specialist who owns modern means of presenting information (1-3).

Descriptive geometry is a general professional discipline with which engineering graphic education begins in a higher educational institution. To study it successfully, a student must have the skills to perform simplest geometric constructions and a certain level of development of spatial imagination. At the same time, it can be noted that a significant proportion of problems arising in solving problems of descriptive geometry is precisely the lack of skills in working with traditional drawing tools and graphic packages. Skills of working with drawing

tools should be acquired before entering a higher education institution, and the basics of computer graphics and computer-aided design as university disciplines intended for teaching computer tools for creating and processing images are taught at senior courses.

Despite the fact that the working program of the “Descriptive Geometry” educational discipline does not provide time for a student to learn how to use a drawing tool, objective reality requires developing skills for performing the simplest graphical constructions in the process of studying descriptive geometry, which is not the goal of the subject. Today it is easier and faster to train a student to perform graphical constructions using computer programs than to perform high-quality drawing with traditional drawing tools. At the same time, the motivation to study a subject that is difficult for students to understand is growing, as in the process of studying, skills are acquired to use modern information technologies in engineering.

Descriptive geometry - a section of geometry in which spatial figures, as well as methods for solving and researching spatial problems, are studied using their images on a plane. To perform graphical constructions on the plane, you can use KOMPAS Graph, which is a system for automating drawing works in their traditional sense. Paper is replaced by a two-dimensional workspace, and instead of drawing tools, a set of commands are used to perform graphical constructions. The use of pencil and paper technology for geometric constructions in conditions where such a drawing device as a drawing board can be found in higher educational institutions only as a museum piece, and for carrying out parallel and perpendicular lines, the Tasshing is used at best, and most often a set of triangles leads to a sharp drop. accuracy of graphic constructions. As a result, students' understanding and adherence to algorithms for solving positional and metric tasks of descriptive geometry ceases to be a determining factor in the correctness of the assignment, but, on the contrary, may cause uncertainty in understanding the subject matter. Correction of errors made in the course of work, leads to blots and multiple redrawing, which significantly increases the complexity of the educational process and reduces the number of learning tasks to be solved. The application for drawing tasks of descriptive geometry of drawing tools of a graphic package removes the problems described above and allows, by combining the accuracy of algebraic calculations and the visibility of geometric constructions, to make the understanding of the subject content responsible for the correctness of the solution. The skills of working with a graphic package are acquired by students fairly quickly, and the time spent on getting acquainted with the program is fully compensated by the fact that the refinement and correction of graphic works performed in electronic form does not require a complete re-drawing of the drawing.

The main condition for the use of a graphic package in the process of teaching graphic disciplines is its availability for individual use by the student in extracurricular independent work. It is provided by the availability of a training version, which can be installed on any computer without copyright infringement. Currently, all companies that develop graphic packages have various educational programs that allow educational institutions to acquire relatively inexpensive university licenses, and students to use their products for independent work. In addition, the relevance of the instrumental capabilities of the graphic package to the requirements of subject preparation is important. In this sense, any graphical package on the market is suitable for studying descriptive geometry. In systems such as SolidWorks and KOMPAS 3D, a planar drawing and a solid part are various graphic documents that can be

associated associatively. Therefore, the information environment of these systems is very convenient for implementing descriptive geometry training.

The organization of learning descriptive geometry in the environment KOMPAS-Graph allows simultaneously with the study of subject content to acquaint students with the instrumental capabilities of the system. Thus, when studying the methods of graphical assignment of a point, line, plane, skills of creating a user coordinate system and methods for constructing simplest geometric objects in a computer environment are acquired, and in the process of solving positional and metric tasks - skills of working with anchors and image editing tools, parallel and perpendicular lines.

By the end of the semester, students studying descriptive geometry using KOMPAS acquire the skills of geometric modeling, both flat and three-dimensional, which, in turn, creates a platform for organizing the study of engineering graphics in the KOMPAS-3D environment, which allows starting the preparation of design documentation from product models with the subsequent design of associative graphic design documents in accordance with the requirements of ESKD.

The practice of using KOMPAS 3D in the process of teaching descriptive geometry has shown that the use of graphic packages as part of the initial graphic training at the university is appropriate and does not damage the content part of the subject. It should be noted that the use of drawing graphic packages for solving educational tasks at the initial stage of higher professional education contributes to the formation of sustainable skills in applying modern information technologies to solve production problems and thus creates conditions for the preparation of a modern IT specialist for various industries.

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