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ИСПОЛЬЗОВАНИЕ СОВРЕМЕННЫХ ТЕХНОЛОГИЙ В ОБУЧЕНИЕ ИНЖЕНЕРНОЙ И КОМПЬЮТЕРНОЙ ГРАФИКИ

USE OF MODERN TECHNOLOGIES IN TEACHING ENGINEERING AND COMPUTER GRAPHICS

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В статье используются информационные технологии в процессе обучения студентов, а также приводятся методы повышения уровня образования и качества молодых специалистов технических вузов и использования систем компьютерных программ в выполнении чертежей и проектов.

The article uses information technology in the process of teaching students, as well as methods for improving the level of education and quality of young specialists of technical universities and the use of computer program systems in the implementation of drawings and projects.

Ключевые слова: инженерная и компьютерная графика, обучение, информационная технология, чертеж, программа.

Keywords: engineering and computer graphics, training, information technology, drawing, program.

INTRODUCTION

Improving the technology of traditional methods of teaching graphic training for students of technical specialties is the use of information

technology in the organization of the educational process, i. e. the use of computer graphics and innovative technology in the process of teaching engineering and computer graphics.

The disciplines that form the initial skills of graphic engineering activities include: descriptive geometry, engineering and computer graphics. The process of studying descriptive geometry coincides with the period of adaptation of students in a higher educational institution. In the process of studying engineering graphics and descriptive geometry, the automation of drawing and graphic works is of particular importance, when at a certain stage of the educational process it is required to acquire new graphic skills inherent in computer graphics.

MODERN TECHNOLOGIES IN TEACHING

The educational process in the discipline is implemented in various types of educational work: lectures, practical exercises and independent work of students (fig. 1).

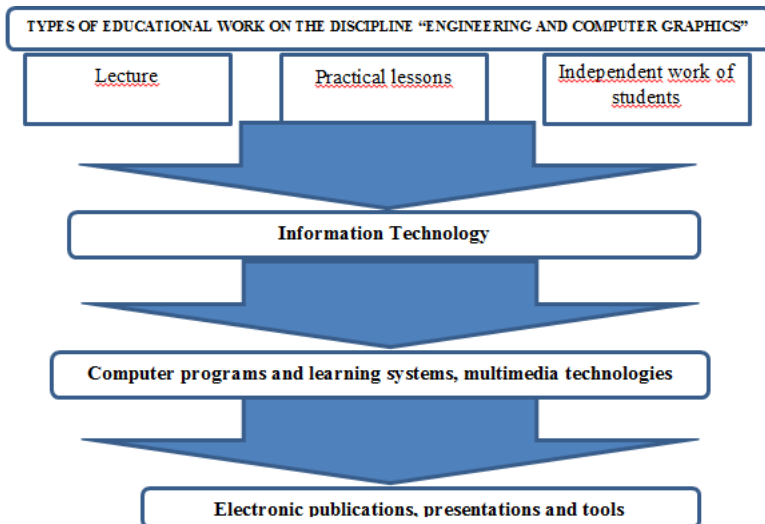


Figure 1 – Application of modern technologies in the study of the discipline “Engineering and computer graphics”

In this regard, the main tasks of the department “Descriptive geometry, engineering and computer graphics” of TSTU are the following:

1. To improve the process of teaching students of technical direction and specialties in engineering and computer graphics in the context of global informatization and computerization of professional activities and graphic training of future specialists.

2. Facilitate the understanding and mastering of the labor-intensive course of engineering and computer graphics by younger students in the conditions of a shortage of study time allotted by the State General Educational Standard for the study of this fundamental general engineering discipline;

3. To increase the efficiency and quality of general engineering graphic training for students of technical specialties, contributing to the formation of engineering competence of future specialists and the compliance of TSTU graduates with the increased qualification requirements imposed on them by the information technology society.

The main task of the department at this stage is the creation of an educational and methodological complex that would allow teachers to more effectively organize the educational process and conduct knowledge control in the disciplines studied at the department. The development and approbation of teaching materials is a long and laborious process and includes the following types of work to create didactic units:

- adjustment of work programs in the disciplines studied, where emphasis should be placed on the use of computer graphics in the learning process and in the performance of graphic work;

- creation of educational and methodological developments and methodological aids to facilitate the perception of students of the studied disciplines, containing the necessary material for independent work of students, in the process of which the foundations are laid for the creative and cultural self-development of future specialists;

- creation and improvement of demonstration and poster materials that will help organize classroom work with students and contribute to increasing the efficiency and visibility of the educational process;

- development of test tasks in descriptive geometry and engineering graphics for intermediate and final control and assessment of knowledge in the studied disciplines.

In order to enhance the intensity of studying the disciplines “Descriptive Geometry” and “Engineering and Computer Graphics” in the process of teaching students, it is planned to use electronic methodological developments that can improve the efficiency

of the learning process. Numerous attempts to adapt SolidWorks to the needs of the domestic designer have led to the emergence of many inexpensive two-dimensional and three-dimensional CAD graphics editors.

SolidWorks is a CAD software package for automating the work of an industrial enterprise at the stages of design and technological preparation of production. Provides development of products of any degree of complexity and purpose.

In SolidWorks, you can work equally well with both solids and surfaces. Typically, a part is a solid body, a surface, or a combination of a solid body and a set of surfaces. The process of building a 3D model is based on creating elementary geometric primitives and performing various operations between them. Like the LEGO constructor, the model is assembled from standard elements (blocks) and can be edited by either adding (removing) these elements, or changing the characteristic parameters of the blocks.

The 3D model contains the most complete description of the physical properties of the object (volume, mass, moments of inertia) and gives the designer the opportunity to work in a virtual 3D space, which allows the computer model to be brought closer to the appearance of the future product at the highest level, excluding the prototyping stage.

The design process in SolidWorks does not end with the development of solid parts and assemblies. The program allows you to automatically create drawings according to a given 3D model, excluding designer errors that inevitably arise when drawing product projections manually. SolidWorks supports GOST, ANSI, ISO, DIN, JIS, GB, and BSI drawing standards. SolidWorks drawings have bi-directional associativity with 3D models so that the dimensions of the model always correspond to the dimensions in the drawing.

The analysis showed that the most convenient for use in teaching the basics of computer graphics is SolidWorks CAD, designed for direct design in mechanical engineering. The SolidWorks system fully ensures the creation of a complete computerized training course “Engineering Graphics”, as well as the use of software tools for performing graphic works provided for by the work program for this discipline. The introduction of computer graphics into the educational process, of course, does not replace traditional engineering graphics classes, in which the student acquires the initial skills of making drawings.

The use of computer graphics tools makes it possible to solve such educational tasks at the modern level as labor polytechnic and vocational training of students of technical specialties for the conditions of modern production; formation of the foundations of computer engineering graphics; ability to draw up drawing and graphic documentation using CAD design.

Under the current conditions, the basic software tool can be considered the geometric modeling system “SolidWorks”, which is designed to create and display models of three-dimensional objects in the process of design, design and engineering and technological work. Boolean union, intersection, and subtraction operations can be performed on object models, which will also result in solid 3D models.

The SolidWorks system makes it possible to perform the following types of work: designing and editing the external shape of products; obtaining and viewing realistic halftone images of designed objects; solving layout problems. The creation of a three-dimensional model of the object is carried out in stages. First, a blank of the designed object is created. Elementary bodies (parallelepiped, cylinder, cone, truncated cone, sphere, torus), bodies of revolution, extrusion bodies (prisms) can be selected as blanks.

In the section “Projection method and graphic methods of constructing an image”, almost all tasks can be performed in the SolidWorks system. The Sections and Cuts section is beautifully illustrated with cuts (cuts) in a rectangular isometric projection. The files of drawings of assembly units included in the delivery package can be used when studying the section “Assembly drawings”, in particular when detonating.

Experience has shown that the use of modern software in the classroom in engineering and computer graphics activates the cognitive activity of students, leads to the development of spatial representations, figurative thinking based on the analysis of the shape of objects. It is also extremely important that the use of CAD exclude unproductive elements of students' graphic activity.

SolidWorks is currently the undisputed leader among 3D modeling packages. Such qualities as an intuitive interface, ESKD support predetermine the success of SolidWorks implementation at domestic industrial enterprises. That is why, choosing SolidWorks as the base CAD, the enterprise not only receives a good, high-quality and functional set of programs, but also focuses on the most advanced technologies that have

become the de facto standard for computer-aided design throughout the world.

CONCLUSION

In conclusion, it should be noted that the use of computer technology in engineering education has become a socio-economic need, and engineering graphic education, implemented without the use of information technology, cannot be considered modern.

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ВАЖНОСТЬ ГРАФИЧЕСКИХ ПРИЛОЖЕНИЙ В РАЗРАБОТКЕ ЦИФРОВЫХ СИСТЕМ

THE IMPORTANCE OF GRAPHIC APPLICATIONS IN THE DEVELOPMENT OF DIGITAL SYSTEMS

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Данная статья посвящена процессу создания графических приложений в разработке цифровых систем. Использование графических