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MODELING OF GEOMETRIC OBJECTS BY MEANS OF COMPUTER TECHNOLOGIES

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Abstract. The article states that information technologies are a powerful means of forming the professional competence of a future engineer. Information technologies expand the possibilities of the educational environment by using various computer technologies aimed at forming personal and professional qualities. It is considered necessary to create conditions for the transition to a new level of education based on information and communication technologies by forming a competence-based information educational environment. The stages of modeling a three-dimensional model are proposed, which will help increase students' interest in design and inventive activities.

Keywords: information technology, engineer, educational environment, computer technology, three-dimensional model, detail.

Introduction.

In connection with social changes and processes taking place in Ukraine, society is at a stage of development, when up-to-date information is the main productive force of a highly qualified and competitive specialist who owns information technologies and independently acquires new scientific information. Accordingly, there is a need to train specialists who are able to apply the acquired knowledge in various fields.

Today, modern information and communication technologies are the basis of the process of informatization of education, the implementation of which involves the development of promising teaching tools, methods and technologies [1]. Such a



concept ensures the informatization of the educational process, and then society, requiring the correspondence of the acquired knowledge to the level of development of science and technology.

In connection with the constant development of information technologies, an innovative focus is observed in the educational process of higher technical institutions. Future specialists must master practical knowledge, skills and abilities, experience of their use in professional situations through the formation of a competence-based information and educational environment.

Creation of conditions for the transition to a new level of education requires the expansion of the educational environment with modern computer technologies; the use of methods, techniques and forms of training; development of pedagogical conditions for the use of information technologies in the educational process.

Main text.

The implementation of the educational process in various forms, methods and means will ensure comprehensive and targeted training of the student. Information and communication technologies occupy a significant place in this process, being a powerful means of forming the professional competence of the future engineer. Information technologies expand the possibilities of the educational environment through the use of various computer technologies aimed at forming personal and professional qualities.

In the process of preparation, the future engineer needs to acquire practical skills in the application of modern computer technologies when solving professional tasks, which is connected with the replacement of traditional technology for performing technical tasks [2]. Pupils need to be involved in real activities that promote the growth of creative activity and motivate productive activities, as the result of the work performed can be seen, understood and analyzed.

The organization of the educational process based on the application of information technologies will contribute to the mastery of innovative techniques and methods of solving educational tasks, which ensures the development of non-standard thinking, multivariate decision-making processes and the formation of such qualities



as: activity, creativity, creativity, which is necessary for a modern specialist.

Application of the latest technologies that contribute to the improvement of motivational, educational and cognitive, project and design activities of students. Accordingly, it is necessary to create conditions for the transition to a new level of education based on information and communication technologies by forming a competence-based information educational environment. This will increase the efficiency of the educational process and ensure not only general computer literacy, but will also contribute to the formation of professional competence of the future engineer. Along with their multifunctionality, the latest technologies have great potential in the educational process, which guarantees high-quality training of the future specialist.

It should be noted that information and communication technologies expand the possibilities of the educational process due to the use of various software tools. Thus, in the process of studying graphic disciplines, modern graphic programs are used, such as Compass, AutoCad, CorelDraw, etc., which is associated with the development of the latest technologies and widespread implementation in production, design and research activities [3]. This has led to certain changes in the graphic training of students of engineering specialties. Today, professional training of a future engineer is impossible without studying computer technologies of automated design, which are used in the process of teaching graphic disciplines and contribute to the formation of independence, activity, creativity, creativity, which are the necessary qualities of a modern engineer.

In the context of the outlined problem, it should be noted that the use of modern graphic programs allows students to be freed from routine actions, the same type of engineering and graphic works, which are performed more accurately and quickly on a computer, and allows the repeated use of drawings or its fragments. In addition, it speeds up the process of performing a graphic task and developing technical documentation for it.

Accordingly, many opportunities for modeling three-dimensional objects of varying complexity are opened up in the design and construction activities of



engineers. Let's consider the possibilities provided by the part model built using automated design technologies:

- on the basis of the three-dimensional model of the part, it is possible to create three standard associative types of the part that are related to the constructed three-dimensional model;
 - in the process of working with the model, the details of the changes are displayed on all associated associative views, this allows you to speed up the work process and reduce the number of constructions;
 - it is easier for a student to move from a spatial model of a part to a flat image.
- When working with a spatial model, it is easier to perform the reverse action – to present the geometric (two-dimensional) shape of the part;
- drawing construction using computer technologies of automated design is largely automated.

It should be noted that the student must competently perform the actions necessary for drawing, because the computer is only a perfect tool of an educated engineer. Therefore, when solving engineering tasks, the spatial model is more visible and detailed. In addition, we have the opportunity to see it from all sides, the internal structure of the part, by making sections, cuts (Figure 1).

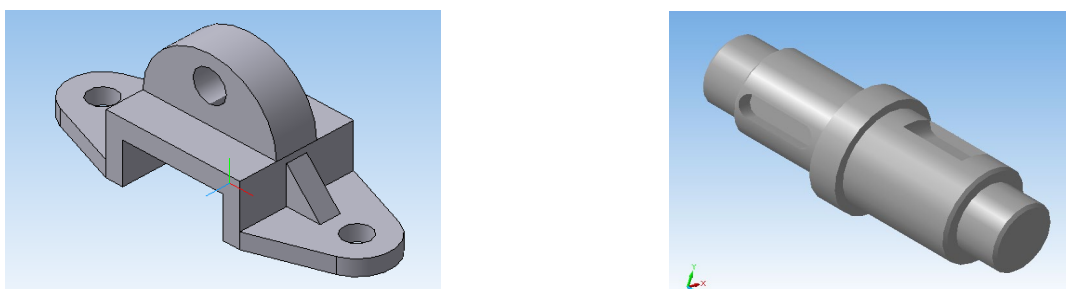


Figure 1 – 3D models of parts

Authoring

Developing a three-dimensional model is a complex process that requires the student to apply basic knowledge of theoretical and practical material of graphic disciplines (sketch geometry and engineering graphics) during the construction process. The future engineer must be able to use complex knowledge in further design and engineering activities, applying algorithms of descriptive geometry and



engineering graphics and the capabilities of graphic programs.

One of the leading places in design and engineering activities is occupied by computer technologies of automated design. In accordance with this, it is necessary to determine the stages of modeling a three-dimensional model, which will increase the interest of students in design, engineering and inventive activities, taking into account technical progress (Figure 2).

Stage I (*analytical*) – it is necessary to analyze the conditions of the graphic task and build a spatial model of the part. To perform these actions, knowledge of traditional graphic disciplines is required. The constructed spatial model is more visual and expanded, of particular importance is the ability to see it from all sides, which helps to understand the conditions of the graphic task and further actions that need to be performed.

Stage II (*geometric*) – using a cutting plane, it is necessary to make a cut (or section), which will allow you to see the internal structure of the part, examine the section of surfaces, etc.



Figure 2 – 3D model (intersection of cylinder and cone)

Authoring

Stage III (*synthesis*) – based on a three-dimensional model of the part, you can create three standard associative types of the part, which are associatively linked to a specific three-dimensional model of the part.

Summary and conclusions.

Recently, there has been an intensive development of information and communication technologies and their introduction into the educational process of students. This is due to the change in working conditions in many industries, where it



is impossible to prepare a competent specialist capable of performing design and engineering work and developing technical documentation using the latest technologies and graphic systems using traditional methods and forms of training alone. Along with their functionality, they have great potential in teaching classical graphics and can become a basis for guaranteeing high-quality engineering and graphic training for students.

Taking into account the above, it can be stated that the development of a three-dimensional model is a step-by-step process that requires the student to have knowledge of theoretical and practical material of graphic disciplines (descriptive geometry and engineering graphics) and computer graphics. However, it should be noted that the use of computer technologies of automated design will be a powerful tool only if students have knowledge of the traditional graphic cycle.

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