

FORMATION OF PROFESSIONAL COMPETENCES OF STUDENTS WHEN STUDYING THE TOPIC "DETAILING"

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***Abstract** – the article shows how the formation of students' professional competencies can be improved based on a comprehensive approach to the organization of the educational process in the courses of engineering and graphic disciplines. The achieved results are demonstrated on the example of the topic "Detailing" - the final stage of studying the course. The positive effect is achieved thanks to the complex combination of traditional methods used in studying the course with new methods of using tools of universal graphic editors such as AutoCAD in the educational process. This allows you to significantly expand and deepen the range of educational tasks performed by students. There is an opportunity to apply in practice the educational process of three-dimensional modeling, parameterization, etc., which brings it closer to the conditions of modern production. This approach makes it possible to improve the quality of professional training of graduates of higher technical educational institutions, promotes their rapid adaptation in modern production, helps to be competitive in the professional market.*

***Keywords** – courses in engineering and graphic disciplines, detailing, general view drafters, working detail drafters, graphic editors, 3D modeling, parameterization, professional training*

Formulation of the problem. The level of professional training of an engineer is largely determined by his ability to develop design documentation and to understand and be able to operate the documentation created by others. The foundations of such knowledge and skills are laid when students of technical higher educational institutions study engineering and graphic disciplines. One of the additional tasks of today is the rapid adaptation of graduates of technical educational institutions to the requirements of the modern level of production.

Analysis of the latest research. The pedagogical community is actively discussing options for modernizing the courses of engineering and graphic disciplines with reservations about the impossibility of losing their main content, which lays the foundations for the future engineering activities of students of higher technical institutions [1, 2, 3].

Formulation of goals. Therefore, in addition to the traditionally accepted system of knowledge and skills for students to master the methods of building images and the system of standards for design documentation, teachers of engineering and technical disciplines face the task of forming a new graphic culture, a new type of technical thinking, adapted to the design and technological innovations of modern production.

Main part. Engineering and engineering and computer graphics courses taught at the department of sketch geometry, engineering and computer graphics of NTUU "Ihor Sikorsky Kyiv Polytechnic Institute" for specialties 141 "Electric power, electrical engineering and electromechanics", 171 "Electronics" and 172 "Telecommunications and radio engineering" are built in such a way that upon completion of their studies, students not only gained experience in applying methods of geometric modeling of technical objects, mastered the method of orthogonal projection, the system of standards for drawing up design documentation, but also acquired skills in creating and drawing up design documentation in the AutoCAD environment, one of the main universal graphic editors used in design and construction works. To achieve the goal, course syllabi were developed and, in accordance with them, distance courses posted on the distance learning platform "Sikorsky" [4, 5]. These distance courses can be used by both teachers when organizing training and students when organizing their own cognitive activities at a time convenient for them and from any available means (computer, tablet, phone, etc.). At the same time, students perform educational tasks that are as close as possible to those that they will have to perform in their future professional activities. That is, after mastering the theory of geometric modeling of objects, students gradually go through the process of creating and designing design documentation, which is similar to the work of an engineer in modern production.

The final topic of the course is "Detailing". When studying this topic, students have the opportunity to additionally familiarize themselves with the stages of product design and the creation of appropriate design documentation. The main ones are: a **technical proposal** *with the creation of a drawing of a general type; details of the technical proposal; an explanatory note* (the documents contain a technical and technical-economic rationale for the feasibility of developing the product based on the technical task); a **sketch project** *with the creation of a drawing of a general view; details of the draft project; explanatory note* (documents contain basic design decisions that give a general idea of the principle of operation of the product and its structure); **technical project** *with the creation of a drawing of a general view; details of the technical project; explanatory note* (documents contain final technical solutions that give a complete idea of the design of the product and the shape of its constituent parts, which is necessary for the development of working design documentation). Thus, in the process of studying the topic "Detailing", students develop a holistic picture of the production process and an understanding of the set of requirements for the tasks they perform. At the same time, they already have enough experience in the

implementation of working design documentation, since they applied the entire set of knowledge obtained during the implementation of the previous practical tasks of the course.

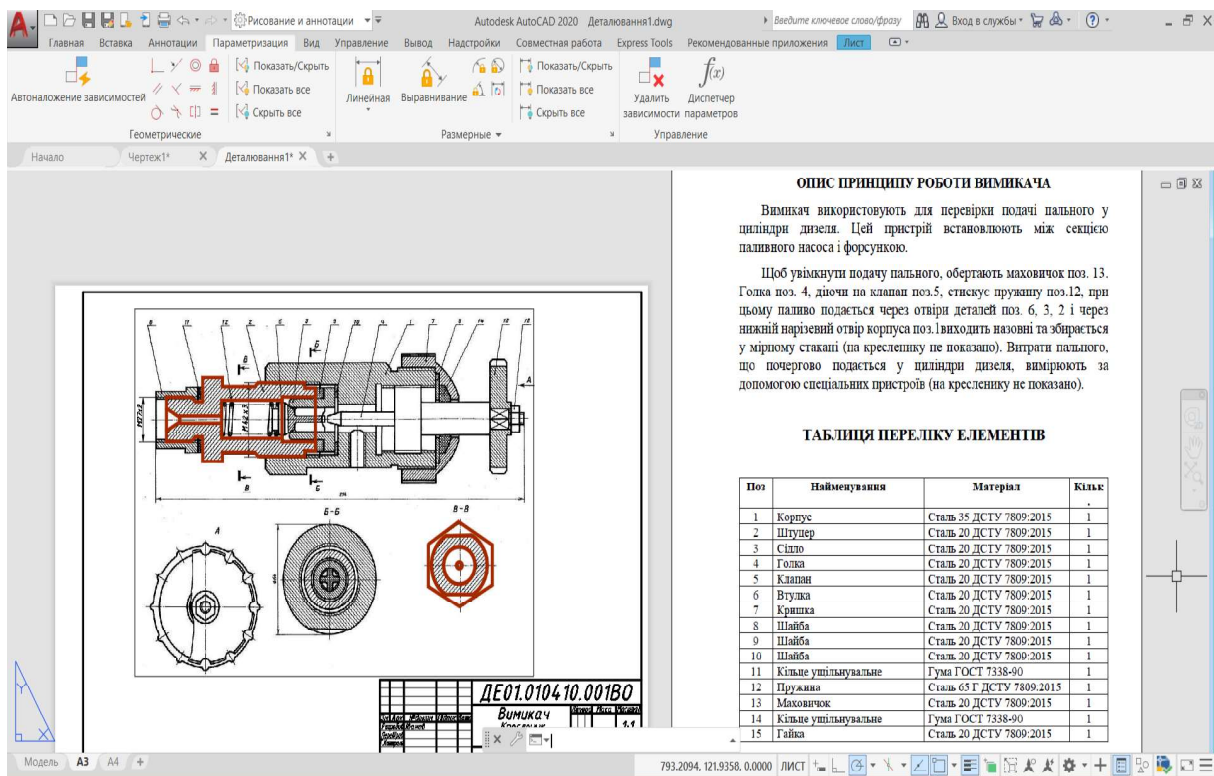


Fig. 1 Example of a drawing of the general view of the "Switch" device

Detailing is the process of making working drawings of the parts included in the product, according to the drawing of its general appearance, created during the execution of the indicated stages of product design (Fig. 1). That is, the practical tasks of the student consist in the production of working drawings of the details of the product depicted on the drawing of the general view. Drawings created in the process of studying the topic "Detailing" must meet a set of requirements that are similar to the requirements of real production. In the process of studying the course, students gradually got to know them and consolidated the acquired knowledge by making working drawings of typical details of real technical products. At the final stage of the course, students gain experience in reading blueprints of technical products. That is, they learn to form in their own imagination spatial images of details that create the structure of the product. Completing this difficult task forces students to actualize previously acquired experience and combine it with new knowledge. Such a synthesis of the acquired knowledge allows to form a complete picture of the engineer's activity in the conditions of modern production and to demonstrate the ability to perform the educational tasks in conditions close to real professional activity.

Fig. 2 shows an example of a working drawing of a part made by a student according to a given version of the drawing of the general type shown in fig. 1.

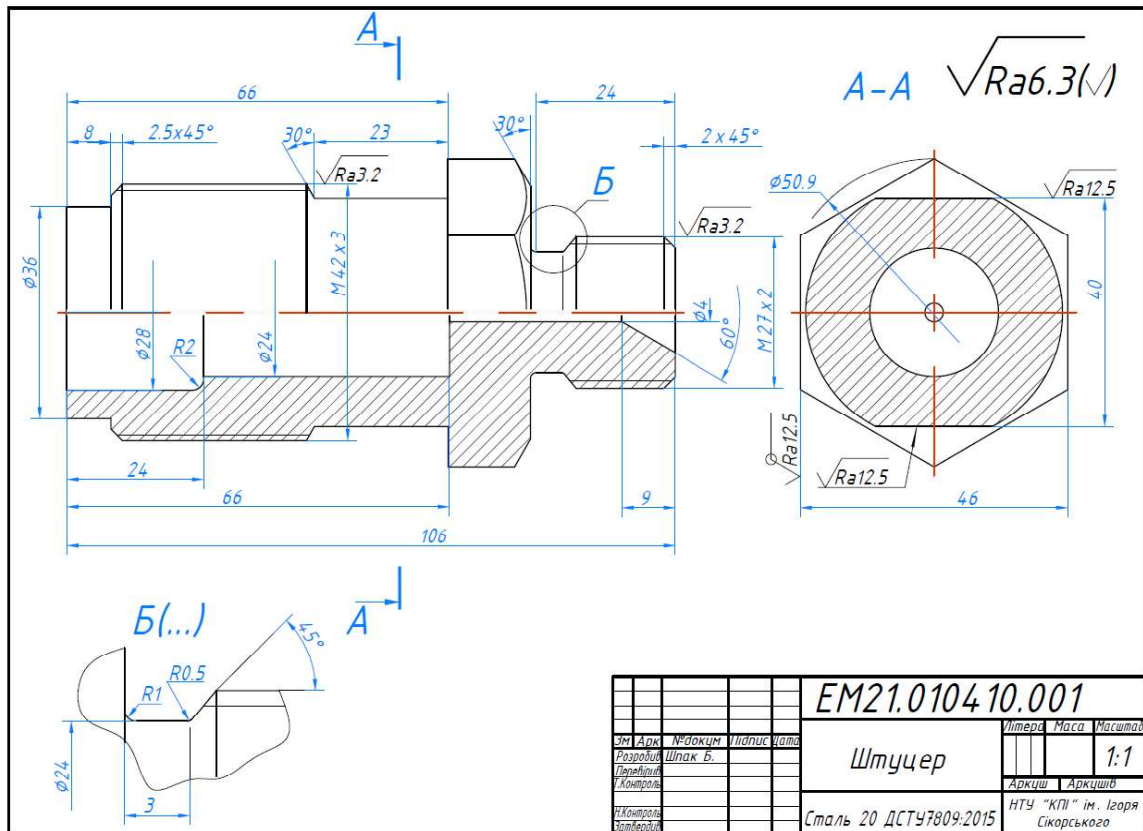


Fig. 2 An example of detailing the drawing of the general type of device shown in Fig. 1. Working drawing of the "fitting" part

In the educational task, the process of building a projection drawing involves the execution of a three-dimensional model of the part and, if necessary, its parameterization (Fig. 3). If the 3D model itself is used in production, it can be supplemented by modeling the corresponding thread. In modern production, such forms of presentation of electronic design documentation are increasingly used. That is, in the course of the engineering and graphic discipline, already at the very beginning of studies at the institute, students receive lessons on adaptation to the conditions of modern production.

Conclusions. The goal of the authors of the courses "Engineering graphics" and "Engineering and computer graphics" was to bring the tasks that students perform in the process of mastering the course as close as possible to the design and construction documentation that engineers perform in production conditions. Moreover, they must learn to master the technical means of creating this documentation. In the developed courses, it is a universal graphic editor AutoCAD. As the experience of teaching these courses shows, at the final stage of studying the course, students demonstrate such a level of acquisition of professional competences that meet the requirements of modern production.

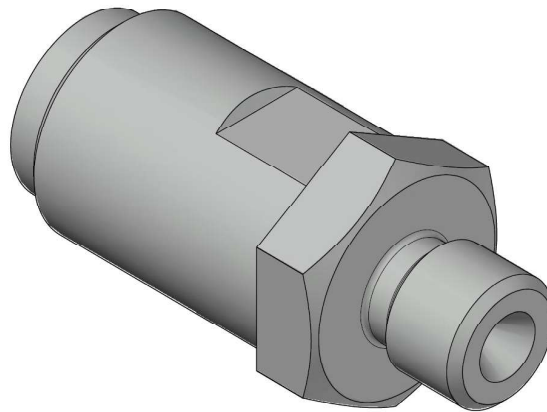


Fig. 3 The stage of creating a 3D model of the part with subsequent execution of its working drawing

It is safe to say that the experience gained during the course lays a solid foundation for mastering the future profession by students of the first year of a technical higher educational institution. The acquired knowledge and acquired skills will help them in their further studies, and later they will easily and quickly adapt to the requirements of modern production and be competitive in the labor market.

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