

THE ROLE OF ENGINEERING GRAPHICS IN THE TRAINING OF ENGINEERING PERSONNEL

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Abstract

This article examines the role of engineering graphics in the higher education system, its importance in training future engineering professionals, its contribution to the development of spatial thinking, and its integration with modern technologies. It also analyzes the professional competencies and practical skills developed through this discipline.

Keywords: engineering graphics, descriptive geometry, spatial thinking, CAD systems, engineering education, technical drawing.

Today, in a context where science and technology are rapidly developing, the training of qualified engineering personnel has become one of the most pressing issues. Any engineering activity is closely related to the correct perception, analysis, and creation of graphical information. From this perspective, engineering graphics is considered one of the fundamental pillars of engineering education.

Among the positive reforms being carried out in our country, special attention is being increasingly paid to education. This, in turn, places significant responsibilities on teachers. The President of our country, Shavkat Mirziyoyev, has substantiated this important issue from scientific-theoretical and practical perspectives, emphasizing that the technologization of the educational process is a key principle for achieving the goals of a unified pedagogical system. Indeed, building a bright future for the nation, promoting its reputation worldwide, preserving and enriching the cultural heritage created by our great ancestors, and ensuring that our republic ranks among developed countries all depend on educating the younger generation as well-rounded individuals and highly qualified specialists.

We proudly acknowledge that our great scholars such as Abu Nasr al-Farabi, Ahmad al-Farghani, Ibn Sina, Omar Khayyam, Muhammad al-Khwarizmi, and Abu Rayhan al-Biruni made significant contributions not only to various sciences but also to the field of engineering graphics. We believe that teachers should instill this sense of pride in students starting from school-level drawing courses.

It is advisable to organize thematic activities in engineering graphics clubs dedicated to the lives and scientific contributions of these scholars.

Considering that drawing (graphics) teachers are also expected to teach engineering graphics in vocational colleges, they must possess in-depth knowledge of all sections of engineering graphics, understand its connections with other disciplines, and have a clear vision of its polytechnic and humanitarian aspects, along with the ability to apply them in practice. The growing demand for technically literate specialists places new responsibilities on drawing teachers. The current situation shows that it is essential to provide them with additional methodological support.

It should also be noted that both students and young teachers sometimes need to work with industrial drawings. Drawings, as technical documents, are widely used in various fields of human activity. Moreover, their constructive, technical, and technological characteristics significantly influence their application.

Graduates of technical fields, that is, future specialists, often encounter working drawings of parts in production processes. In many cases, they must manufacture these parts using available enterprise resources, which requires first creating accurate drawings. Therefore, they must master the preparation of working drawings, including proper dimensioning, necessary annotations, and correct completion of title blocks.

Engineering graphics is a discipline that represents technical objects graphically, conveys ideas clearly through drawings, and serves as an essential tool in the design process.

The subject of engineering graphics includes the following main areas:

- fundamentals of descriptive geometry
- technical drawing
- standardization and ESKD (Unified System for Design Documentation) requirements
- computer graphics and CAD systems

The main objectives of the discipline are:

- to develop students' graphical literacy
- to form skills in reading and creating drawings
- to enhance spatial imagination
- to develop technical thinking

The role of engineering graphics in training engineers is significant and is manifested in the following aspects:

1. Development of spatial thinking in engineering practice, the ability to visualize objects in three dimensions is essential. Through this subject, students learn to interpret parts in different projections, analyze complex shapes, and imagine constructions. As a result, engineering thinking skills are developed.

2. Formation of graphical literacy every engineer must be able to read, understand, and independently create drawings. Engineering graphics develops these skills step by step, reducing errors in production processes.

3. Foundation of the design process any technical project is created based on drawings. Engineering graphics provides both theoretical and practical foundations for preparing design documentation, representing parts, and developing assembly drawings.

4. Standardization and accuracy the discipline teaches students to follow state standards (GOST, O'zDSt), work with precision and discipline, and properly prepare graphical documentation. These are essential qualities for a professional engineer.

Today, engineering graphics is highly integrated with modern technologies. It is no longer limited to traditional drafting but is closely connected with computer technologies. CAD systems such as AutoCAD, SolidWorks, and Kompas 3D play a crucial role. With their help, 2D and 3D models are created, automatic calculations are performed, and the design process becomes faster. As a result, engineers' productivity significantly increases.

By mastering engineering graphics, students acquire the following competencies:

- technical thinking skills
- ability to analyze graphical information
- ability to solve problems visually
- ability to justify engineering decisions
- proficiency in modern software tools

These competencies are essential for training competitive specialists in the labor market.

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In conclusion, it can be stated that developing initial design concepts in students, increasing their confidence, and fostering professional skills require drawing teachers to have a deep love for their profession, strong knowledge, and high-level expertise. It is also important for drawing teachers to maintain interdisciplinary collaboration with teachers of other specialized subjects.

Engineering graphics plays a fundamental role in training engineering personnel, as it develops not only graphical literacy but also technical thinking, spatial imagination, and design skills. Teaching this subject in integration with modern technologies ensures the preparation of highly qualified and competitive engineers.

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