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PROBLEMS OF USING A MATHEMATICAL MODEL IN ENGINEERING WORK

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Abstract:

This article presents the advantages of using mathematical modeling in solving engineering problems and professional problems. This allows students to discover the content of career guidance based on an active and integrated approach through the teaching of specific sciences, improve the content of theoretical and practical materials, better master, integrate theoretical and practical knowledge, easily find solutions to problems based on mathematical and physical knowledge .

Keywords: *Product, differential equations, differential and integral calculus, mathematical model, equation with divisible variables, cooling rate of the body.*

Today, when science and technology are growing rapidly, great attention is paid to mathematical modeling to raise the level of quality of educational services to a new level, to adapt graduates to the modern production environment. It is important that the system of exact and natural sciences serves as a basis for the formation of professional competencies of future engineers. At the same time, the role of the educator in the ability of graduates to apply their knowledge in practice is invaluable.

The role of mathematics in the development of independent thinking, teaching students to think creatively, the formation of professional skills is invaluable. Much attention is paid to its application in the teaching and learning of mathematics

According to the world practice, in the process of training engineers for professional activity in technical universities, research is conducted on the methodology of solving problems of professional orientation and implementation of the system of assignments related to the educational and research activities of students. Studies of students' training in specific disciplines in technical universities show that their knowledge of the importance of specific disciplines is not at the required level, there is no consistency between the course of specific disciplines and career-oriented disciplines. This requires improving the content of theoretical and practical materials, revealing to students the content of career guidance based on an active and integrated approach through the teaching of specific subjects.

In our country, special attention is paid to the creation of educational, regulatory, logistical and information base that ensures the required level and quality of continuing education in the new socio-economic conditions, the priority of the system of training and sustainable development. According to the priorities set out in the Action Strategy for the further development of the Republic of Uzbekistan "Improving the quality and efficiency of higher education institutions through the introduction of international standards for quality assessment of education" effective mechanisms of integration of education with science and individualization technologies tools are being developed. In this regard, it is important to implement the specific content and methods of vocational guidance of students of engineering specialties of technical higher education institutions on the basis of specific disciplines. In particular, future engineers majoring in civil engineering should have a deep understanding of the relationship between the heuristic and inductive functions of career guidance based on the synthesis of mathematical knowledge and skills.

The methodological system of vocational guidance of students will be improved on the basis of the integration of elements of specific sciences (mathematical and physical concepts) related to production

processes. Didactic (problem-solving, interest, creative and practical orientation) opportunities to increase professional competence will be expanded through the formation of integrative knowledge based on the design and modeling of professional issues. Based on the development of logical, abstract and non-standard thinking skills through the use of analytical, graphical, numerical, approximate methods, a system of creative tasks (design, construction and creative issues of professional content, etc.) aimed at strengthening theoretical knowledge will be developed.

In order for students majoring in engineering to effectively carry out their professional training in the teaching of specific sciences, it is necessary to: acquaint them with examples and issues related to their field-related processes, represented by mathematical models; use of career-oriented issues in lectures, practical classes and independent work of students; extensive use of not only the analytical method of solving commonly used differential equations, but also graphical, numerical, approximate methods; Methodical recommendations for the study of the theoretical and practical part of the section of differential equations, based on the mathematical method of solving problems - including the use of mathematical modeling.

The development of vocational guidance in the specialties of technical universities is based on the content of reforms in education and the scientific and theoretical ideas of domestic and foreign pedagogical researchers on this issue. In the course of higher education mathematics, the materials studied are analyzed for professional orientation, the topics and sections of disciplines that are important for the specialty are identified, and different types of mathematical models are used. Correspondence is established between the concepts, terms of mathematical science and their interpretation. The basics of different types of mathematical models that can be used in engineering are identified. Consistency is established between concepts and their interpretation.

For example: product - the speed of the technical process, the differential equation - a mathematical model of technological processes, etc.

The course of differential and integral calculus can show the application of the product in finding the velocity and acceleration of all objects in nature, in increasing labor productivity in the national economy, in testing the multiplication of viruses in medicine. The use of differential equations in determining the change of faces of different fields, finding the volume of objects, finding the centers of gravity of reinforced concrete structures, gas distribution, determining the propagation of electric waves, the application of probability theory and mathematical statistical formulas in solving economic problems.

Mathematics lessons show the mathematical nature of the laws studied in physics, engineering, architecture, engineering and other sciences. But students see these laws as the law of a physicist, for example, and do not care that it is the result of a mathematical expression.

Below we would like to draw your attention to another application of mathematics.

Students with a deep understanding of the brick-making process will be able to manage this process. Process management is a guarantee of quality building materials, and the use of mathematical knowledge in the study of building materials manufacturing processes is an effective tool. To this end, I would like to raise the issue below to teach the application of mathematics in the prediction of temperature changes during the process of baking bricks in the oven.

example. Brick taken from the oven 25^0 for 20 minutes outdoors 100^0 and 60^0 cooled to. Its the most convenient temperateras for laying bricks 30^0 It is advisable to have. How long does it take to start laying after the brick is taken out of the oven?

The cooling rate of a body is according to Newton's law $V(t) = K(T - t^0)$ determined by the formula

Here

$V(t)$ - the cooling rate of the body,

K - proportionality coefficient,

T - the temperature of the brick,

t^0 - air temperature.

According to the meaning of the product

$$V(t) = T't = \frac{dT}{dt} = K(T - t^0)$$

will be. Hence, it follows that the process of cooling a brick in the open air is determined by a differential equation. We solve this equation on the above question. Given

$$V(t) = T't = \frac{dT}{dt} = K(T - t^0)$$

we put in the equation. As a result

$$\frac{dT}{dt} = K(T - 25^0) \qquad (1)$$

a differential equation is formed in which the variables are separated.

His general solution $T = Ce^{Kt} + 25^0$ will be. $t = 0$ from the initial condition $C = 75$ we determine. $t = 20$ $T = 60^0$ conditionally K we find: $60^0 = 75^0 e^{Kt}$, $K = \frac{\ln 7 - \ln 15}{20}$.

From this we obtain the cooling equation of the brick: $T(t) = 75e^{\frac{\ln 7 - \ln 15}{20}} + 25$.

In this equation $T(t) = 30^0$ that is,

$$t = \frac{20\ln\frac{1}{15}}{\ln 7 - \ln 15} = \frac{20\ln 15}{\ln 15 - \ln 7} \approx 71 \qquad (2)$$

we find the minute.

This means that it would be advisable to transport the brick 71 minutes after it is taken outdoors. By explaining to students that it is possible to manage similar processes, we will be helping them to improve their professional skills better.

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