

USE OF COMPUTER MATHEMATICAL PRACTICAL PACKAGES IN INCREASING THE EFFICIENCY OF TEACHING THE DIFFERENTIAL EQUATIONS MODULE IN TECHNICAL HIGHER EDUCATION INSTITUTIONS AND THE QUALITY OF EDUCATION

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Abstract. *The article discusses the integration of students using traditional and software in solving problems in the teaching of the differential equations module taught in technical higher education institutions.*

Key words: *differential equation, digitization, Maple mathematical application package, radiation, ionization, digital technologies, teacher's activity.*

Introduction

The demand of the present time requires the improvement of the quality of education in all areas of education, the introduction of innovations, the formation of creativity, and the improvement of educational efficiency.

Effective use of mathematical practical packages in the educational process using traditional and non-traditional methods of teaching in education and new technologies, the impact of digitization on all components of the methodological systems of teaching mathematics, and digital technologies and products of mathematics is a means of modernizing the existing methodological systems of science education.

In the conditions of digitization and the diversity of digital products, it is necessary to highlight the criterion of intensification among the problems of improving the methodology of teaching mathematics to students, as well as clarifying the set of criteria for the effectiveness of using new digital technologies. In this case, the criterion of effectiveness of mathematical training of future engineers is relevant.

Such changes create a greater responsibility in the teacher's work and the need to use new technologies. Continuing to learn according to the information of the senses in the activity of the teacher; thinking, remembering while learning science; to thoroughly study the basic concepts of the studied knowledge; moving from simple to complex in acquiring knowledge; study the history of science; it will be appropriate if the requirements such as studying the relationship of events are fulfilled.

According to N.I.Lobanova and N.P.Puchkov, some problems caused by digitization technology of mathematics in educational institutions were analyzed. In his research, he explained the issues of rational use of digitization tools in the study of the course "Differential Equations", as well as the advantages of the technology of developing complex practical tasks, which includes elements of traditional analytical research and computer mathematics tools [9].

In our opinion, a modern teacher should not only learn his subject, but also know how to effectively use pedagogical and information technologies in the educational process.

We will consider the problem of practical importance in the traditional and practical packages of mathematics. Ease of use, ease of use of operators, possibility of analytical solution of mathematical problems, adaptability to the types of Windows operating system, high speed of operation, increase the possibility of using Maple mathematical application package compared to other mathematical application packages. Due to the rapidity of solving the differential equation in the Maple system, accurate solutions and quick results are achieved, it allows students to analyze the problems they have solved. Because of its comprehensiveness, the Maple software system can be applied to problems in other branches of mathematics [3].

Matter. The ionization process occurs in a gaseous medium under the influence of constant radiation. In it, in one second, as many positive and as many negative ions are formed for a given volume of gas. As positive and negative ions combine again, their quantity decreases. Assuming that a part proportional to the square of their amount is united every second from the total amount of positive ions, find the time dependence of the amount of ions (the proportionality coefficient depends on the nature and state of the gas).

Solving. Ionization process from matter condition

$$dn = qdt - kn^2 dt$$

comes to a differential equation of the form Separate the variables

$$\frac{1}{k} \cdot \frac{dn}{n^2 - \frac{q}{k}} + dt = 0$$

$$\frac{1}{2\sqrt{kq}} \ln \left(\frac{n - \sqrt{\frac{q}{k}}}{n + \sqrt{\frac{q}{k}}} \right) + t = \frac{1}{2\sqrt{kq}} \ln C$$

into the equation and the general integral of this equation is:

From here

$$n = \sqrt{\frac{q}{k}} \frac{e^{\sqrt{kq}t} + C e^{-\sqrt{kq}t}}{e^{\sqrt{kq}t} - C e^{-\sqrt{kq}t}}$$

originates. since it is in and a particular solution that determines the dependence of the number of ions on time takes the form

$$n = \sqrt{\frac{q}{k}} \operatorname{th}(t\sqrt{kq})$$

The solution of the differential equation representing this problem in the Maple system is as follows. In this case, the student will be introduced to the commands of the Maple program [2].

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> ode := d/dt n(t) = q - k*n(t)^2
> ode := d/dt n(t) = q - k*n(t)^2
> dsolve(ode)
n(t) =  $\frac{\tanh(C1\sqrt{qk} + t\sqrt{qk})\sqrt{qk}}{k}$ 
> ics := n(0) = 0
> ics := n(0) = 0
> dsolve({ode, ics})
n(t) =  $\frac{\tanh(t\sqrt{qk})\sqrt{qk}}{k}$ 

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In conclusion, the solution of the problems of differential equations in traditional and mathematical

practical packages was shown in practice. The student's use of mathematical practical packages in solving problems and examples within the subject leads to correct and quick results. This saves students time and helps them acquire other skills. During the independent study of assignments, the student develops the ability to use several different methods to solve problems. This serves to increase the efficiency and quality of education.

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