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DEVELOPMENT OF THE FOUNDATIONS OF INTEGRATED METHODS OF TEACHING THEORETICAL KNOWLEDGE IN THE DISTANCE EDUCATION SYSTEM USING INFORMATION TECHNOLOGY

Abstract: *This article highlights the issues of studying and mastering the complex theoretical foundations of special subjects for students and undergraduates of higher educational institutions. At the same time, a wide application of the information technology system is proposed and a scheme for studying and mastering the theoretical foundations of special subjects in distance learning has been developed.*

Key words: *Master, student, integral methods, deterministic, stochastic communication, road transport, reliability theory, distance learning, information technology.*

Language: *English*

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Introduction

It is known that obtaining knowledge with theoretical features has certain difficulties and requires serious work from the student. Since theoretical knowledge is outside our field of vision, we have very little chance of mastering it by sight. Such knowledge is mainly acquired through independent and mental thinking. Consequently, such knowledge depends on the student's ability to think, visualize material using spatial thinking, have sufficient knowledge of related disciplines and other similar characteristics of perception. The higher a student's thinking ability, the higher his or her chances of learning. But in general, with the exception of most students, they acquire analytical knowledge with a number of difficulties. To facilitate the development of complex theoretical knowledge by students and masters in the educational process of universities, along with traditional methods of teaching academic disciplines, new information technologies are increasingly used, which contributes to a change in the very method of presenting material. The use of computer technologies (CT) in the learning process increases the quality of assimilation and educational information, makes the process of their learning more effective and productive, provides an increase in motivation to gain knowledge of a theoretical and practical nature [1,2].

The practice of using computers initiates the emergence of a new generation of CT, which, in turn, makes it possible to improve the quality of education, create new means of educational influence, effectively interact with computers, and develop the information competence of teachers and students. The introduction of CT in education can be seen as the beginning of a revolutionary transformation of traditional teaching methods and technologies and the entire education sector. Communication technologies play an important role at this stage: telephone means of communication, television, which are mainly used in managing the learning process in distance learning systems.

An example of the successful implementation of CT in modern educational institutions is the introduction of the Internet into universities with its practically unlimited possibilities for collecting and storing information, transmitting it to each user [4].

Orientation to innovative technologies in the field of education, modern material and technical base, highly professional teaching staff - everything in a large educational, scientific and innovative complex of the country is aimed at producing competent specialists who are well-trained to create high-quality products, thinking progressively and creatively solving the assigned tasks ... The main educational value of information technology is that it allows you to create a brighter interactive learning environment with unlimited opportunities available to both teachers and students. The advantages of information computer technologies in comparison with traditional ones are manifold. In addition to the possibility of a more illustrative, visual presentation of the material, effective verification of knowledge and everything else, they include the variety of organizational forms in the work of students, methodological techniques in the work of a teacher. In contrast to conventional technical teaching aids, information technology allows not only to saturate the student with a large amount of knowledge, but also to develop intellectual, creative abilities, their ability to independently acquire new knowledge, to work with various sources of information [2].

II. METHOD OF EXPERIMENT

At the same time, the basic information about theoretical knowledge to students is first of all provided by the teacher during the lecture, and then this knowledge is supplemented with the help of practical exercises. However, even the knowledge gained in these classes is still insufficient. In order to fully master the theoretical knowledge in the chosen subject, the student must be able to work independently, develop practical skills based on the knowledge gained, have excellent knowledge of the use of CT in the educational process, and also be able to express their personal opinions and suggestions. One of the most important conditions for meeting these requirements is the student's interest in the subject being studied. To implement these requirements, students are offered the following integrated schematic methods that facilitate the acquisition of theoretical knowledge and help applicants acquire knowledge in developing memorization skills and applying them in practice for a long time.

For example, the following theoretical material is given: “Foundations of the theory of reliability of road transport. Failure is a random event, a study of its current distribution laws. "The solution of these problems is based on the knowledge of probability theory, statistical mathematics, physics, road transport and its technical operation, as well as other similar disciplines and has a high complexity. Therefore, it is desirable that the first information about the theory of reliability is explained by the teacher during lectures in connection with the provisions of applied, statistical mathematics and information technology systems.

In modern conditions, the importance of applied mathematics is invaluable, with the help of which it is possible to predict random events in various areas of technical and economic sectors and find the optimal ones, i.e. the most profitable technical and economic solutions based on an information technology system without high costs. If we consider each case as an event, its occurrence depends on several arguments and forms a mathematical relationship between the event and the arguments, and this relationship is divided into two types [3]:

- deterministic communication;
- stochastic connection.

Deterministic relationships are based on known patterns, and such related events occur on the basis of these patterns. In a deterministic relationship, the value of each argument corresponds to one function value. An example of a deterministic relationship is a freely falling object. In this case, each value of the path traversed by the object corresponds to a certain value of time. The path traversed by a freely falling body is determined by this well-known equation.

$$S = \frac{gt^2}{2}$$

Stochastic relationship is a relationship in which each value of the argument has a different value of the distribution density of functions. Stochastic relationships are presented using mathematical models, and in many cases, rough conclusions are drawn about the relationships considered using these models. Mathematical models are used in various fields and sectors of the economy. For example, in engineering, biology, chemistry, medicine, economics and so on. Mathematical models allow expressing the essence of the process under consideration using a mathematical model and choosing optimal solutions for it. In order to objectively (clearly) express the patterns of the processes under consideration, mathematical models must take into account all internal and external factors influencing this process. To achieve this state, it is necessary to plan an experiment on the process, conduct it, statistically process and analyze the results using computer technology.

All aspects of human activity can be expressed using mathematical models, and all internal and external factors affecting each process under consideration are random. And the influence of these random factors on the process is of a guided nature.

For example, the efficient operation of a service station (STO) is inextricably linked with the accidental entry of cars into the station, their presence at it, as well as the random time spent on maintenance (MOT) and car repairs. It also depends on the random arrival time of the customer at the dealership and the random customer service time. In such conditions, that is, under the influence of several random factors per process, it will be necessary to find optimal solutions for a number of indicators, such as equipment, number of workers, working capacity, quality of repair, and so on.

Thus, the relationship between all the processes under consideration and the factors that randomly affect them, and the identification of the mathematical expression of these laws, the search for optimal (most convenient) solutions and the correct organization of the experiment can be carried out only with the help of probability theory, statistical mathematics and information technology.

The mathematical theory of reliability is important in solving all problems of vehicle maintenance and repair. In particular, the issues of improving the quality of products manufactured in the automotive industry are absolutely impossible without the theory of reliability. Because the main components of reliability indicators are:

• reliability;
• durability;
• maintainability;
• preservation.

The numerical values of such classifications are determined based on the theory of reliability. This theory serves to study the regularities of the causes of defects in products, to determine the wear time of the product and to develop measures to improve its reliability. Any product manufactured in mechanical engineering must have high performance based on experimental tests. The results of such an experiment are statistically analyzed and the following random phenomena are studied:

• random phenomena;
• random variables;
• random processes.

Random processes are such a connection that it either happens or does not happen. For example, the transmission of a car may or may not work for 400-500 hours of operation. This means that transmission failure at regular intervals is a random event. The probability of propagation of random events is expressed by R (L), and the density - R (L). The probability of an event occurring is determined prior to experimental testing and, under normal conditions, is expressed as follows:

$$P(L)=\frac{m(L)}{n}$$

m (L) – the number of favorable conditions for the event;

n – is the total number of possibilities.

The distribution density of random events is determined from the results of experimental tests, i.e.:

$$R(L)=\frac{m*(L)}{N}$$

m * (L) – the number of occurrences of a random event;

N is the total number of experiments performed.

Random values are numerical values that can be the result of an experiment and have any previously unknown values. For example, the distance traveled by a car's braking system to failure is a random variable. The laws of analytical distribution of random variables are usually written in the following form:

$$Y = f(x)$$

x – value of a random variable (argument);

Y – distribution density (function).

A random process is defined as a function that, as a result of experiments, takes on a random form that was not previously known. Acceptance of a random function of a specific random form is also its implementation.

For example, abrasion of cylinder liners, piston rings, liners and bearings of an automobile engine. There are the following main types of wear of engine parts: abrasion and scuffing of rubbing surfaces, which can be mechanical, corrosive and abrasive, The nature, reasons for the appearance, quantitative assessment and determination of patterns that describe the essence of the flow of such types of wear are also revealed by probabilistic methods of the theory of probability and mathematical statistics [five]. Under normal operating conditions, it is the abrasion of the parts that determines the life of the engine.

As mentioned above, random variables are represented by the laws of probability and correspond to the physical nature of the considered random events. Probability laws can be one-dimensional or multi-dimensional.

The numerical values of the reliability indicators in the operating conditions of the car and its components are determined using the laws of random events, which are based on:

The density of the function of the law of normal distribution is determined by the following expression:

$$\mathrm{f\,(x)} = \frac{1}{\sigma\sqrt{2\pi}} exp\left[-\frac{(x-\overline{x})^2}{2\sigma^2}\right]$$

f (x) – distribution density of the law;

x – is a random variable;

$\overline{x}$ – mean mathematical value of a random variable;

σ – standard deviation σ = 2.72

While the normal distribution law is a process of gradual wear of automobile parts, the mathematical model of the exponential distribution law represents the state of failure in the theory of reliability. Such pressure failures occur during overload and heat stress, for example, failure of engine parts at engine temperatures above 100 ° C, lamp burning in case of overvoltage, etc.

The exponential distribution reflects the processes of replacing broken parts, lubricating, adjusting engine components and other similar maintenance operations for cars at service stations.

The laws of exponential distribution also play an important role in the theory of reliability and are used to determine the numerical values of vehicle reliability indicators.

The distribution density of the exponential distribution law is expressed by this formula.

$$\mathrm{F\,(t)} = \mathrm{e}^{-\omega t}$$

Where:

T – is a random variable, time or distance traveled by the vehicle (hour, day, month, year or m, km);

ω – parameter of the regularity or density of its distribution;

e – random event per unit of time, failure / hour., refusal/km.

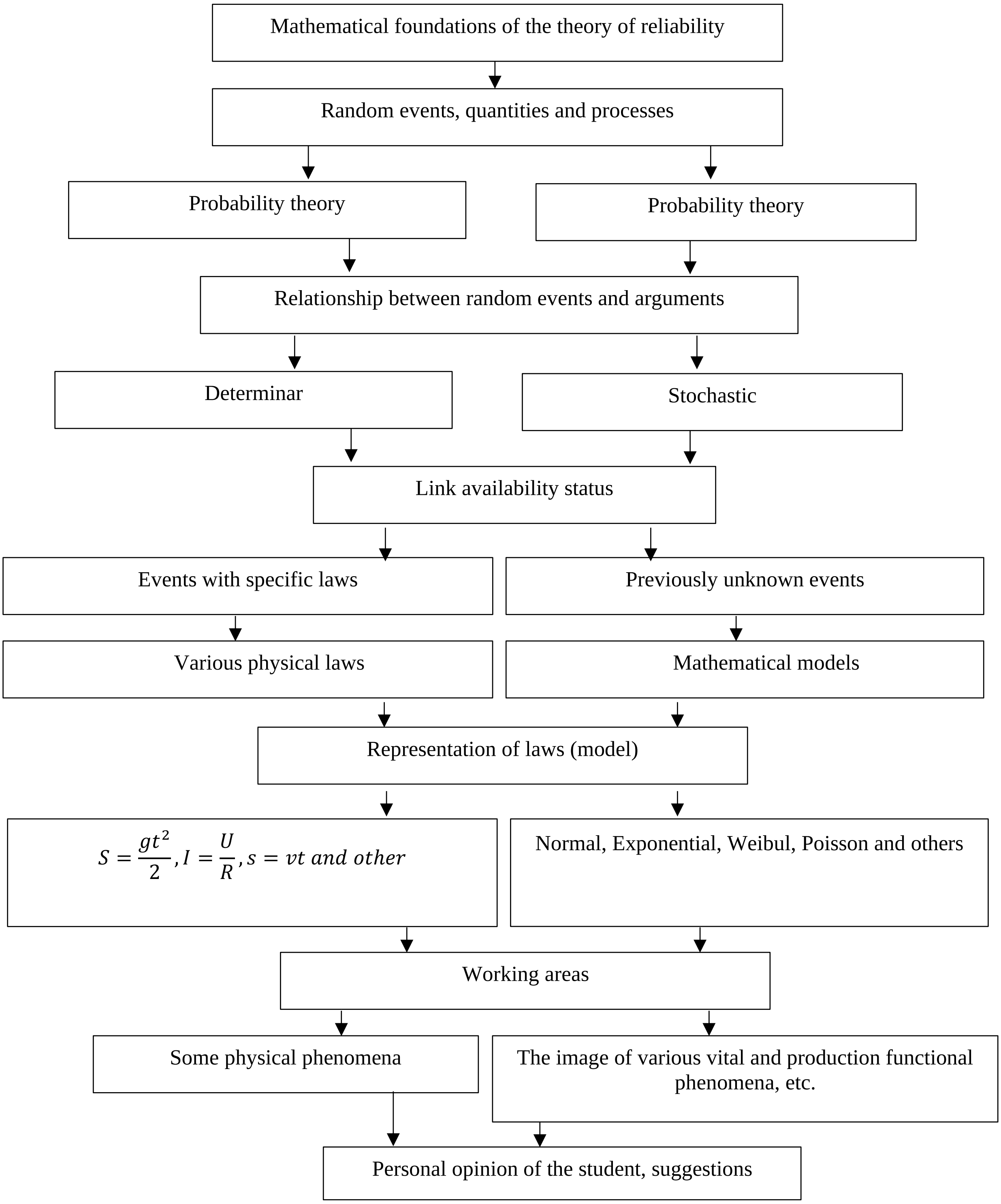
In addition to these laws, there are a number of laws in the field of car operation, including: Poisson distribution law, Weibul distribution law, gamma distribution law and others.

III. EXPERIMENTAL RESULTS

To master the above material, a master student or student must solve examples and problems in practical classes and work on himself independently. In addition, the student summarizes his opinions about the assimilated material of analysis and places them in the integrated circuit shown in the picture 1.

IV. CONCLUSIONS

1. When analyzing the coverage of the issues of studying and mastering the complex theoretical foundations of special subjects for students and undergraduates of higher educational institutions in distance learning, it was determined that the relationship between all the considered processes and factors that influence them randomly, and the identification of the mathematical expression of these laws, the search for optimal (the most convenient) solutions and the correct organization of the experiment can only be carried out with the help of probability theory, statistical mathematics and information technology.
2. An integrated circuit for the study of complex theoretical knowledge has been developed, in which a student or master's degree student summarizes and places his views on the material learned and analysis.



Picture1. Integrated circuit for studying complex theoretical knowledge

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