THE ROLE OF INFORMATION TECHNOLOGY IN THE TEACHING OF TECHNICAL SCIENCES

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ABSTRACT

The article describes how to view the graph of functions in the Matlab software complex using the capabilities of computer software. Demonstration, which is one of the main principles of didactics, is one of the most widely used principles in the teaching of technical sciences. Lessons have been shown to be effective when used with visual aids and to facilitate student mastery. It is stated that the modeling of complex processes using computer programs will be the basis for the formation of a comprehensive range of thinking of students in the future.

Keywords: information and communication technologies, intellectual learning system, computerization, MATLAB, Command Window, plot function, comet function.

INTRODUCTION

Our republic is creating conditions for the rapid entry of news into the education system, the establishment of global information in modern conditions, and the access of large amounts of information to students. Continuous education in our republic, in particular, integration with leading foreign countries in the field of higher education, if it takes a place among the member states of the Bologna agreement, which at this stage of education has clearly demonstrated its quality, efficiency, transparency, and practical value in practice, will be able to compete competently in accordance with international education standards. there will be an opportunity to achieve the expected results in the training of durable personnel.

Purposeful use of the conditions created in higher education institutions, modern work experiences that allow to increase the quality of education, popularization of advanced teaching approaches, activities aimed at solving pedagogical problems of using information technologies in the educational process are considered important tasks of reforming the educational process, the work being carried out in this regard is the new principles of modern education. and is significant in that it is aimed at identifying development trends and defining prospective directions of pedagogical activity.

LITERATURE ANALYSIS AND METHODOLOGY

In accordance with the Decree No. PF-5349 dated February 19, 2018 of the President of the Republic of Uzbekistan "On measures to further improve the field of information technologies and communications", a number of measures are being implemented based on the fundamental improvement of the information technologies and communications system in 2018-2019. Also, as the President of our country, Sh. Mirziyoev, stated: life itself and the demands of the people are putting before us new and more complex tasks that need to be found in practical solutions [1][1]. Quickly solving the necessary and important tasks that cannot be delayed in all areas, finding their solution, largely depends on the development of the educational process. In modern conditions, the rapid development of information and communication technologies has created favorable conditions for using their capabilities in the educational process. Serious attention is paid to the use of this type of education in the conditions of Uzbekistan. There are two approaches to computerization (informatization) of the teaching process:

-use of the computer as a means of educational activity;

-use of the computer as a learning object.

The improvement of information technologies, the expansion of didactic possibilities, widely manifests its aspects as a teaching tool. Teaching with the help of computers can be divided into traditional and intellectual teaching. The main feature of the intellectual education system is that it involves the management of educational activities taking into account the characteristics of all stages in solving educational issues.

In the system of intelligent teaching, individualized teaching is carried out on the basis of a dynamic model of the learner. Such systems provide stability and regularity in the formation of the student's educational activity by providing the opportunity to distribute management tasks between the student and the computer, that is, the transition to teaching independent reading is carried out in an optimal way [2].

Didactic principles play an important role in the teaching of all subjects, so didactic principles play an important role in the content and organization of lessons in the teaching of engineering subjects.

Demonstrability, which is considered one of the main principles of teaching (didactics), is one of the most introduced principles in the teaching of engineering

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[1]Mirziyoev Sh.M. Critical analysis, strict discipline and personal responsibility should be the daily rule of every leader's activity. Report at the extended meeting of the Cabinet of Ministers on the main results of socio-economic development of our country in 2016 and the most important priorities of the economic program for 2017 // People's word, January 16, 2017

subjects. If the lessons are conducted with the help of visual aids, students' learning becomes easier. The preparation of visual information using computer programs expands the ability to visualize and remember complex schemes. Presentation of knowledge in a visual and realistic way makes the topic understandable. The goal is for the lesson to reach the student's mind and remain in his memory for a long time [3].

The goal of using ICT in the educational process is to speed up the process, to make effective use of large-scale information flows. In this case, the quality and efficiency of the educational process increases, the students' knowledge and mastery of engineering sciences is activated.

High efficiency is achieved by introducing ICTs, which have an important place in the didactic point of view, into the educational process [5, 6]. In this:

- control of educational activities is achieved through feedback;
- the student will be able to control himself;
- the student has the opportunity to repeat, practice and prepare independently;
- time spent studying and studying is saved;
- information in the form of a complex scheme is visualized;
- there is an opportunity to express events and processes through modeling;
- it is possible to perform laboratory exercises through special computer programs;
- the database is formed and so on.

RESULTS

Below, we will consider how to insert a graph of functions in the **MATLAB** software complex using the capabilities of computer software [4, 7, 8, 9].

Graphing a function in **MATLAB** is very convenient. For this purpose, the program of the function to be solved is created using the syntax of the **MATLAB** programming language, and the graph of the function is constructed using the plot function of **MATLAB** . It is also possible to observe the process of changing the graph of the function. For this ***plot*** function instead of ***comet*** function is used. To reduce the rate of change of the trajectory of the graph, the step of changing the value of the argument should be taken very small.

MATLAB 's ***plot*** function can take many different forms depending on the input parameters. For example, ***the plot(y)*** function produces a graph against the element of ***y , while the plot(x,y)*** function produces a graph of the dependence of ***y on x.***

For example, $y(x)=\sin(x)$ the function $x=[0, \ 2\pi]$ To construct an interval graph, the equation is written in the **MATLAB** programming language and the

program is inserted into the **Command Window** part of the **MATLAB** program screen . This is done in the following sequence.

1.   The lower limit, the step of change and the upper limit of the argument value are given:

>>*t = [0: pi /100 : 2* pi];*

2. The formula for calculating the value of the function is entered:

>>*y = sin(t);*

1.   The plot function is used to construct the graph , i.e

>>*plot (t,y)*

The result is the following subroutine:

>>*t = [0: pi /100 : 2* pi];*

>>*y = sin(t);*

>>*plot (t , y)*

and the graph of the function appears on the computer screen (Fig. 1) .

The number of graphs increases with the number of parameter pairs of **MATLAB** 's *plot* function. Using this feature of the function, the roots of two functions can be graphically compared. For this, it is necessary to construct the graph of the functions on one coordinate axis. For example, the following $f(x) = e^{-0.1x}\sin^2 x$ and $g(x)=e^{-0.2}\sin^2 x$ we will build the following program to construct the graph of the functions in the interval [-2pi, 2pi] and compare them.

>>*x = [-2* pi:pi / 20:2* pi];*

>>*f = exp (0.1* x).* sin(x).^2;*

>>*g = exp (-0.2* x).* sin(x).^ 2;*

>>*plot (x, f, x, g)*

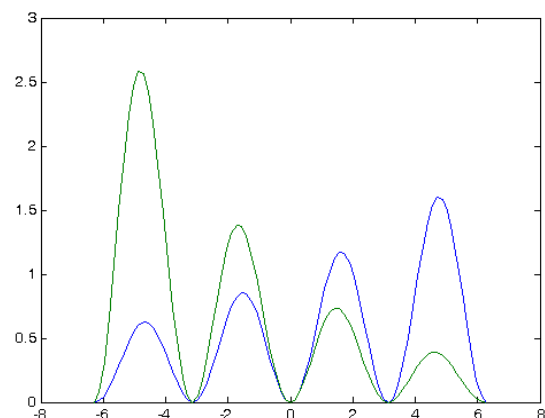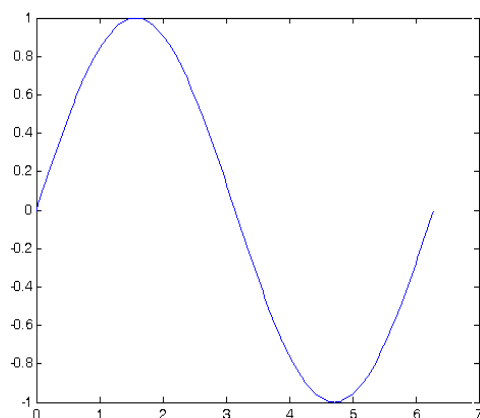The result of the program is shown in Figure 2.

Figure 1. $y(x) = \sin(x)$ the graph of the function

Figure 2. $f(x) = e^{-0.1x}\sin^2 x$ and $g(x) = e^{-0.2}\sin^2 x$ the graph of functions

MATLAB automatically labels the graphs in different colors. The user can also define its color, line and marker type to differentiate the graphs. For this:

$$plot\,(\,x, f, 'color\_linetype\_marker'\,)$$

command is used. Graphic colors - *c, m, y, r, g, b, w* and *is defined as k* . Here *cc yan , mm aroon , yy ellow , r -r ed , g -g reen , b -b lue , w -w hite* and *k - blac k.*

Graph line types ("-","—", ":",".") and data intersection points (".","+", "*", "o", "x") with special commands can be reflected.

For example, the first curve of the graph generated using ***the plot (x, f, 'b-+', x, g,'r:x')*** command is blue, continuous, the data intersection point is represented by '+', the second curve is red in color, dotted, data intersection point is represented by 'x' (Figure 3). That is,

>>*x = [-2* pi:pi/ 20:2* pi];*
>>*f = exp (0.1* x).* sin(x).^2;*
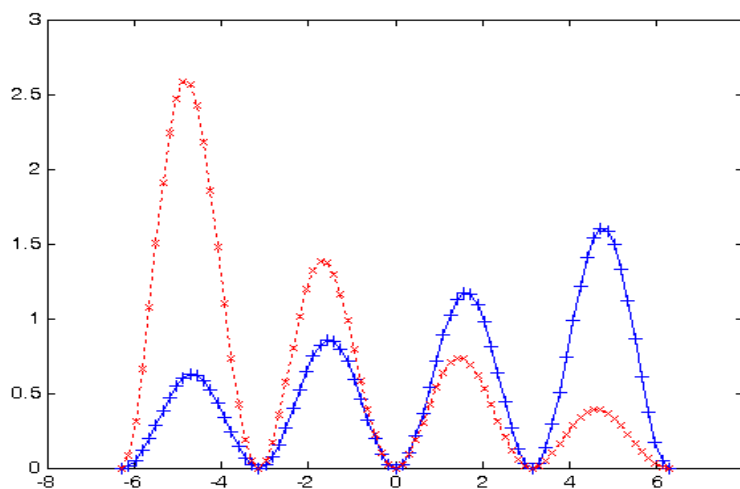>>*g = exp (-0.2* x).* sin(x).^ 2;*
>>*plot (x, f, 'b-+', x, g,'r:x')*

Figure 3. Representation of graphics in different colors and types

Somecharacteristicscatch upfor Special functions of **the MATLAB** system can be used. For example, **pole(),** when analyzing the links of the system in the subject "Theory of Automatic Control" ,**zero()** , **step** (), **impulse** (), **nyquist** () and similar special functions of **the MATLAB system are used** to construct dynamic and frequency characteristics [4-13].

Let's see how some of these functions are used in practice. Let the transfer function of the analyzed system be given:

Oriental Renaissance: Innovative,
educational, natural and social sciences
SJIF 2024 = 7.404 / ASI Factor = 1.7

(E)ISSN: 2181-1784
4 (5), May, 2024
www.oriens.uz

$$W(s) = \frac{b_0 s + b_1}{a_0 s^3 + a_1 s^2 + a_2 s + a_3} = \frac{s+2}{3s^3 + 4s^2 + 5s + 3}$$

1. Using the **tf** (*Transfer Function*) constructor in the MATLAB program, we create an LTI (Linear Time Invariant systems) - object (linear stationary dynamic systems) model.

>> **n=[1 2];**
>> **d=[3 4 5 3];**
>>**sys = tf (n, d)**

The result is an LTI-object based on the transfer function of the system :

Transfer function:

s + 2

-

3s^3 + 4s^2 + 5s + 3

2.   We determine the poles of the transfer function:**pole(sys)** .

>>**pole(sys)**

ans =

-0.2639 + 1.0825i

-0.2639 - 1.0825i

-0.8055

3.   We define the zeros of the transfer function: **zero(sys)** .

>>**zero(sys)**

ans = -2

4.   We construct the reaction of the system to a step signal (transition graph): **step(sys)** (Fig. 4).

5.   We construct the reaction of the system to an impulse signal (impulse transition process graph): **impulse(sys)** (Fig. 5).
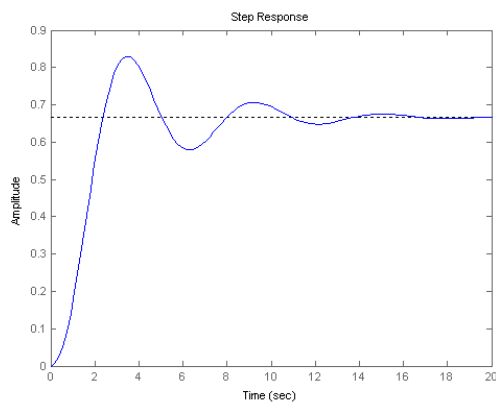
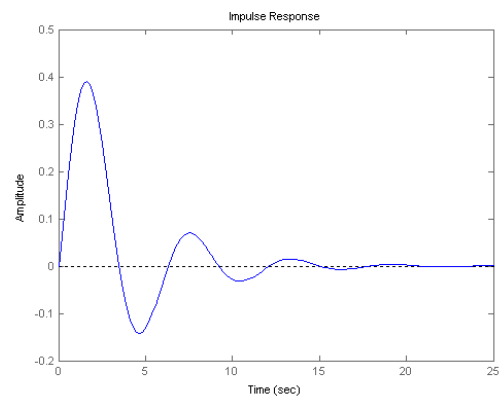Figure 4. Characterization of the
transition process of the system

Figure 5. Characterization of the
impulse transition process of the system

6. We construct the logarithmic frequency characteristics (Bode diagram) of the system: **bode(sys)** (Fig. 6).

7. We construct the amplitude-phase-frequency characteristic (Nyquist diagram) of the system: **nyquist(sys)** (Fig. 7).
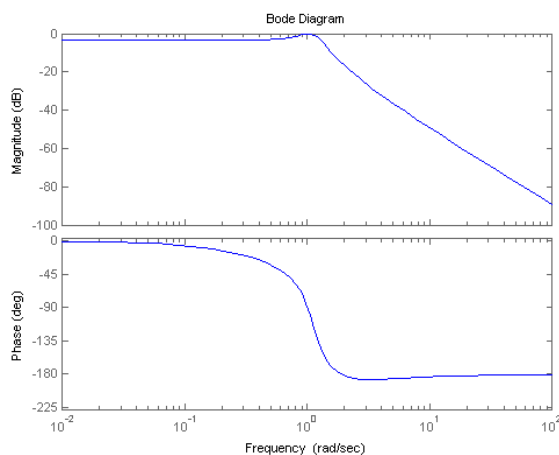

Figure 6. Logarithmic frequency
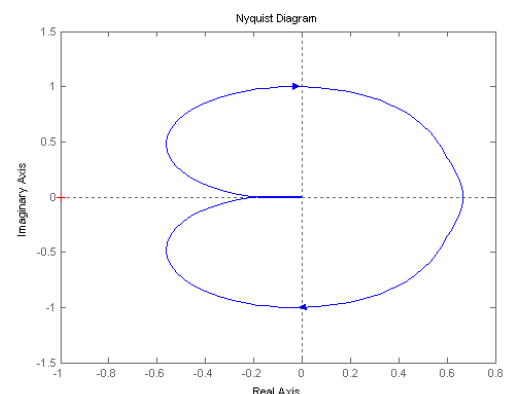characteristics of the system

Figure 7. Amplitude-phase-
frequency characteristic of the system

It can be seen from the above that conveying information to the student by modeling complex systems through computer programs allows to explain and remember a large amount of information in a short period of time.

DISCUSSION

By using the capabilities of computer programs in the educational process, by expanding the possibilities of forming a science information base and providing

information to students, it leads to a change in the quality of didactic requirements for teaching tools and textbooks. Formation of modern information technology environment in education leads to informatization of science fields, intellectualization of educational activities, acceleration of integration processes, improvement of educational system infrastructure and its management mechanisms [14,15,16]. Modeling of complex flows using computer programs is the basis for the formation of a comprehensive thinking framework of students in the future.

CONCLUSION

Development of methods of effective use of information communication technologies and their software in higher education institutions is the basis for creation of mechanism of electronic textbooks, virtual laboratories, distance courses. As a result of the implementation of the developed methodology in higher education:

- a system of effective use of information communication technologies and their software will be created;

-modernteachingtools - electronic textbooks, virtuallaboratories, distance learningcoursescurrentreachsystemis created.

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