METHOD OF APPLICATION OF VIRTUAL STANDS IN TEACHING SUBJECTS OF «ELECTRICAL ENGINEERING, RADIO ENGINEERING AND ELECTRONICS»

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Abstract: *the main purpose of using virtual learning tools in the learning process is to give students a clear understanding of the subject of each student, as well as the independent use of teaching materials in their free time. provide deep development. The virtual stand is designed to help students and teachers of universities to study the course "Electrical Engineering, Radio Engineering and Electronics". It naturally complements the classical teaching scheme, which consists of the assimilation of theoretical material and the development of practical skills for experimenting in the electrical laboratory.*
Keywords: *virtual stand, electrical engineering, laboratory.*

МЕТОДИКА ПРИМЕНЕНИЯ ВИРТУАЛЬНЫХ СТЕНДОВ В ОБУЧЕНИИ ПРЕДМЕТУ «ЭЛЕКТРОТЕХНИКА, РАДИОТЕХНИКА И ЭЛЕКТРОНИКА»

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Аннотация: *основная цель использования виртуальных инструментов обучения в процессе обучения - дать учащимся четкое понимание предмета каждым учащимся, а также самостоятельное использование учебных материалов в свободное от учебы время, обеспечить глубокое развитие. Виртуальный стенд предназначен в помощь студентам и преподавателям вузов для изучения курса "Электротехника, радиотехника и электроника". Он естественным образом дополняет классическую схему обучения, состоящую из усвоения теоретического материала и выработки практических навыков экспериментирования в электротехнической лаборатории.*
Ключевые слова: *виртуальный стенд, электротехника, лаборатория.*

The program is an electronic designer that allows you to simulate the processes of assembling electrical circuits on the screen of a monitor, investigate the features of their work, and measure electrical quantities in the same way as in a real physical experiment [1].

Using the constructor, you can:

- to study the dependence of the resistance of conductors on the specific resistance of its material, length and cross section;
- study the laws of direct current - Ohm's law for a section of a circuit and Ohm's law for a complete circuit;
- study the laws of serial and parallel connection of conductors, capacitors and coils;
- learn the principles of using fuses in electronic circuits;
- study the laws of heat energy in electric heating and lighting devices, the principles of matching current sources with load;
- familiarize yourself with the principles of measuring current and voltage in electronic circuits using modern measuring instruments (multimeter, two-channel oscilloscope), observe the appearance of alternating current on individual parts, the phase shift between current and voltage in alternating current circuits;
- to study the manifestation of capacitive and inductive resistances in AC circuits, their dependence on the frequency of the alternator and the values of the parts;
- to study the allocation of power in AC circuits;
- to investigate the phenomenon of resonance in circuits with a serial and parallel oscillatory circuit;
- determine the parameters of an unknown part;
- explore the principles of constructing electric filters for AC circuits.

The designer can also be used within its capabilities and for other tasks in the students' independent creative work.

One of the main features of the complex is the maximum possible imitation of a real physical process. For this purpose, for example, the following is provided:

- images of parts of the designer and measuring instruments are not shown schematically, but in such a form as "Actually";
- when the rated power of the electric current flowing through the resistance is exceeded, the latter “Burns” and takes the form of a blackened part;
- the bulb and electric heater at rated power begin to glow and “Burn out” if the power dissipated by them exceeds the operating value;
- when the operating voltage at the capacitor is exceeded, the latter is also “Fails”;
- when exceeding the rated operating current through the fuse, it "Blown";
- most operations and their results are accompanied by sound effects.

This is done so that the student can clearly see the consequences of their mistakes, learn to understand the causes of one or another unsuccessful experiment and develop the necessary skills for preliminary analysis of the scheme [2].

To use the program, basic Windows skills are sufficient.

The contents of the working window and the basic principles of working with the complex and the assembly table.

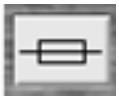
An assembly table is a set of 7 x 7 = 49 pads to which electrical parts are “soldered” to assemble various electrical circuits. Each part can be located only between the two nearest contact pads, either vertically or horizontally. To the parts, at the points of their connection with the contact pads, probes of measuring instruments can be connected. The selection of parts from the designer kit and "Soldering" them on the desktop is done using the "Mouse" manipulator. This is done in the standard way for Windows applications - you need to place the "Mouse" pointer on the desired part (the pointer takes the form of tweezers), then press the left "Mouse" button and holding it pressed, move the part to the desired location on the pasteboard. After releasing the left mouse button, the part will be installed in the specified location. Unnecessary and “Damaged” parts can be removed from the table in the “Recycle Bin” in the same way.

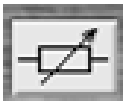
You can remove parts from the table in another way. You need to "Click" on the part with the right mouse button - a window with the inscription "Discard the part" will appear. After confirmation (clicking on the button), the part will be deleted to the basket [3].

Parts that are “Discarded” outside the pasteboard, but not into the basket, accumulate at the bottom of the pasteboard.

AC and DC sources cannot be located on the table at the same time.

Table 1. The contents of the working window and the basic principles of working with the complex and the panel of designer parts.

№	The following details can be used in the constructor	
1		Resistor (characterized by resistance in Ohms and power in watts, “Burns” when it is exceeded);
2		Fuse (characterized by the maximum operating current, "Burns" when it is exceeded);
3		Capacitor (characterized by capacitance in Farads and operating voltage, fails when it is exceeded);
4		Inductor (characterized by the inductance in Henry, has a very low active resistance);
5		Hook-up wire (has very low resistance);

6		Switch (characterized by two states - "Open" and "closed");
7		Battery element (characterized by polarity, EMF in Volts and internal resistance in Ohms);
8		Sinusoidal voltage generator (characterized by the amplitude and frequency of the alternating voltage);
9		Light bulb (characterized by operating voltage in Volts, operating current in milliamperes or power in Watts, “Blown” when exceeded);
10		Electric heater (characterized by operating voltage and operating power, “Burns out” when exceeded);
11		Real conductor (characterized by material, length and cross-sectional area);
12		Unknown part (may be a resistor, capacitor, coil, battery or generator);
13		Rheostat (characterized by maximum resistance in ohms);
14		Capacitor of variable capacity (characterized by the maximum capacity in Farads).

Given the lack of the ability to perform laboratory and practical exercises on the subject “Electrical Engineering, Radio Engineering, and Electronics” using virtual education, it is necessary to improve the methodology for the formation of qualifications, knowledge and skills of students.

Using virtual education at universities, training in the discipline "Electrical, Radio Engineering and Electronics" in the direction 5112100 - Professional Education, it is possible to increase the efficiency of mastering the subject.

References / Список литературы

1. *Аленицын А.Г., Бутиков Е.И., Кондратьев А.С.* Краткий физико-математический справочник. М. Наука, 1990. 386 с.
2. *Кабардин О.Ф.* Физика: Справочные материалы. М. Просвещение, 1991. 367 с.
3. *Young H.D., Freedman R.A.* University Physics. Addison-Wesley Publishing Company, 1996. 1259 p.
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