American Journal Of Applied Science And Technology
(ISSN – 2771-2745)
VOLUME 03 ISSUE 11 Pages: 6-10
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705) (2023: 7.063)
OCLC – 1121105677
Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ajast

Research Article

METHODOLOGICAL DEVELOPMENT OF THE LESSON "ALTERNATING ELECTRIC CURRENT"

Submission Date: November 01, 2023, Accepted Date: November 05, 2023,
Published Date: November 10, 2023
Crossref doi: https://doi.org/10.37547/ajast/Volume03Issue11-02

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ABSTRACT

This article describes the technology of teaching the topic "Alternating current circuits" taught in electrical engineering and physics using new pedagogical technologies.

KEYWORDS

Electrotechnics, physics, electric current, voltage, line currents, phase currents, consumer.

INTRODUCTION

The development of modern socio-economic relations in Uzbekistan requires a new quality of education [1-3]. It provides for the readiness and ability of graduates of general education institutions to bear personal responsibility for both their own well-being and the well-being of society [4].

Lesson topic: "Alternating electric current."

After studying this topic, students should know:

- AC applications;
- transformation ratio;
- principle of operation of devices consuming alternating current;
- difference between phase and line voltage.

They should also be able to:

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- draw up an installation diagram for studying electrical appliances based on alternating current;
- collect consumer circuits using a star and a triangle;
- determine phase and line voltage.

The topic we study plays an important role in the development of imaginative, design and technological thinking of students, their creative potential; fosters a work culture, develops professional skills in collective practical activities.

Methodology. In the didactic analysis of the content of the material, four levels are distinguished. At the first level, students become familiar with basic concepts and definitions, such as transformer, line voltage, three-phase current.

When studying the structure of a transformer, students can draw an analogy with DC motors, that is, children identify the phenomena being studied by comparison with an already studied object.

At the reproduction level, students carry out activities to reproduce information about alternating current, or can explain the design of a transformer.

Based on this data, students can complete the proposed practical work to study the design of a transformer.

The third level is characterized by independent activity of students. Based on the knowledge gained about three-phase current, linear and phase voltage, schoolchildren can complete a project or write an essay on the influence of alternating current on human life or on the topic "Environmental problems of electricity production." At this stage, children test their technical knowledge and skills acquired in the school physics course, and also independently apply the knowledge and skills acquired in the lesson.

To develop technological and analog thinking, students can be asked to play a game following the example of the television program "Brain Ring". Students must independently develop the course of the game and draw up questions on this topic. Thus, schoolchildren transfer their existing knowledge to a new situation, since the children will need to independently study additional literature from the field of physics and electrical engineering.

Planning the study of the lesson topic.

According to the program, the topic "Alternating electric current" is studied in the second quarter. Twenty hours are allotted for studying the subsection "Electrical Engineering," so the amount of time for studying the topic "Alternating Electric Current" is sufficient in the structure of the subsection.

Teaching can take the form of conversation or explanation with demonstration of visual aids.

To update the existing knowledge of schoolchildren, we can recommend the use of posters and diagrams (installations for studying transformers, star and triangle consumer diagrams).

When presenting new material, you should use the diagrams of the technology textbook (edited by V.D. Simonenko, 2001 [5]) on pages 76, 77, 79. In relation to this topic, the most common is the form of a combined lesson, where, along with With the teacher's explanation, practical work is carried out, and the necessary explanations are given for doing homework using the textbook.

Conversation is a dialogical teaching method in which the teacher, by posing a carefully thought-out system

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of questions, leads students to understand new material or checks their understanding of what has already been learned.

Depending on the specific tasks, the content of the educational material, the level of creative cognitive activity of students, and the place of conversation in the didactic process, different types of conversations are distinguished.

Informative conversations are used to communicate new knowledge. If a conversation precedes the study of new material, it is called introductory or introductory. The purpose of such a conversation is to induce in students a state of readiness to learn new things (you can interest students in the discovery of the phenomenon of alternating current). Consolidating conversations are used after studying new material in order to determine the degree of mastery of the topic.

During the conversation, questions can be addressed to one student (individual conversation) or to students of the whole class (frontal conversation).

The success of conversations largely depends on the correctness of asking questions. Questions are asked by the teacher to the whole class so that all students are prepared to answer. Questions should be short, clear, meaningful, and formulated in such a way as to awaken the student's thoughts. You should not ask double, suggestive questions or encourage guessing the answer. You should not formulate alternative questions that require clear answers like "yes" or "no".

Explanation is a verbal interpretation of patterns, essential properties of the object being studied, individual concepts, phenomena.

Using the method of explanation requires an accurate and clear formulation of the task, the essence of the problem, the question; consistent disclosure of cause and effect relationships, argumentation and evidence; the use of comparison, juxtaposition and analogy; attracting vivid examples; impeccable logic of presentation.

When using problem-based and search methods of teaching, the teacher uses the following techniques: creates a problem situation (poses questions, proposes a task, an experimental task), organizes a collective discussion of possible approaches to resolving the problem situation, confirms the correctness of the conclusions, puts forward a ready-made problem task. Students, based on previous experience and knowledge (from a physics course), make assumptions about ways to resolve a problem situation, generalize previously acquired knowledge, identify the causes of phenomena, explain their origin, and choose the most rational option for resolving a problem situation.

One of the methods of problem-based learning is heuristic and problem-search conversations, since it is necessary to present voluminous material in a short time in an accessible and understandable manner; The content of the educational material is not fundamentally new, but logically continues the material studied in the physics course in the seventh - ninth grades.

Control methods are used to test students' knowledge. Oral control is carried out through individual and frontal questioning. During an individual survey, the teacher asks the student several questions, by answering which the student shows the level of mastery of the educational material. With a frontal survey, the teacher selects a series of logically interconnected questions and puts them in front of the whole class, calling on certain students for a brief answer.

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An individual form of organizing work means each student completing a different task. The undoubted advantage of this form of training is the ability to completely individualize the content and pace of study, to enable those who are lagging behind for some reason to complete the curriculum without psychological trauma.

The consolidation of theoretical knowledge with practical skills occurs during practical work to check the degree of mastery of the material by each student.

To ensure that students have a solid grasp of knowledge, the following basic questions can be used:

What is the difference between line and phase voltage?

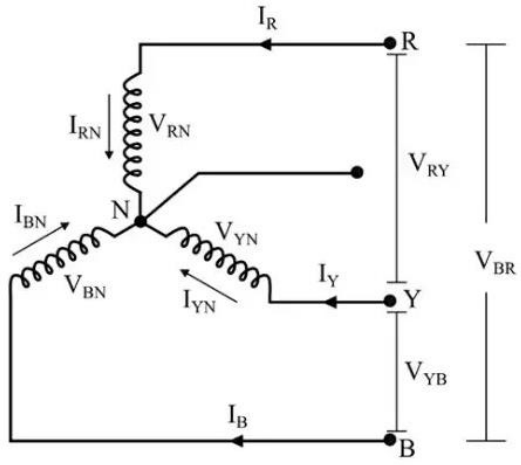
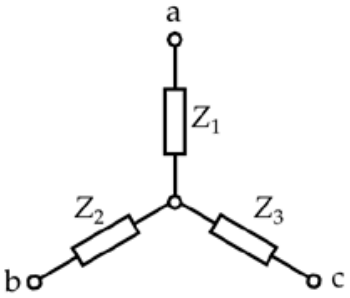
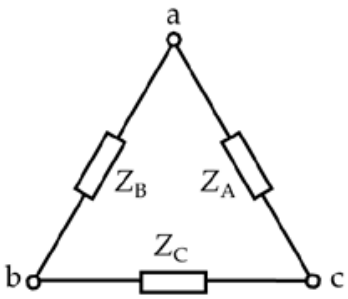


Fig.1. Difference between line and phase currents

What determines the connection of consumers with a triangle and a star?





$$Z_A = \frac{Z_1 \cdot Z_2 + Z_2 \cdot Z_3 + Z_3 \cdot Z_1}{Z_3}$$

$$Z_B = \frac{Z_1 \cdot Z_2 + Z_2 \cdot Z_3 + Z_3 \cdot Z_1}{Z_2}$$

$$Z_C = \frac{Z_1 \cdot Z_2 + Z_2 \cdot Z_3 + Z_3 \cdot Z_1}{Z_1}$$

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Fig.2. Methods of connecting three-phase consumers

The educational capabilities of the educational material include accuracy, hard work, formation of responsibility, caution (assembling a transformer circuit, alternating current values). This can be realized during practical work on studying the design of a transformer.

When studying the material on this topic, such developmental components are used as the formation of design thinking, the development of spatial imagination, and technical thinking.

During the lesson, the teacher presents part of the material being studied, which includes key concepts.

The presentation of the material can take place in the form of a heuristic conversation in order to activate the technical and design thinking of students.

The conversation must be conducted using visual aids: diagrams, tables, posters - to develop logical thinking in students.

CONCLUSIONS

To consolidate knowledge after studying a topic, you can use cards - tasks of varying degrees of complexity.

As homework, students can be asked to complete an essay or create a crossword puzzle on the topic "Electrical engineering." (Appendix 2).

Recommendations for logistical support of the learning process.

In order for students to qualitatively assimilate educational material, it is necessary to have appropriate material and technical equipment for the lesson. For this lesson, we can recommend the use of educational and technological maps, visual aids (products made by high school students), and appropriate artistic design. Blackboard, chalk, and textbooks are used as traditional material and technical support.

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