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# METHODS OF CONDUCTING LABORATORY CLASSES IN ELECTRICAL ENGINEERING

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## Abstract:

This article discusses the stages and methods of laboratory work. The ways of increasing the role and effectiveness of laboratory classes, as well as the correct preparation of the report of the experiment are shown.

## Keywords

laboratory, method, occupation, cadet, thinking, experiment, integration, independently.

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## Introduction

Improving the quality of professional training of highly qualified specialists and the problems of improving education is one of the important tasks in the development of society. The development of science, changes in its content, methods and means inevitably cause the emergence of new ideas and tasks in the educational process in higher military educational institutions. Systematic studies of pedagogical problems of higher education have been started relatively recently. The works of S.I. Arkhangelsky, S.I. Zinoviev, T.V. Kudryavtsev, A.M. Matyushkin, K. Tursunmetov, M. Kurbanov, etc. created the scientific foundations of teaching methods, the introduction of new means and methods of presenting educational material, enrichment of types and forms of classes, etc. However, there are many unsolved problems in the theory of learning. In particular, it is necessary to take into account the new requirements imposed by scientific and technological progress to education, primarily to the modernization of teaching methods.

Laboratory classes on the basics of electrical engineering and electronics are designed to form the skills and abilities necessary for a specialist in solving professional tasks. The purpose of the laboratory workshop is to deepen the educational material and concepts studied in theoretical classes, to teach practical research methods and the ability to use special experimental tools; to instill general and private experimentation skills; to form practical skills of setting up devices in conducting measurements in electrical circuits. These tasks are solved with the traditional form of organization and conduct of laboratory classes. However, this is not enough, since a modern specialist must be trained to independently acquire knowledge, have creative thinking. In order to form a university graduate with these qualities, it is necessary that the educational process as a whole, and in particular laboratory classes, satisfy the system of requirements: problematic, when the

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student has knowledge and sources of information, characterized by incompleteness, inconsistency of parts, inconsistency of relationships and, realizing this, he is forced to eliminate them by attracting new information, creating new semantic connections.

Laboratory classes allow you to integrate theoretical and methodological knowledge and practical skills of the teacher in a single educational process. The increasing role of laboratory work is associated with the rapid development of the experiment in its modern form. The selection of the content of educational material is not limited only to the scientific side of the issue. The choice of methods, forms and means of organizing educational and cognitive activities, training is based on the principles of a personal approach and on the principles of the development of a creative personality.

To link theory with practice – to confirm the theory's provisions by experiment; to familiarize with the elements of devices, measuring instruments, machines, installations and processes occurring in them; to teach the skills and skills of handling the listed equipment and experimental techniques; to teach to generalize and formalize research results; to instill the skills of laboratory research preceding production tests and the ability to understand them to develop the skills of research work and teach its methodology.

Laboratory classes require students to be more independent and active. They demand strict responsibility for the quality of their work, make them think deeply about it, teach them to critically evaluate their actions, teach them to summarize the results of their work. When performing laboratory work, theoretical provisions are checked, the validity of laws, methods of analysis and calculation of circuits is confirmed.

Work in the laboratory, conducted in parallel with lectures, should contribute to the systematic study of theory, raises interest in the course and fully meet the requirements of the didactic principle – the close connection of theory with practice. The work in the laboratory is divided into several cycles, and a specific cycle begins after the lecturer has read the necessary material; during the execution of the work of this cycle, the lecture continues, and students receive the information necessary for the work of the next cycle, etc. In particular, in the laboratory of electrical engineering, the workshop can be divided into cycles: electrical measuring devices, single-phase current circuits, three-phase current circuits and electric machines. Until a lecture on the provision of the first cycle is given, practical classes are allowed. They can be devoted to solving problems of electrical measurements, calculations of circuits with various ways of connecting resistances, etc.

The content of the laboratory work is selected in such a way that it corresponds to the essence of the course being studied. The nature and topics of the work should take into account both professional training and the specifics of the specialty. Each paper should cover some question or section of the course.

Laboratory work includes three stages: preparation for work, conducting an experiment, processing the data obtained, processing the results and a report. An important stage in the performance of laboratory work is the preparatory stage, which includes: familiarization with the goals, content and means of upcoming experiments; identification of relationships

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and patterns of the theoretical position that underlie the experiment; drawing up an experiment plan; forecasting results. The effectiveness of the work performed by the student is determined by his awareness of the purpose of the work. Practice shows the need for preliminary training of students to perform laboratory work.

But in many cases, independent training of students in extracurricular time does not allow to solve all the necessary preparatory tasks at the proper level. As a consequence, experiments are performed by students not consciously enough and independently. To help students to perform laboratory work, special manuals are prepared, which contain a system of methodological guidelines. The manual essentially determines the nature of work in the laboratory and the degree of independence of students. It contains: the name and purpose of the work, general or theoretical information, a schematic electrical diagram for experimental research, the procedure for working with tables for entering measurement data, control questions. When studying electrical measuring devices, it is important to learn their design features. The principle of operation of measuring mechanisms is to get the skill of switching the device into the circuit, to take the device reading based on the correct determination of the division price, to learn how to obtain correction curves as a result of comparing the tested devices with reference ones.

On the basis of experimental research of transformers and electrical machines, they gain practical skills in switching on and operating them, removing and studying performance characteristics, and learn the principle of operation based on the elucidation of electromagnetic phenomena occurring in these devices. In the process of preparing and conducting experiments, students can use individual consultations of the teacher.

A report on the work performed is compiled by each student, issued after the complete completion of the work during extracurricular time. The quality of the final report indicates the effectiveness of the experimental study by the student. The report should contain brief information on the theory, calculation formulas, schemes according to which experiments were carried out, tables of measured values, data from measuring instruments, the main calculation ratios used in this work, graphs and vector diagrams, conclusions based on the results of the work. Graphs and vector diagrams are drawn in compliance with the scales on millimeter paper. It is allowed to represent several functional dependencies on one argument on one graph. For each of these dependencies, their own scales should be indicated, applied parallel to the coordinate axes. Quality control of the work, the knowledge and skills acquired by the students are checked during the protection of the work. The student is allowed to defend himself if there is a report.

At the stage of laboratory training, students master the experience of conducting laboratory research in accordance with the plan and program they have drawn up, comprehend and summarize the results obtained, prepare data for the final report on the work performed.

## CONCLUSION

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The pedagogy of higher education proceeds from the fact that the old ways of building educational activities, focused only on the explanations of the teacher, form intellectual passivity, jam the creative possibilities of students. This leads to inefficient use of study time, loss of students' ability to apply the acquired knowledge in professional activities.

It requires a creative approach to the task with the use of existing knowledge, a comprehensive analysis of current information, comparison and comparison of information. Therefore, in order to form professional thinking, it is necessary to train students in solving various tasks that develop their mental abilities and skills of analysis, synthesis, abstraction, generalization, classification, assessment of the situation in the field of professional activity.

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