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### **TOOLS FOR ADAPTATION OF FUTURE MAJORED IN ELECTROMECHANICS TO CONSTANTLY CHANGING CONTENT OF EXPERIMENTAL RESEARCH**

*The article considers the ways of improvement of professional pageonce specialists Electromechanical profile and the emphasis on the fact that to fulfil professional functions engineers Electromechanical connected with installation, repairs and maintenance of complicated equipment, specialists in this field of industry should know not only the basics of operation of electrical mechanical devices, operating rules and repairs procedure, but also know how to analyze different parameters of electromechanical devices, fulfil logical and mathematical processing of instrument readings and signals provided by controlling equipment.*

**Key words:** *students majored in electromechanics; experimental studies; technical subjects; electro-technical knowledge and skills.*

#### **Setting up the problem and its connection with important scientific and practical tasks.**

University training of a modern specialist requires not only to form special and ideological knowledge, but also to develop essential corresponding creative skills and abilities [1, p. 8].

The activity of an engineer-electrician implies overall preparation for both practical and theoretical training in major occupational courses (polytechnic, common occupational and specialized), that are determined by definite professional activity connected with particular production field.

Taking into consideration the increasing necessity in qualified employees, the society today is placing a higher demand to industrial-engineering education of specialists Electromechanical profile, whose activity is directly linked with social expectations. This requires such specialists not only to orientate themselves effectively in the surrounding world, but also to be able to allocate thinking in activity directed to a definite field of industry and instructional subjects, focused on forming corresponding professional competences.

**The analysis of studies and publications that highlight the decision of the given problem.** The issues of preparation and conduct of experimental research in laboratory conditions while studying specialized subjects at higher educational establishments were considered by S. Artuh [1], O. Krokoshenko [2], I. Pyatnitsko-Pozdnyakova [3], W. Petruk [4], N. Erganova [5], etc. Meanwhile the basic element of qualitative training of students majored in electromechanics to conduct experimental research while studying technical subjects is not studied and specified enough.

**Defining the aims of the paper (setting the task).** That’s why the aim of the given paper is to summarize the structure of knowledge in electrical engineering needed for students majored in electromechanics, to define its place and role while conducting experimental research in studying technical subjects.

**Description of basic material.** Engineering activity is an integrated, multifunctional activity of an engineer, aimed at professional preparation and development of the personality of a future specialist in a definite field of production [6, p. 10], who is capable to organize and fulfil

teaching main (specialized) subjects to future qualified employees. The peculiarity of professional pedagogical activity of an instructor of specialized subjects is its strict professional orientation [7, p. 70].

In terms of these statements, let's consider future professional activity of students majored in electromechanics.

As research shows, creative nature of work of specialists in conditions of modern manufacturing especially becomes apparent in electro-mechanical field of production. This is caused by the fact that specialists in this field are connected with installation, repairs and maintenance of extremely complicated equipment. To fulfil their working functions they need to know not only how electromechanical devices operate, operating rules and making-good procedure, but also how to analyze various parameters of electromechanical machines, to make logical and mathematical processing of instrument readings and indications, coming from controlling equipment. Introduction of new tools into manufacturing, using new mechanical means require future engineers majored in electromechanics to be highly qualified in the field.

The quality of preparation of future specialists depends on many factors and as a consequence we have many problems in engineering education, one of which is the problem of interaction of general educational, general technical and specialized training of future specialists.

It's common knowledge, the theoretical basis to form professional skills and abilities is common educational and common technical subjects. They contain basic knowledge needed to master a profession, in other words it's a foundation to get professional education. Meanwhile common technical subjects play an independent role in the content of preparation of modern specialists, as they perform as "a logical bridge" between common educational and specialized subjects. Thus, common technical subjects give succession and mobility to the whole educational system [8].

Electrical engineering is the leading, integrating common technical subject in the content of professional training for rather a wide range of professions linked with electromechanics. Besides, electrical engineering is both a polytechnic subject in the educational system of preparation of students majored in electromechanics and a basis to form systematic knowledge in electrical engineering while studying theoretical material describing practical electromechanical objects: electric circuits, electromechanical devices, electrical machines, as well as a basis to form skills that are important in the professional aspect while conducting experimental research.

For example, the basics for electrical circuit theory consists of knowledge about general notions, laws of electrical circuits, where electrical circuits are presented as generalized technical devices. The knowledge of electrical engineering that was formed in this way will facilitate deeper consideration of other electromechanical devices and systems. While studying electrical circuits students majored in electromechanics develop skills and abilities for analysis, generalization, synthesis of the knowledge of electrical engineering, and are able to shift the system of knowledge in electrical engineering that was formed while studying general technical subjects onto technical subjects; also students are able to use these skills when considering typical electromechanical devices and conducting experimental research. Technical subjects are those containing knowledge about principles of outer or inner operation of either complicated construction or separate its parts at any stage [9, p. 59].

According to the importance of professional direction of teaching electrical engineering, it is necessary for electrotechnical devices under consideration to correspond to those which electricians will come across at manufacture or while mastering professional activity. Although not all electrotechnical devices can be shown to students when studying a subject. In most cases a real object is replaced by a model that generally retains the structure, functional purpose and separate characteristics of the original. In the teaching process models are the sources of information in different kinds of teaching activity when conducting a training experiment and in the laboratory. A training experiment is conducted in theoretical classes where a group of students investigates physical processes and structural parameters of electric devices. In the laboratory each student investigates the operation of an electrical circuit himself which contributes to deeper comprehension of the educational content.

Let's try to specify the essence of some notions that are connected with the field of polytechnic education with electrotechnical content. First of all, let's consider electrotechnics as a

science because electrotechnics in its broad sense is understood to be a field of science and technology that uses electrical and magnetic phenomena for practical purposes.

In recent century industrial electronics has derived from electrotechnics including three branches: energy, technological and informational that are becoming more independent with every year. Electromechanics as a part of electrotechnics takes an important place in this list and deals with electromechanical conversion of energy. Devices that convert electric power into mechanical energy are electromechanical converters or electrical machines.

The production of electric power is carried out mainly by electric generators, and it is consumed primarily by electric motors. That's why rotating electrical machines are very important in electrotechnics and are the basis for creation electric drive. Until nowadays the notion of electric drive has been formed according to the notion that it is a system which carries out controlled electromechanical conversion of power. Electric drive provides mechanical power to most devices, connected with movement in all fields of human activity, and that's why it may be viewed as the major supplier of mechanical power that was received from a source as a result of electromechanical conversion. Practically all processes in modern technology linked to mechanical power and movement are carried out with the help of electric drive. This wide nearly all-round spread of electric drive is caused by the peculiarities of electric power – the ability to deliver it over long distances which is economically sound, it is also always ready to be used and easily can be converted into other kinds of power.

A special field of electrotechnics is electrotechnical materials. Electrotechnics places extremely high demands to the quality of consumption materials. The term “electrotechnical materials” appeared similarly to, for example, the term “building materials” and in its broad sense it means any material used in the production of electrotechnical goods. In this sense, electrotechnical materials may also be considered other materials used in other industries. In the narrow sense these are only the materials possessing special qualities.

As it was already mentioned, industrial electronics has been derived from electrotechnics and it has taken a special place according to spread, professional level and the level of influence on other fields of technology, manufacturing and development of different structures. Industrial electronics comprises all industries in the above mentioned interpretation.

Electrical measurements deserve special attention, they provide direct connection between the experiment and the theory, high validity of scientific research and high quality of goods of modern production.

Traditionally the professional preparation of students majored in electromechanics was held on the basis of fundamental electrotechnical education, which comprised all key problems, general principles and notions of electrical measurements and electronics, the basics of theory and methods of analysis of electrical and magnetic circuits, electromagnetic devices and electric machines. Teaching the basics of electrical engineering has always been obligatory for students majored in electromechanics, it's been one of the main elements of professional preparation.

Application of new technologies and a new element basis, a widespread usage of computer and digital technologies in different branches of manufacturing have led to a constant growth of subjects based on a solid electrotechnical preparation. The dynamics of this process also influences traditional established training courses facilitating their updating, emergence of new chapters, and sometimes even leading to changes in their titles.

Although deep comprehension of the nature of electromagnetic phenomena, knowledge of laws and principles of theoretical electrical engineering, skills to use them in practice have always been and are a necessary condition for qualitative preparation of students majored in electromechanics. They must know well properties and peculiarities of different electrotechnical and electronic devices while studying, designing, engineering and especially operating the equipment used in their professional activity.

The above mentioned issues are very important for an engineering higher educational establishment. A future specialist in electromechanics should have a highly adaptive and mobile professional knowledge, skills and abilities, which form the complex basis of professional competencies of an engineer-electromechanic [7, p. 65].

The knowledge of electrical engineering will facilitate the adaptation of future specialists to a constantly changing content of experimental research, the possibilities for self mastering of new

skills while conducting experimental research in the process of studying technical subjects [10, p. 110]. That's why a fundamental polytechnic training should become one of the main components of professional preparation of students majored in electromechanics, combining general scientific and general technical training courses where courses in electrotechnics play the key role.

**Conclusions and perspectives for further research in this field.** One of the main tasks of general electrical engineering is to help a future engineer-electromechanic form common knowledge and notions otherwise he will not be able to use electromechanical devices and machines consciously and effectively and which are necessary to secure reliable and economical operation of different technical facilities in his professional activity.

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**Abstract.** *The paper highlights qualitative preparation of students majored in electromechanics to conduct experimental research in studying engineering sciences, which is determined by presence of the basic element – availability of knowledge in electromechanics, gained in studying general technical subjects, that can be shifted onto technical subjects by students majored in electromechanics and use it while studying common electro-mechanical devices when conducting experimental research. The paper presents a summarized structure of knowledge in electromechanics of students, who specialize in the given field, defines its place and role while conducting experimental research in the process of studying technical*

*subjects, specifies the meaning of some notions related to the field of polytechnic training in electromechanical context and emphasizes that one of the basic components of professional training for students majored in electromechanics must be principal polytechnic training that combines common scientific and common technical subjects while the key role is given to electromechanics. One of the main tasks of electrical engineering is to give general knowledge and notions to a future engineer electrician, without which he will not be able to use effectively electromechanical devices necessary to provide reliable and economic operation of various technical facilities in his professional activity. To fulfil professional functions that are connected with installation, repairs and maintenance of complicated equipment, specialists in this field of industry should know not only the basics of operation of electrical mechanical devices, operating rules and repairs procedure, but also know how to analyze different parameters of electromechanical devices, fulfil logical and mathematical processing of instrument readings and signals provided by controlling equipment. According to this, successful mastering of the course in electrical engineering facilitates both deeper learning of other technical courses and qualitative arrangement and conducting experimental studies in the process of learning technical courses.*

**Key words:** *students majored in electromechanics; experimental studies; technical subjects; electro-technical knowledge and skills.*

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