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FORMATION OF STUDENTS' COMPETENCE IN TEACHING MICROPROCESSOR DEVICES

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A B S T R A C T

In this article, in the formation of the competence of future engineers in the field of electric power in higher technical educational institutions, problem-based learning technology is used to realize students' ability to draw logical, correct and scientific conclusions in their thinking.

K E Y W O R D S

Competence, practical skills, problem situation, characteristic of the problem, decision-making.

INTRODUCTION

In our country, considerable work is being carried out to modernize the education system by revising regulatory documents, introducing new equipment and technologies related to all fields of engineering into the educational process, and taking into account the knowledge, competencies and skills that future engineers will need to possess. This work is aimed at fulfilling the tasks set out in Decree PF-5847 of the President of the Republic of Uzbekistan, dated 8 October 2019, "On Approving the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030."

The decree sets out the priority directions for reforming the higher education system of the Republic of Uzbekistan, emphasizing the importance of raising to a new level the process of training independently thinking, highly qualified personnel with modern knowledge and high moral and ethical qualities, thereby developing the branches of the economy.

Methods and Materials

An analysis of the activity of future engineers being trained in the technical field at higher education institutions shows that, at present, developing measures to expand the skills, competencies and knowledge of students in line with the modernization of engineering equipment and technologies is one of the main tasks of higher education.

Today, a country's level of development is required to be assessed not only by the technical condition of its equipment but also by the level of competence development among specialists in their respective fields. Competence does not imply that a specialist has acquired isolated pieces of knowledge and skill, but rather that they have mastered in-depth knowledge and actions within their own field. This, in turn, requires a specialist in a given field to be able to constantly assimilate new information, to

stay informed of changes in the technical field, and to be capable of applying this knowledge in practice.

A specialist possessing professional competence must stay informed of innovations in the energy sector – that is, of the technological equipment used in current production processes and of the culture of using it, among other things – and must continually enrich their knowledge in these areas. They must also master the processes of reconstructing and modernizing the modern power equipment used in today's energy systems.

They must draw conclusions from the various decisions and decrees adopted in our country regarding the improvement and modernization of the energy sector, and adapt to the demands of the times accordingly.

Specialists must work on themselves to search for and find new information on technologies being created abroad and in other countries in the field of energy, to enrich their knowledge, and to apply this knowledge effectively in their own practical activity in terms of introducing it into practice. As noted above, specialists with developed competence gain the ability to manage any complex technological process directly. This, in turn, is determined by the professional-pedagogical level of the teaching staff working in higher education and by the process of effectively using teaching technologies in the educational process. For this reason, it is important for professors and lecturers working in higher education to have a good understanding of the technical field and to apply, in the educational process, teaching technologies that yield positive results in teaching specialized subjects, since this will bring positive outcomes in the future. It should be emphasized here that, for example, as the energy sector continues to develop, microprocessors composed of logic elements have emerged and are being applied throughout all branches of the energy system; as a result, raising the level of preparedness of the specialists being trained in the higher education system for their future work with such modern devices is an important issue.

Results

Future engineers in the field of electric power engineering must possess knowledge of the numerous complex functions performed by modern microprocessor devices. In this regard, modern microprocessor devices are capable of performing self-diagnostics (automatically checking the condition of individual modules and equipment and blocking their outputs if they fail to operate) and of diagnosing primary devices, and are capable of:

– automatically recording emergency and accident situations, and determining the causes of accidents while saving time;

– reducing the number of settings, increasing their accuracy and the accuracy of measurements, and reducing the number of selectivity stages, which in turn reduces the operating time of protection and, as a result, reduces the likelihood of significant damage to equipment;

– achieving low power losses in the measurement and consumption circuits (as a rule, there is no need to check the voltage transformer (VT) and the current transformer (CT));

– combining protective devices within the system in an automated manner while ensuring that settings can be changed remotely, allowing remote monitoring of the state of protection itself and of the power facility's operating mode, and transmitting records of emergency processes to the operator's workstation, as shown in Figure 1;

– performing new functions and accounting for operational wear (taking into account the remaining breaking capacity of the switch, storing several sets of settings and configurations, checking the saturation-current curve of current transformers and other devices), among other capabilities.
TJABT (KIT) – automatic process control system (corporate information system)

Discussion

At the same time, it is expedient for specialists to have a thorough understanding of the tasks that microprocessor devices must perform, and to possess in-depth knowledge of how to ensure the continuous operation of the energy system.

As is known, in measurement technology and in telemechanics, telecontrol and tele-regulation systems, a microprocessor (MP) performs the following functions when measuring electrical and non-electrical quantities:

– automatically setting measurement limits, and correcting additive and multiplicative errors;
– automatically controlling the balancing process in devices that compare alternating and direct currents;
– primary processing of values, detecting deviation from the maximum value, determining the approach to boundary conditions (points), calculating maximum-minimum ratios, and amplifying and dividing constant values;
– determining, during the processing of statistical values, the average values of the quantities being examined over a precise time interval;
– calculating expenditures being incurred, taking into account the non-linear characteristics of thermal elements;
– diagnosing the functional nodes of devices, measurement, and other tasks;
– controlling the operation of a measuring-converter node performing a separate task;
– fully controlling the measurement process, based on a given program, together with external and additional blocks;
– organizing ordinary and protected codes in telemechanics devices, checking them, and organizing informational and decision-making feedback connections;
– in building and controlling a program-based telemechanical system, microprocessor devices are able to ensure that the tasks noted above are performed reliably and with high quality.

Conclusion

It is expedient for a professor or lecturer, having knowledge of the requirements and tasks placed on the microprocessors noted above, of the need to convey this information to students, and of how the application of such devices in energy systems leads to improved control systems in other distribution substations and to increased operational reliability, to conduct classes using new pedagogical technology methods.

Organizing problem-based lessons in forming the engineering competence of students in the field of electric power engineering. The expansion of production volume and the development of the energy industry, in turn, indicate the need to train qualified specialists in the field of electric power engineering. This, in turn, requires enriching the content of the educational literature for specialists being trained at higher education institutions and properly organizing the educational process. There are a number of pedagogical technologies that serve to develop students' competence in the

educational process; all the work carried out under problem-based learning technology has its own specific practical basis.

In order to apply the problem-based learning method during lessons, every teacher working in the education system must first clearly know the following sequence:

– posing the problem;
– studying the conditions that characterize the problem;
– substantiating the correctness of the solution found;
– recognizing the new knowledge that emerges in the process of searching for and resolving the problem;
– systematizing, motivating and generalizing the problem;
– studying the solution to the problem and searching for more concise and convenient ways of arriving at it.

Problem situations consist in improving the independent work of students; below we give an example of creating a problem situation in the subject "Relay Protection."

Figure 1.1. Classroom assignment for the subject "Relay Protection."

Problem	**Requirements for relays**	**Sensitivity**
		Speed
		Selectivity
		Reliability

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