Editorial board

Dear readers!

The challenges sent by the global society to the Russian engineering education call for adequate and prompt responses that assure retaining its level of compatibility and global competitiveness of Russian engineering solutions and developments. Undoubtedly, Russian system of engineering education is undergoing improvement changes on all path segments of specialists' training organization, starting from organization of admission process and designing of educational programs and ending with advanced training of engineers. Among these changes the main one is the transition towards training of specialists, who possess the needed set of competences.

The problem of competences formation of engineering programs' graduates within the training process has emerged a while ago, however, the solution is still far from the final state.

The reasons for the appearance and existence of any problem and this problem in particular are the objective and subjective contradictions that occur due to inevitable changes in nature and all spheres of human activities: in politics, economics, culture, education, engineering, technology and many others.

When it comes to the objective contradictions that led to the emergence of a problem of engineering graduates' competences formation, first and utmost, we need to focus on the contradiction between the philosophical concept of education and the applicative definition of a competence. Education as an act of knowledge consumption can be received without introduction of dynamic practical activities to the educational process. At the same time, competences as a body of knowledge, skills and attitudes, despite its incorporation in the educational knowledge basis, cannot be formed without a solid, if not a prevailing, practical part of education.

As a result, the contradiction between the market (stakeholders') requirements and the educational system (even the system of engineering education) becomes apparent.

We need to bring to notice the contradiction between the arising level of bureaucratic requirements for competences description and methods of its formation and the traditionalistic forms of educational process organization.

Thus, for instance, a stringent requirement to state precisely, when developing the teaching materials, how and in which part of the course the numerous competences are to be formed while studying the discipline contradicts directly with the learning methods, forms of educational process organization and pedagogical approaches used by the faculty.

The other contradiction is between the professional skills of the faculty members and the growing employers' demand for such competences of engineering programs' graduates as the ability to work efficiently within the field of the major (both individually and in a team). It is not infrequent that faculty members teaching technological courses (disciplines) are not familiar with real technological equipment and specific aspects of its exploitation.

In fact, there is a contradiction between the requirements towards the teacher and his/her working conditions.

One of the major contradictions lies in the area of the quality. Nowadaysm many universities have functioning Quality Management Systems (QMS) that are certified according to Russian or even international standards. However, the fact that university has QMA can hardly imply high quality of specialists' training and advancement of their competences' level. The problem is determined by the contradiction between formalization of the process of quality (graduates') development and the real-life conditions, in which this quality is to be formed.

And, finally, there is a contradiction between the need for competences development and credible methods of their assessment (monitoring) within the training process of future specialists. Supposedly, today, it is one of the sharp contradictions that is stipulated in some cases by complete absence of such assessment methods. The existing methods of learning outcomes' control hardly concern the competences.

This issue of the Engineering Education journal presents best practices and innovative propositions of scientific and educational networks on decreasing acuteness of the contradictions mentioned above and, therefore, on solving the problem of competences development of engineering programs' graduates.

We hope that the ideas presented in these articles will be put into use in the best interest of Russian engineering education and will serve as an impulse for generation of new innovative ideas, whose realization will ensure substantial advancement of future engineer's training quality.

Sincerely,
Editor-in-Chief,
Prof. Yury Pokholkov

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Innovation Approaches to Development of Educational Programs in Field of Engineering

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The article is devoted to the main conditions of effective development and design of educational programs in the field of engineering.

Key words: educational programs, individual route, competences.

Intensive processes of structural changes, that take place in Russian economy, have stipulated high demand for new age specialists, who could successfully implement these changes with reference to the current historical, economic and political situations in the country. Practical activity, interests of economy, intensive development tracks that are taken by our country, have to prescribe the goals, methods and contents of higher education. However, modern education at national HEIs is insufficiently focused on resolving innovative problems. There is a critical shortage of HEI graduates, who have a high level of technical competency.

It is only possible to ensure a high quality of engineering specialists' training by having an efficiently functioning "Science – Industry – Market" system.

The key role in this system is given to the applied sciences – the source of scientific and technical innovations that determine progressive trends for advancement of products and services both in techno-economic and in social contexts. Undoubtedly, the market demand and the follow-up diversification of the production to a great extent influence the applied research trends. However, the breakthrough innovations that qualitatively alter the end-user characteristics of produced goods and services can drastically affect the market environment. Thus, the dialectics of the "Science – Industry – Market" system's development emphasizes the need for "elite" specialists training based on individual programs in the field of new engineering solutions' synthesis at the interface of different scientific fields that require deep technical knowledge and mandatory experimental research training [1, 2].

At the present time, implementation of the international quality standards, educational and professional standards, credit system and other conceptually new modifications to the system of HEI graduates' training leads to the emergence of some significant challenges in development of engineering educational programs that would be innovative, competitive and creative.

In response to the implementation of credit system to the students' educational process the main goals are:

- standardization of the scope of knowledge;
- creation of conditions for the highest personalization of education;
- strengthening the role of student's self-study efficiency.

The set goals and objectives of engineering graduates' training are most efficiently reached when the following key preconditions are respected: organization of applied Bachelor's Degree programs (existence of practical training resource center), development of practice-oriented units of educational programs, realization of dual education system, arrangement of individual paths for grasping the educational program, proficient use of e-learning elements, engineering of

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