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**NEW TRENDS IN VOCATIONAL TRAINING OF FUTURE SPECIALISTS  
IN APPLIED MECHANICS****НОВІТНІ ТЕНДЕНЦІЇ У ПРОФЕСІЙНІЙ ПІДГОТОВЦІ МАЙБУТНІХ ФАХІВЦІВ З  
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**Abstract.** *The analysis of the new trends in vocational training of future specialists in applied mechanics has been presented in the paper. A special attention has been paid to the exploration of the competence-based approach. The significance of the competence-based approach implementation into educational process of National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" has been substantiated.*

**Key words:** *engineering, future specialists in applied mechanics, vocational training, competence-based approach.*

**Introduction.**

XXI century is considered to be the century of the information society that requires new ways of doing things and rediscovery of the existing technologies.

Taking into account the following trends, the specialists in engineering need to provide the solutions to the mentioned problems. That's why it is an important issue for higher educational institutions as there is a growing need in the specialists in engineering field who will be able to provide the ways of solving the existing and coming technological problems.

The **aim** of this paper is to analyze the new trends in vocational training of future specialists in applied mechanics.

The problem of training of the specialists of new generation who will keep up with the times is urgent nowadays. Many studies have focused on the analysis of the higher engineering education.

As reported by Gerard van Oortmerssen, President of the International Council of Academies of Engineering and Technological Sciences, there is a growing demand for engineering talent and the nature of engineering is changing as it combines physics, chemistry mathematics with creative design, invention and innovation; but its scope is increasing. Engineers, more and more, have to be aware of the social and environmental impacts of technology, and have to work in complex teams, interacting and cooperating with society. Awareness of the importance and the changing nature of engineering should be raised in circles of government as well as the general public (UNESCO Publishing, 2010, p.7).

John Boyd, President of the International Federation of Consulting Engineers states that it is a challenge that needs true engineering innovation. Leadership in this issue requires us to go beyond our comfort zone, to engage in the debates of our



society, and to stand up for values regardless of their popularity. This is our challenge, and this is our opportunity (UNESCO Publishing, 2010, p.8).

The analysis shows that there is a gap between those competences that the future specialists acquire at universities and those ones which are required by the employers (World Bank, 2018). It is reported that a strong partnership between the education system and industry is crucial to integrate firm resources, share risk burdens, develop industry wide skill standards, and deliver apprenticeship training at scale (World Bank, 2018, p. 158).

Particular attention is paid to the increase of the quality of the process of training of future specialists in applied mechanics. The concern is the correlation between educational process and modern needs of society.

The move to a competence-based approach provides the mobility of the future specialists in applied mechanics in the conditions of the modern labour market. The competences which a future specialist of applied mechanics must acquire should be defined taking into account the requirements for the accreditation of engineering and associated curricula (Washington Accord, EMF). So, the basis for the development of the Standards consists in the competence-based approach.

According to the profile of the educational program in 131 Applied Mechanics (Standart vyshhoji osvity Ukrainy, 2019, p. 6-8) the main competences that should be obtained by the future specialists are:

*Integral competence* comprises ability to solve complex specialized tasks and practical problems in applied mechanics or in the educational process that involves the application of theories and methods of mechanical engineering and characterized by the complexity and uncertainty of the conditions.

*General competences:*

- ability to analyze and synthesize data, think logically;
- knowledge and understanding of the specified field;
- ability to identify, formulate and solve a wide range of problems based on applied mechanics;
- ability to apply technical knowledge in practice;
- ability to work in team effectively;
- certainty and firmness in solving tasks and duties;
- ability to learn and master knowledge independently;
- ability to communicate in a foreign language;
- ability to use information and communication technologies;
- ability to perform the work safely;
- ability to have social responsibility and consciousness;
- ability to search, process and analyze data;
- ability to estimate and provide work quality;
- ability to realize the rights and duties as a member of the society;
- ability to keep and develop moral, cultural and scientific values and achievements of mankind.

*Specialty competences:*

- ability to analyze materials, constructions and processes based on



fundamental laws and knowledge of applied mechanics, etc.;

- ability to make parameter estimation of materials, structures and machines and find appropriate solutions to ensure the appropriate level of reliability of structures and processes;
- ability to conduct technological and technical and economic evaluation of the effectiveness of the use of new technologies and technical means;
- ability to make the best choice of technological equipment and have basic understanding of current methods of their operation;
- ability to understand and use analytical and numerical mathematics methods skillfully to solve the problems in applied mechanics;
- ability to perform experimental research, receive, analyze and evaluate the results of the experiment critically;
- ability to apply appropriate quantitative mathematical, scientific and technical methods as well computer software to solve engineering problems in applied mechanics;
- ability to describe and classify a broad range of technical objects and processes based on the deep knowledge and understanding of a wide range of specific topics and related sciences;
- ability to acquire new knowledge and skills independently, using already acquired professional and general scientific knowledge and skills.

So, the skills that the future specialists in applied mechanics should require are: thorough knowledge and understanding of specified disciplines, assessment skills, mathematical skills, experimental skills, troubleshooting, computing skills, technical expertise, learning skills; skills of analysis and synthesis, flexibility of thinking, ability to work individually and in team, autonomy, communication skills, promotional skills, ethical skills.

One of the examples of the implementation of the competence-based approach is National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” (further Igor Sikorsky KPI). It is realized in the following ways:

- implementation of the educational programme which comprises the educational components (disciplines, modules and practices) and is described in the form of learning outcomes (competences) (Babyn, Boljubash, Gharmash et al, 2011, p. 46).
- development of the competences through the vertical and horizontal coherence among the disciplines – to keep interdisciplinary learning;
- improvement of the information and methodological support of the educational process in relation to the changes which take place in the field of applied mechanics;
- improvement of the qualification of the teaching staff through research, participation in conferences, competitions (Award on conducting scientific researches funded by the state, Award on the best textbook, coursebook, monograph, “Junior teacher-researcher”, etc.);
- increase of the quality of the educational process through implementation of new approaches (blended learning), methods (student-centered) and techniques of



training (cooperative learning, differentiation) etc.;

- increase of the level of research conducted at the institute (creation of Council of Young Scientists which was established to promote research, inventions of young scientists, realization of their rights and integration of their work);
- cooperation with employers (State Employment Agency).

### **Conclusions.**

Thus, the results obtained show that the implementation of the competence-based approach in the education process of the future specialists in applied mechanics is conducted effectively to train the specialists of new generation who will be competitive on the domestic and international labor market.

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**Анотація.** У статті проаналізовано нові тенденції у професійній підготовці майбутніх фахівців з прикладної механіки. Особлива увага приділяється дослідженню компетентнісного підходу. Обґрунтовано значення впровадження компетентнісного підходу в навчальний процес Національного технічного університету України «Київський політехнічний інститут імені Ігоря Сікорського».

**Ключові слова:** інженерія, майбутні фахівці з прикладної механіки, професійна підготовка. компетентнісний підхід.

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