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## СОВРЕМЕННЫЕ ТРЕБОВАНИЯ К ПОДГОТОВКЕ СТУДЕНТОВ ИНЖЕНЕРНЫХ СПЕЦИАЛЬНОСТЕЙ В ТЕХНИЧЕСКИХ УНИВЕРСИТЕТАХ УКРАИНЫ

### MODERN REQUIREMENTS TO TRAINING STUDENTS OF ENGINEERING SPECIALTIES AT TECHNICAL UNIVERSITIES OF UKRAINE

*В статье на основании анализа литературных источников исследуются вопросы введения иноязычных профессионально ориентированных спецкурсов в программы студентов машиностроительных специальностей, проанализированы исследования ученых по данной тематике. В статье рассматриваются вопросы профессионально ориентированного обучения, анализируются документы, касающиеся этого вопроса. Автор описывает примеры внедрения дистанционного обучения в учебный процесс. Изучает особенности современных информационных и коммуникационных технологий и способы их практического применения. Описываются возможности системы Moodle для повышения эффективности преподавания иностранного языка. Автор приводит практические примеры применения платформы Moodle.*

*The article is based on the analysis of the literature sources, it examines the introduction of foreign languages professionally-oriented courses in the programs of teaching mechanical engineering; scientific studies on this subject are analyzed. The questions of professionally oriented education are discussed; documents related to the issue are analyzed. The author describes examples of introduction of distance learning. The features of modern information and communication technologies and the ways of their practical application are studied. The capabilities of Moodle to improve the teaching of foreign languages are described. The author gives practical examples of how the Moodle platform can be used.*

*Ключевые слова: университет, инженер, машиностроение, компетентность, дистанционное обучение, смешанное обучение, учебный курс, задания, мультимедиа, Moodle, международная программа.*

*Keywords: university, engineer, mechanical engineering, competence, distance learning, combined learning, training course, tasks, multimedia, Moodle, international program.*

Nowadays, the development of education in Ukraine is in accordance with international standards and programs. An important aspect of the modernization of higher education is training of highly qualified specialists of engineering industry. The priority task is to train professionals with appropriate expertise who can speak foreign languages and are capable of professional self-improvement. Pressing issue is the introduction of competence-based approach with respect to training of future

engineers. Particular attention should be paid to the competences that contribute adaptation to changing labor market of future professionals.

In recent years, many economic sectors have undergone significant changes. Today the growth of engineering industry is impossible without highly qualified specialists. The studying of foreign languages by future engineers is in particular importance as it provides opportunities for foreign language communication with foreign experts and enhances opportunities to study international experience.

Increased interconnection of science and technology, information society, a high rate of development of new technologies require new approaches in training of future engineers. In this connection special importance is paid to the new forms of learning. It is hard to imagine a quality education without information and communication technologies. There is a need to combine traditional and modern teaching methods. Distance learning is a solution to this combination.

The purpose of this article is to explore the features of training students of engineering specialties, to study the regulations relating to the preparation of students and to outline a number of tasks related to the preparation of future specialists.

The main objective is to provide all engineering sectors of the economy with high-performance machines and equipment. Engineering as an industry emerged in the XVII century. It quickly began to develop in the XIX century, initially in the UK, some countries of Western Europe and the United States. In Russia the first engineering plants have been built in the XVIII century.

More than 15% of the value of fixed assets and 21% of the number of employees industry (586,700 people in January — November, 2012) are focused on engineering in Ukraine. Engineering enterprises now produce 3.5 thousand items of machinery and equipment, including about 2 thousand modernized and more than 500 new models of machinery and equipment for agriculture [1; 2].

Today, mechanical engineering industry has a number of problems and needs for upgrading and introducing new technologies. Competence approach is at the heart of the development of education standards. Application of the competency approach to developing industry standards should lead to the formation of new diagnostic tools with the transition from knowledge to assess competency assessment and determine the level of competency as a whole. Thus, the results of the formation of competences are the key points in assessing the quality expertise. It is about improving the educational technology through continuous interaction between teacher and student.

Since the late 1970s, Mechanical Engineering has evolved into a leading industry in the development and application of high tech, ranging from optoelectronics to new materials and alike. Many products of the industry combine mechanical technologies — often denigrated as old technologies — with advanced technologies. The engineering ingenuity to create innovative products that combine different technologies is one of the prominent strengths of European Mechanical Engineering. Although Mechanical Engineering is understood as a supplier of hardware, machinery and equipment, it has evolved in the direction of a service industry. Services such as the installation of manufacturing systems, training of operators, maintenance and repair, and even the supply of finance, have become more important. These services contribute not only to higher productivity but simultaneously reduce the exposure to low-cost competition.

As a consequence, the assessment of Mechanical Engineering's competitiveness will put a degree of emphasis on upstream and downstream linkages. The supplier industries' state of technology and their pace of innovation are of importance for the performance of Mechanical Engineering in the global technological competition. The growing weight of the emerging countries in manufacturing has even accelerated in the course of the global crisis — and this has become an important topic for the assessment of the opportunities and threats to Mechanical Engineering [3].

G. Kozlakova notes that competences in a foreign language, mathematics and information and communication technologies are among the most important key competencies for students of technical university and emphasizes that competence approach will promote and specify the existing ideas about the content and quality of foreign language, mathematical and special training of graduates of higher technical schools in terms of the spread of European and global integration of educational processes [4].

Training of engineering specialties in Ukraine is carried out in many technical universities including the National University «Lviv Polytechnic», the National Technical University «Kharkiv Polytechnic Institute», the Lutsk National Technical University, the National Technical University of Ukraine «Kyiv Polytechnic Institute» and many others. Notable universities have their centres of distance learning (for example, the National Technical University «Kharkiv Polytechnic Institute» and the National University «Lviv Polytechnic»). Centers of distance learning develop different distance learning courses using different Learning Management Systems. Distance learning courses are created on different platforms in different areas.

The National Technical University of Ukraine «Kyiv Polytechnic Institute» (NTUU «KPI») is a research university. It is one of the largest and most renowned technical universities in Ukraine. Institute of Mechanical Engineering is one of the largest departments of the University, which brings together eight specialized departments.

Institute of Mechanical Engineering of NTUU «KPI» prepares graduates as social individuals who are able to solve certain problems and tasks provided mastering system of skills and competencies. Graduates of NTUU «KPI» are capable of carrying out production and service functions and typical features of the tasks of professional activity [5]. Institute of Mechanical Engineering is among the largest scientific and educational units of NTUU «KPI» where training of students is held according to such specialties as:

Dynamics and solidity of machines

Hydraulic machines, hydraulic drives and hydraulic and pneumatic automation

Metal processing under special technologies  
Mechanical Engineering  
Metal-cutting machines and systems  
Applied Mechanics  
Equipment and technologies of plastic molding of engineering constructions  
Tool Production  
Intellectual property.

The National Technical University of Ukraine «Kyiv Polytechnic Institute» uses a lot of information technologies in its work. Ukrainian Institute of Information Technologies in Education is a good example of implementing e-learning in Ukraine. It was established in 2004 by the Ministry of Education and Science of Ukraine for the effective implementation of information and communication technologies in education on the basis of positive activities and experiences at the Ukrainian center for Distance Education of NTUU «KPI» [6]. It was created as a part of NTUU «KPI» in 2004 by the Ministry of Education and Science of Ukraine for the effective implementation of information and communication technologies in education.

The main tasks of the Institute are improving the quality of education, access of different age groups and segments of the population to educational resources, enabling continuous lifelong learning through the effective integration of information and communication technologies, including distance learning in education.

In accordance with these problems the specialists of the Institute initiated and carried out a variety of projects aimed at the expansion of modern educational technologies, improving national education and dissemination of public access to modern educational resources and technology. Also, the bank of web resources was created that now includes:

- Distance learning courses;
- Test system;
- Video lectures;
- Glossaries;
- Simulation games;
- Virtual labs.

It should be noted that in spite of a sufficient number of hours to study these subjects, researchers and teachers should still seek out new training methods for improving the educational process. For example, Ukrainian Institute for Information Technologies in Education NTUU «KPI» allows teachers to undergo training on various special courses or create courses on the platform Moodle.

Moodle system is most common in the world. According to information that is located on a worldwide site, system Moodle (Modular Object-Oriented Dynamic Learning Environment) is a «modular object-oriented dynamic learning environment», it is also known worldwide as the Open Source Course Management System (CMS), Learning Management System (LMS) or a Virtual Learning Environment (VLE) [7]. Moodle system has become quite popular in the world among teachers as a tool for creating dynamic courses for students.

Moodle is an open source Course Management System (CMS) that universities, community colleges, businesses, and even individual instructors use to add web technology to their courses. More than 30,000 educational organizations around the world currently use Moodle to deliver online courses and to supplement traditional face-to-face courses. Moodle is available for free on the Web (<http://www.moodle.org>).

Moodle has a very large, active community of people who are using the system and developing new features and enhancements. You can access this and enroll in the Using Moodle course. There you'll find people who are more than willing to help new users

get up and running, troubleshoot, and use Moodle effectively.

The Moodle community has been indispensable to the success of the system. With so many global users, there is always someone who can answer a question or give advice. At the same time, the Moodle developers and users work together to ensure quality, add new modules and features, and suggest new ideas for development. Because users are free to experiment, many people use and test new features, acting as a large quality control department.

These three advantages — open source, educational philosophy, and community — make Moodle unique in the CMS space.

#### Forum

Forums allow you and your students to communicate with each other at any time, from anywhere with an Internet connection. Students don't have to be logged in at the same time you are to communicate with you or their classmates. The technical term for this type of communication is asynchronous, meaning «not at the same time». Asynchronous communications are contrasted with synchronous forms such as chat rooms, instant messaging, or face-to-face conversations.

#### Chat

The Moodle chat module is a simple synchronous communication tool allowing you and your students to communicate in real time. If you've ever used an instant messaging system like AOL, MSN, or iChat, you've used a system similar to the Moodle chat.

#### Messaging

Messaging is a private communication tool between student and teacher or between two students.

#### Quizzes

Moodle's quiz module is one of the most complex pieces of the system. The community has added a large number of options and tools to the quiz engine, making it extremely flexible. You can create quizzes with different question types, randomly generate quizzes from pools of questions, and allow students to re-take quizzes multiple times, and have the computer score everything.

#### Assignments

The assignment module gives you an easy way to allow students to upload digital content for grading. You can ask them to submit essays, spreadsheets, presentations, web pages, photographs, or small audio or video clips. Anything they can store on their hard drives can be submitted in response to an assignment.

Assignments don't necessarily have to consist of file uploads. You can create offline assignments to remind students of real-world assignments they need to complete. Alternatively, you can ask students to input their answer directly into the assignment itself.

Assignments are a useful tool you can use in creative ways to collect more authentic responses from your students than is possible with the quiz engine.

#### Glossaries

Each Moodle course has its own set of glossaries. Only teachers can edit the main glossary. Secondary glossaries may be configured to allow student entries and comments. Your Moodle course may contain one main glossary and as many secondary glossaries as you want. You can export entries from any secondary glossary into the main glossary.

#### Wikis

A wiki is a collection of collaboratively authored web pages. A wiki starts with one front page. Students can edit the page or add more pages to the wiki by creating links to new pages that don't yet exist. Old versions of

each page can be viewed by checking the page history.

#### Blogs

The word «blog» is a contraction of «web log». Blogs are a form of online journal that millions of people around the world use for self-expression and communicating with family and friends. The author of a blog usually organizes it as a chronological series of postings. Although some groups of people contribute to blogs, there is usually only one central author for each.

#### Databases

The database module provides a tool for collaborative development of a database within the course. It's not meant to be very complex or powerful, it's simply a way for multiple people to add structured data to a shared resource.

#### Grades and Scales

The Moodle grades area is a sophisticated tool for tracking student scores in your course. You can use it for scored activities both in the classroom and in Moodle. Moodle 1.8 introduces a number of useful improvements, including options to assign extra credit, grade on a curve, and exclude a particular score from a student's total grade.

With the new improvements, you should consider using the Moodle gradebook as your primary tool for recording scores and calculating grades. Students will appreciate being able to check their grades at any time and to compare themselves to the class average [8].

We created a multimedia training courses that have been approved in the learning process of NTUU «KPI» [9; 10]. Experimental studies conducted in the NTUU «KPI» confirm the effectiveness of the application of these courses in the classroom. Also, students in the survey noted that the main benefits are:

- increased interest in the study of foreign languages;
- comfortable environment for independent work;
- better knowledge of foreign language.

Consequently, teachers combine traditional teaching methods with remote, which increases the effectiveness of teaching.

A. Danilkevich argues that information and communication competence plays a huge role in the training of future professionals. According to scientist, the study of computer science and other professional disciplines affect the level of ICT competence. The data obtained show that the higher the academic performance of the student, the higher the level of ICT competence [11].

According to European standards the mobility of students plays the important role today. There are many international programs that enable students to study foreign experience and to increase proficiency in a foreign language. Fulbright Graduate Student Program, German Academic Exchange Service (DAAD), Erasmus Mundus and others are among the international application.

The Fulbright Foreign Student Program enables foreign students to obtain a master's degree or PhD in universities in the United States of America. Each year more than 1,800 scholars of the program have the opportunity to learn. The Institute of International Education arranges academic placement for most students and helps participants during their stay in the United States.

German Academic Exchange Service (DAAD) offers opportunities to study at German universities in master or postgraduate course (Aufbaustudium or Masterprogramm) and get a «Diplom» or «Master».

The strategic directions of modernization of higher education should be:

1. Using the experience of modernization of education.
2. Organization of a network of higher education institutions.
3. Enrollment of students and doctoral candidates



must be aligned to the real resource base of high school.

4. It is necessary to establish a national system for ranking of higher education institutions.

5. The development of competence-based approach in developing and modernizing curricula.

6. Effective mechanisms should guarantee quality education in Ukraine.

7. Creating a system of quality assurance in accordance with international standards.

Preparing students of engineering specialties requires special attention with regard to the mainstreaming competence approach. It should be understood that the engineering industry requires highly skilled professionals with knowledge of professional disciplines, new technologies and foreign languages. It is necessary to look for new approaches to learning/teaching of these disciplines as well as the introduction of multimedia courses in educational system can be a key combination of new technologies, professional fullness of informative and effective

learning. Mobility of students and teachers is one of the basic principles of modern European education. It is necessary to update the educational standards and curricula in line with international standards.

Accelerating the pace of technological development of the industry, current conditions of economic globalization require a new approach to training engineers. Today, there is a need for highly skilled engineers with a new world view, capable of ownership information and communication technologies for specialists who can accumulate foreign language communication and international experience.

Various learning platforms where teachers can create distance learning courses in accordance with the curriculum provide more opportunities in teaching any subjects. Studying a foreign-language distance courses increases the level of foreign language knowledge, promotes the interest of the students for learning languages, intensifies and diversifies independent work.

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