

## THE WAYS OF INTEGRATION OF ENGINEERING EDUCATION OF THE UKRAINE INTO THE INTERNATIONAL COMMUNITY

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**Abstract** *¾ The problems and prospects of development of engineering education in connection with globalization of economy and integration of the Ukraine in the world community are considered in this paper. The ways of training specialists who are competitive in the world labour-market are shown on the example of cooperation of Donetsk State Technical University with German educational institutions. The new concept of cooperation of the university with foreign firms developed together with Siemens company solves not only the problem of outflow of brains from the Ukraine, but also promotes formation of new generation of the specialists, who have the European professional standard, are fluent in foreign languages and aware of advanced technologies in the sphere of automation, mechatronics, information and telecommunication systems.*

**Index Terms** *¾ Collaboration of the universities, integration, engineering faculties, mechatronics.*

Integration of the Ukraine into European Community requires training of new generation of specialists who are oriented to the modern tendencies of science and technique development, aware of technical level of well-known world companies and have good knowledge of foreign languages. In this case integration of technical universities of the Ukraine into the European system of engineering education is taken into consideration as one of necessary conditions of the country development in new economic and political surrounding. The task is solved at Donetsk State Technical University and is based on the complex programme which forsee:

- University popularization in the world university surrounding
- Development of general problems related to the education
- Providing of taking part in the Internet
- University participation in the world educational events
- Establishment of the consortium on common with the institutes -partners training of specialists.
- Providing of wide possibility for the Ukrainian students studying at the universities of the European countries

The main object of this programme is a student, his level of special and humane training. Globalization of

economics puts forward new tasks of integration of higher educational establishments into the world division of labour and of integration of the universities into corporation of the Ukrainian and foreign enterprises. In this case language training of future engineers plays an important role. From one side a foreign language is as a way of communication at the international conferences, commercial negotiations, presentations, and so on.

The English language fulfills this function successfully. From the other hand side good knowledge of a foreign language is a necessary condition of international collaboration in the field of science, arrangement of partial studying in foreign universities and also of realizations of foreign companies' contracts in modernization of the Ukrainian enterprises, or giving engineering services out of the Ukraine. In this case, as the practice shows, only the language the partners speak is the way of communication. It requires knowledge of two foreign languages at the final stage of training.

Taking into consideration the responsibility for professional support of the reforms Donetsk State Technical University was the first to establish engineering faculties where special subjects are taught in a foreign language. Today the German Engineering Faculty (electromechanical profile), English Engineering Faculty (computer engineering) and French Engineering Faculty (mechanical profile) work successfully. These faculties have already done science and language retraining of lecturers; business contacts with foreign institutes, have been already established, different professors from Europe and America do lecturing, our library has received a lot of books in foreign languages, the technology of diploma projects training in foreign universities – partners has been developed.

It is necessary to mention the collaboration of Donetsk State Technical University with universities of Germany. First of all these are links with Magdeburg and Stuttgart universities. These universities have the history of development which is connected with state, economical process revival and which is also related to the university problems such as the idea of formation of new specialties and professional directions of technical and technological education.

The establishment of new departments, institutes, and faculties, the transformation of higher technical schools into

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technical universities, integration of research work and educational process is the main factor of engineers training for dynamic and competitive world market economy. The collaboration with the foreign companies, solving of social students and staff problems, is connected to it. The German Engineering Faculty was founded with Otto – fon – Guericke Magdeburg University and with the help of Siemens Company in 1992. This faculty reflects the great results of work dealt with the integration of the Ukraine into the European educational system. The training of the specialists on this faculty is done in two languages, the native one and German (special engineering training), (common engineering training).

It allows to organize the training process on the faculty based on the usage of German technical literature, the experience of German professors and to do common research in modern direction of power systems development. 85 students are admitted to different faculties, with the experience of professional training in the field of automation system and electric drive system, being widely spreads into different specialties.

300 students will study on this faculty in 2 years. There are a lot of new requirements as to the level of training of future engineers. The curriculum for the students of German Engineering Faculty (GEF) was developed in collaboration with Electric Engineering Faculty of Magdeburg. Courses on special subjects were also developed for students exchange in Magdeburg. The laboratories of GEF are equipped with modern electric drive systems and programming control systems for technological processes. They are equipped with the help of Siemens company.

The advanced training of specialists who will be of demand in the Ukraine in 510 years plays the important role. However, it is also the base for formation of the intellectual atmosphere of future technologies. The development of machine-building complex is one of the priority directions of structural economical reconstruction in the Ukraine. The analysis of foreign information shows that the machine building develops in the directions of mechatronics. Mechatronics is the engineering science which took permanent place in the sphere of machine – building, electronics, and information science. The main idea of mechatronics is the system which allows to take into consideration a lot of high – technological productions as the whole system under the formation of demands and processing of methods at the stage of analysis, design, productions and maintenance. Technological integration, machine-building, and information processing play the important role in the frames of the system project. Important industrial branches such as automobile, aircraft construction, machine – building, domestic equipment and electric drive equipment have already passed through new cycles based on the usage of high productive mechatronical goods.

These problems are not only technical, but also social ones which deal with organization changes in production. Therefore the division into special parts with narrow

specialization has been abolished at the enterprises. The groups of project specialists to optimize products manufacturing appeared. It requires forming of skills of working in-groups with interdisciplinary thinking. The main advantage of mechatronical approach in case of design and modern production equipment is main improvement, diagnostics, and machine service conception change.

Due to the integration of mechatronics into mechanics, hydraulics, pneumatics, and electric drive new possibilities of integration of the equipment into the single automated system appear. It gives a possibility to provide the equipment quality assurance and to control its operation. It also gives a possibility to liquidate accidents. The mechatronics equipment manufacturer gets the access to the information on the equipment operation and its weak points in the different conditions. The mechatronics equipment producer has a possibility to constantly improve his production and quickly react on changes in the world market. It is also the new level of machine – building development in the 21st century. That is why Donetsk State Technical University began to train specialists in “Mechatronics” with Magdeburg University. Curricula and programs in special subjects are coordinated with the curricula and programs of the Department of “Mechatronics” of Magdeburg University. It gives the opportunity to exchange students, to do projects works with the usage of modern scientific and methodological base and laboratory equipment of German higher educational establishments. We consider the synergy of the efforts of the Ukrainian and German lecturers to development of this young, dynamic and scientific direction in the machine – building complex to be very important at this stage. . One of the peculiarities of new century is active approach to industrial nontraditional sources of energy – energy of wind, sun, oxygen and so on. The Ukraine makes its first steps in this directions. Fundamental scientific research of new sources of energy is important. It is necessary to choose the correct strategic directions for ecologically friendly energy in the Ukraine. It is very important to find our own place in research distribution. The International Centre of Nontraditional Energy Sources was established at Donetsk State Technical University with the help of Magdeburg and Braunschweig Universities. The joint research in the sphere of optimization of the work rates of sun electric drive with power source and their interaction is being done. We have mutual agreement with the company “Vitroenergo prom”, which gives new opportunities of training specialists and the Donbass wind-mill electric generation plants operation improvement.

The collaboration of Magdeburg University and GEF in the frames of the DAAD project influences positively the quality of training of Ukrainian specialists.

For this purpose scientific and technical conferences dealing with modern problems of electric drives and automation are held. The textbook on artificial intellect in industrial automation systems has been published. The development of information technologies requires the usage

of multimedia books, virtual technical laboratories, and multimedia systems for independent students training, self – testing and self – control of students knowledge. The development of such systems requires spending of much time, doing scientific and methodological work and enthusiasm of lecturers (teachers). The result of such work is intellectual property.

The analysis of home and foreign experience in the sphere of multimedia programmes shows that the problem of intellectual property is solved in different ways. The first approach is based on multimedia programmes creation. It is the part of scientific and methodological work of a teacher, his working hours, and salary. Multimedia products are the property of institutes and the society. All multimedia programmes should be accessible for each student and each teachers of any institute and they should be used free of charge.

The second approach is based on intellectual property of multimedia book owner, virtual laboratory and so on. The usage of this materials is charged. The most wide–spread example is the development and usage of multimedia systems of translation and learning of foreign languages. These programmes are not accessible for everybody and demand the license. The combined type of the multimedia programmes and the programmes with authors rights are used. The first approach is more useful for Donetsk State Technical university and for the Ukrainian universities. This approach allows to use home and foreign practice of transmissions to the information technologies in the educational spheres. We signed the collaboration agreement with the Language Center of Magdeburg University. One of its issues is taking part at the international project, dealing with creation of multimedia book for self – learning of German “Multimedia Selbstlernprogramm Deutsch als Fremdsprache für die Mittelstufe”. The first part of this book was published in 1999. This part trains students for studying in German native speakers surrounding.

The program has been done on the base of original texts with the purpose of teaching listening comprehension, writing with the help of lexical grammatical exercises. The concepts of this program are first of all to provide students the opportunities of autonomous studying. The students may choose the contents of their studying and estimate their own results in studying.

Integration of the Ukraine into the European Community and international labour market globalization puts forward the strategy question of which place the Ukraine can occupy in international division of labor in front of the Ukrainian economics and higher educational system, The main point in it is the level of knowledge. Future export production is ideas and creative energy. Social analysis says that the intellectual potential is the most valuable thing in the Ukraine. We should concentrate all our financial and human resources on educational system improvement in the Ukraine. The Ukraine can pass to its second stage. It is delivery of highly qualified specialists, first of all in the

sphere of information technologies, onto the international market of labor. It is necessary to develop a legislation mechanism which presents the state and people economical interest in the sphere of engineering services abroad. It gives the opportunity for investments from developed countries. Successful collaboration of DSTU with the Siemens company made it possible to establish Engineering and Technical Centre of the branch company Siemens-Ukraine in Donetsk in 1998. The engineering staff is made up of the graduates of GEF.

The main activity of this center is giving engineering services in the sphere of information technologies both in the Ukraine and abroad. The new concepts of interaction of labor market were developed and implemented by DonSTU and Siemens company. The activity of this center is based on mutual benefit. The German company gets highly qualified specialists on lower prices. It makes the company more competitive and it gives an opportunity to provide greater amount of engineering service. This process saves the working places and expands the employment at the home market. The Ukraine gets currency without spending material resources. The Ukrainian employee of this centre is guaranteed a job according to his speciality, high salary, work for companies in Europe with usage of modern information technologies and social protection. The legislation realization of this concept is establishment of joint with Germany companies. These concepts have social advantages both for young specialists and for future development of higher technological enterprises in the Ukraine. The 2- year existence of Engineering and Technical Center “Siemens - Ukraine” made it possible to create 70 new working places for graduates of our university. It made first steps in the integration of specialists of Donetsk Center to the projects of Siemens in the Ukraine. Engineering Academy based on the experience of GEF and ETC “Siemens - Ukraine” was established in 2001. The main purpose of this Academy is post – graduate education in the sphere of modern automation program control systems and information technologies of Siemens company. The main purpose of Ukrainian German – Technical Centre is professional and language maintenance of talented students who have the desire to continue their education in German universities.

The tasks of UGTC are as follows:

- Training Ukrainian students for studying in Germany
- Additional training in English and German, organization of working experience at German enterprises
- Training specialists for attending post – graduating courses
- Carrying out of research and giving engineering service for Ukrainian and German companies

The main purpose of educational institutions is the development of creative possibilities of a young person, interdisciplinary approach to education, combination of technical and humane aspects of education. The new system of education should be innovative