

# Proceedings of All-Russian Scientific and Practical Conference “Approaches to Development of the National Doctrine of Engineering Education of Russia in the New Industrialization” (December 4 – 6, 2012 Tomsk Polytechnic University)

## WAYS TO IMPROVE THE QUALITY OF ENGINEERING EDUCATION

### WAYS TO IMPROVE THE QUALITY OF RUSSIAN ENGINEERING EDUCATION IN NEW INDUSTRIALISATION

S.A. Podlesniy, A.V. Kozlov  
Siberian Federal University

The article discusses ways to improve the quality of engineering education in Russia in the era of post-industrial information society, analyzes the factors affecting the preparation of world-class specialists in the field of engineering and technology.

### CURRENT TRENDS IN ENGINEERING EDUCATION OF RUSSIA

V.M. Prikhodko V.A. Zorin,  
Moscow State Automobile and Road Technical University MADI

The article deals with the current trends in engineering education of Russia: engineering education quality assurance and introduction of the system for certification of engineering qualifications in order to get impartial assessment of the level of training at higher education institutions.

### FUNDAMENTAL APPROACH - BASIC PRINCIPLE OF ENGINEERING EDUCATION

V.A. Prokhorov  
North-Eastern Federal University named after M.K. Ammosov

According to the author today the system of higher education should be based on fundamental knowledge, be flexible and universal, focus on the formation of general and professional culture. The article proposes a new model of training at technical university that is based on revision of balance between fundamental and technical components, forming a multi-level integration of technical and fundamental knowledge.

### PUBLIC ACCREDITATION OF BELSU ENGINEERING EDUCATIONAL PROGRAMS

A.V. Mamatov, I.S. Konstantinov, A.N. Nemtsev, L.A. Kadutskaya  
Belgorod State National Research University

The article deals with public and professional accreditation of engineering educational programs as a tool for solving problems of improving the quality of training of future specialists in the field of engineering and technology. The authors present the experience of the Belgorod State National Research University in completing the procedure of professional accreditation of educational programs.

### COMPETENCE APPROACH IN ENGINEERING EDUCATION

O.A. Gorlenko, V.I. Popkov  
Bryansk State Technical University

The article discusses the main features of competency models graduates from engineering universities in accordance with the requirements of state educational standards (third generation). The spread of the number of common cultural and professional competencies for different areas of the integrated training of engineers indicates the need for urgent revision and improvement of the given educational standards.

### CONCEPT OF ENGINEERS TRAINING IN CHEMICAL ENGINEERING

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Kazan National Research Technological University

On the basis of KNRTU analysis of recommendations and outcomes of various conferences, parliamentary hearings, forums, academic schools and methodological seminars the problems of engineering education have been summarized. The concept of training engineers in the field of chemical engineering has been formulated.

### THE THEORY OF SEMI-FINISHED PRODUCTS IN THE APPLICATION TO HIGHER VOCATIONAL EDUCATION

V.G. Martynov, V.N. Koshelev, V.S. Sheynbaum  
Gubkin Russian State University of Oil and Gas

The article shows the direct connection between the increasing diversity of educational trajectories of engineering skills and the general laws of post-industrial society of development. The authors make an attempt to review the process of training engineers in comparison with the production of goods and services related to the category of semi-finished products.

### ANALYSIS OF FACTORS AFFECTING THE REQUIREMENTS OF PROFESSIONAL COMPETENCE OF MODERN ENGINEER

O.L. Servetnik I.P. Khvostova  
North-Caucasian Federal University

The social and economic factors affecting the requirements for the professional competence of the modern engineer are considered in the paper.

### INCREASING TRANSPARENCY OF THE EDUCATIONAL SYSTEM BY IMPLEMENTING STATE EDUCATIONAL STANDARDS

A.N. Danilov, V.Y. Stolbov  
Perm National Research Polytechnic University

The paper focuses on the entropy approach to the management of the training process in the transition to new state higher educational standards which involves different extent of transparency of students training systems at different levels of their training. The higher the degree of openness, the more ready for self-organization is the system. This will ensure the development of new way to organize the training process in accordance with the educational objectives set out in the transition to the new state higher educational standards.

### WHY RUSSIAN UNIVERSITIES DO NOT APPEAR IN THE TOP 100 WORLD UNIVERSITIES?

E.A. Gladkov  
Tomsk Polytechnic University

The paper analyzes the main reasons for the lack of Russian universities in the top 100 world universities.

### THE ROLE OF BUSINESS AND GOVERNMENT IN THE FORMATION OF STAFF REQUIREMENTS FOR INNOVATION-BASED ECONOMY

S.A. Vasilyeva, I.V. Filimonenko  
Siberian Federal University

The paper deals with the interaction tools between government and business on the staffing model for innovative development of the national economy.

# MODERNIZATION OF ENGINEERING EDUCATION

## MODERNIZATION OF ENGINEERING EDUCATION AT THE REGIONAL LEVEL

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Among the many challenges facing higher education, the author identifies as particularly important the direct participation of the University in the development of innovative technologies and social infrastructure of the region. The paper describes the main ways to overcome the crisis of engineering education, the priorities of its development and modernization. Implementation of the conceptual modernization program for engineering education is considered by the author as a crucial measure to address the current problems in this area.

## KEY APPROACHES TO MODIFICATION OF EDUCATIONAL STANDARDS FOR TRAINING IN THE FIELD OF INFORMATION TECHNOLOGY

M.V. Trofimova

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The Russian and foreign experience of educational standards for training in the field of information technology is considered. The paper analyzes the approach to determine the content of training on the basis of requirements for professional competence of specialist in the field of information technology.

## INFORMATION AND COMMUNICATION TECHNOLOGIES AS AN INNOVATIVE EDUCATIONAL ENVIRONMENT AT TECHNICAL UNIVERSITY

N. Y. Bratchenko, T.A. Mikhailichenko

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Current state educational standards for students of technical universities address formation of information and communication competencies. It is shown that the of up-to-date laboratory complexes in the training process contributes to the development of fundamental knowledge, skills and abilities of future engineers. The paper presents the most relevant examples of implementing information and communication technologies within the training process.

**PROBLEMS IN ORGANIZING INDEPENDENT STUDY OF STUDENTS IN NATURAL  
SCIENCE COURSES AT TECHNICAL UNIVERSITY**

D.V. Terin, Y.V. Klinaev, O.A. Monakhova  
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Saratov State Technical University named after Yuri Gagarin

The article deals with ways of organizing independent work of students within such disciplines as "Physics", "Modelling of Physical Systems", "Digital Signal Processing", "Computer processing of the experimental data" introduced by the department "Technical Physics and Information Technology".

**FEDERAL STATE EDUCATIONAL STANDARD FOR TRAINING  
ENGINEERS SPECIALIZED IN "DESIGN OF BUILDINGS"**

V.I. Telichenko, P.A. Akimov  
Moscow State University of Civil Engineering

The paper is devoted to the development of the federal state educational standards of higher professional education in "Design of buildings" at Bachelor and Master training levels.

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## **METHODS AND TOOLS FOR TRAINING SPECIALISTS IN THE FIELD OF ENGINEERING AND TECHNOLOGY**

**RESEARCH AND DEVELOPMENT ACTIVITIES  
AS THE BASIS OF TRAINING MODERN ENGINEERS**

V.G. Zaharevich, B.M. Vladimirskiy  
Southern Federal University

The paper reviews some of the current problems of training engineers' that should meet up-to-date requirements. The authors give grounds for the necessity of initiating and executing of large multidisciplinary projects to improve the quality of education and level of graduates from engineering universities.

### RESEARCH WORK OF STUDENTS AS A METHOD TO STIMULATE CREATIVITY

E.N. Kartavtseva

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The paper describes the main trends in the development of vocational education, including learning and research activities of students in the course "Mapping". The objectives of students' research work of the faculty of secondary vocational education are considered in the article. The main forms of research activities for cartography students of the first, second and third years, and the main directions of their creative work development are presented.

### INDIVIDUAL EDUCATIONAL TRAJECTORIES AND COMPETENCE-BASED APPROACH IMPLEMENTING CLIPARTS AND VIRTUAL EDUCATIONAL INFORMATION SYSTEMS

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The article deals with the methodological aspects of the formation of individual educational trajectories. The models and methods of competence-based approach implementing both clipart and virtual educational information systems are discussed.

### NETWORK COOPERATION OF UNIVERSITIES AND ACADEMIC INSTITUTES IN PREPARATION OF THE ENGINEERING STAFF IN PRIORITY AREAS OF SCIENTIFIC AND TECHNOLOGICAL COMPLEX OF RUSSIA

A.N. Danilov, V.Y. Stolbov, A.A. Yuzhakov

Perm National Research Polytechnic University

Three models of networking cooperation of universities and academic institutes in the implementation of educational programs for master's degrees in priority areas of scientific and technological complex of Russia are presented. Advantages and disadvantages of each model are discussed. The examples of these models are shown in the article.

### TRAINING PRODUCTION ENGINEERS FOR THE OIL AND GAS INDUSTRY

A.V. Kravtsov, E.D. Ivanchina

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It is shown that the main principles of training engineers for oil and gas industry are based on close cooperation with leading Russian industrial companies. The interaction of technical universities with industry provides effective training at all levels of studying Bachelor - Master - PhD student - PhD - Doctor of Science. In this case, the system of training is based on the results of the industrial experiment method of mathematical modeling and systems analysis strategy. Specialists have opportunity to implement the results of their research in oil and gas processing factories within the studying process. This facilitates their advanced career development at enterprises in the oil and gas industry.

### TEACHING THE COURSE "REINFORCED CONCRETE AND STONE STRUCTURES" USING MULTIMEDIA TECHNOLOGIES

O.G. Kumpyak, O.R. Pahmurin  
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The paper describes the content of a textbook on the discipline "Concrete and stone structures" where all illustrative material is presented with the help of multimedia technologies. The processes of structural performance under load at different stress-strain states are accompanied by cracks in concrete or masonry forming a network of micro-cracks and the formation of the main crack are shown together with the change of stresses in the section design. All these factors accompanying the process of resistance design are reflected in the movement, in a dynamic form.

### CORRELATION OF EDUCATIONAL MATERIAL ON THEORETICAL AND STRUCTURAL MECHANICS AND FORMATION OF THE NATIONAL DOCTRINE OF ENGINEERING EDUCATION

M.O. Moyseenko, O.N. Popov, E.V. Yevtyushkin, D.N. Pestsov  
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The problems and their solutions in the teaching of such courses as "Structural Mechanics" (StrM) and "Theoretical Mechanics" (TM) are considered in the article. It is assumed that the teacher of TM department should take into account issues and requirements of StrM course when preparing teaching material. At the next training stages the new knowledge acquired by students is associated with the previously obtained. Students become more motivated to study those subjects that they had found unnecessary before.

### CONTINUITY AND QUALITY OF ENGINEERING EDUCATION

E.P. Aprosimova  
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The paper deals with the need to include topics on specifics of engineering training in the natural science courses, as well as providing opportunities for individual training trajectory for talented students in secondary schools.