The paper deals with innovative processes in additional engineering professional education based on the modern state educational policy, new educational technologies, and multidisciplinary approach. The experience of KNRTU in improvement and development of supplementary professional education in cooperation with business partners programs is suggested as a positive model.

GLOBAL INTERDISCIPLINARY TEAMS IN ENGINEERING EDUCATION

Summary

The paper deals with the management issues of training specialists in the field of engineering and technology ready to work in interdisciplinary teams and projects. Interdisciplinarity in the engineering education is considered as a basis for critically new competitive engineering solutions. The indicators proving the presence of interdisciplinary management system at university are outlined. Based on the elaborated interdisciplinary activities a set of required tools and elements to manage interdisciplinary training of engineers is presented.

INTERDISCIPLINARY APPROACH IN ENGINEERING EDUCATION IN TERMS OF INTERNATIONAL FRAMEWORKS AND METHODOLOGY

V.M. Kutuzov, V.N. Pavlov, D.V. Fuzanov, S.O. Shaposhnikov
Saint Petersburg Electrotechnical University "LETI"

The article analyzes the standards and guidelines of international educational
frameworks and initiatives in terms of interdisciplinarity of degree programmes in Engineering and Technology.

**POSSIBLE ALTERNATIVE OF INTERDISCIPLINARY LEARNING IN ENGINEERING STAFF TRAINING SYSTEM OF RUSSIA**

I.N. Konyukhov

Municipal state funded institution of additional education “Parus”, Ufa city

At present the system of supplementary education for children of school age does not imply interdisciplinary learning in Russia. One of the alternatives in implementation of such learning is development and implementation of supplementary education program of different specifications for school age children as well as training teachers capable of working with such programs.

**ACADEMIC PROCESS IN PRACTICAL ACTIVITY AS A MAIN TREND IN DEVELOPMENT OF MODERN ENGINEERING EDUCATION**

V.V. Shalvey, A.V. Koryukh, A.V. Myshlyavcev, L.O. Stripling

Omsk State Technical University

The article is concerned with experience and perspectives of practice-based learning development.

**INTERDISCIPLINARY APPROACH IN INTERACTIVE SELF-LEARNING**

R.Z. Bogoudinova, I.M. Gorordetskaya

Omsk State Technical University

The article considers theoretical-methodological bases of interdisciplinary approach to development of interactive self-education, principles of academic process organization using interactive learning techniques.

**INTERDISCIPLINARY INTERACTION FROM THE POINT OF VIEW OF ISO 9001-2015 STANDARDS**

M.V. Akulenok

National Research University of Electronic Technology MIET

The article is devoted to the analysis of quality management system in management of interdisciplinary interaction and trends in university QMS improvement in accordance with the requirements of new implemented edition of international ISO 9001 standards, in particular, the requirement for risk management.

**TECHNOLOGY IN THE LEARNING DESIGN BY UNIVERSITY TEACHERS IN THE RUSSIAN CONTEXT**

R. Martínez-López, M. Reznichenko

Samara National Research University (Russia)

C. Yot, C. Marcelo

University of Seville (Spain)

This research describes the type of the learning activities technology used by the teachers at the Russian Universities. Results offer evidence to the strong influence of confidence as a predictor of teachers’ technology use and transfer. An instrument is adapted in Russian context for future research.

**COMPUTER APPLICATIONS IN ENGINEERING EDUCATION: NEW OPPORTUNITIES IN TRAINING**

G. Zakharova, A.O. Ponomareva

National Research Tomsk Polytechnic University

This article considers the advantages of cluster supplementary professional education. The synergy is analyzed in development of curricula clusters in the context of university supplementary professional education. The strategy of curricula cluster development is suggested by means of scenario development based on a “neosystem approach”.

**DEVELOPMENT OF PROFESSIONAL COMPETENCIES IN INTEGRATED PROGRAMS OF ENGINEERING EDUCATION**

V.M. Kutuzov, N.V. Lysenko

Saint Petersburg Electrotechnical University “LETI”

The article deals with peculiarities in Bachelor-Master degree education system, presents the employers’ requirements in training engineers able to design, manufacture, and maintain complex machines and equipment.

**SYSTEM OF JOINT PROFILE TRAINING OF STAFF BASED ON INNOVATIVE RESEARCH AND DEVELOPMENT**

I.R. Kuznetsova, V.N. Malyshev, M.E. Shevchenko

Saint Petersburg Electrotechnical University “LETI”

O.G. Petkau, A.Yu. Tarakanov

Scientific Research Institute Vector

The article presents university innovative strategy of solving scientific-practical problems and specialized staff training for research and production focused on development of advanced interdisciplinary staff training and modernization of educational environment in the sphere of perspective means of radioelectronics as well as effective commercialization of research and developments.

**SYNERGY OF EDUCATIONAL CLUSTER DEVELOPMENT IN ENGINEERING EDUCATION PROGRAMME DESIGN OF STAFF BASED ON INNOVATIVE ENERGY PROFESSIONAL EDUCATION**

A.G. Zakhareva, K.O. Ponomareva

National Research Tomsk Polytechnic University

The article considers the issues of cluster supplementary professional education. The system of re-training, staff development, and perspectives of practice-based education under the condition of sharp growth in patent activity in developed countries and increased role of intellectual property items in modern economy are shown. Interdisciplinarity is based on the network relations among the studied disciplines. Goal, content, trends in interdisciplinarity are presented in the system of re-training, staff development, and Bachelor’s education.

**DEVELOPMENT OF ENVIRONMENT FOR TRAINING SPECIALISTS FOR INTERDISCIPLINARY RESEARCH PROJECTS USING RASA CENTER IN TOMSK AS AN EXAMPLE**

Yu.Sh. Strazhitulina, O.O. Bugaeva

National Research Tomsk Polytechnic University

At present, the Russian system of higher professional education stands at a pivotal moment. Challenges of globalization and international competition for talented specialists pose new problems for the Russian universities. The article considers experience of Tomsk Polytechnic University in development of environment for training students in interdisciplinary research projects in collaboration with leading scientists and research-educational centers.

**ENGINEERS TRAINING FOR WORKING IN INTERDISCIPLINARY TEAMS AND PROJECTS**

V.V. Kondrat’ev

Kazan National Research Technological University

The necessity of students’ methodological training in an engineering university is explained. It is improved by new engi-
EDUCATIONAL STANDARDS AS A BASIS FOR INTERDISCIPLINARY INTEGRATIVE MODULES

G.V. Bukalova
State University ESPC, Orel

The author proves axiological function of the integrative approach which is implemented for the new educational standards to be applied for engineering education. The conditions to enhance discipline integration process are determined in terms of systemology fundamentals. The author describes the stages of the integrative module design. The experience in the design of interdisciplinary integrative educational module (automotive transport) is shared and discussed.

TEAM WORK FOR COMPREHENSIVE ENGINEERING

O.N. Timofeev
Kazan National Research Technological University

The paper considers approaches to understanding the ways of ensuring education quality. The laws of creative self-development are described to demonstrate that the psychological function of education (understanding the purpose of the activity and key elements of orientation (intentionality) plays an important role in transition from development to self-development. The personality orientation as a self-development perspective is controlled by the mechanism of emotion regulation and determined by the level of emotional intelligence. The author analyses the assessment criteria for the quality of engineering education provided in higher education institutions in the signatory countries of Washington Accord. It is demonstrated that the major requirement for educational training, which ensures the high quality of education programs in technologies, is to develop the abilities and skills of comprehensive engineering. It has been found out that the key engineer’s competences to be developed in Russia are leadership skills. The interconnection between comprehensive engineering and leadership skills has been revealed. Also, it has been established that the four abilities and relevant skills included in emotional intelligence (EQ) are essential professional qualities of the leader.

PARTICULARITIES OF SELF-STUDY WITHIN ELECTRONICS AND NANO-ELECTRONICS EDUCATION PROGRAMMES

M.V. Akulenko, A.V. Zhelznyakov
National Research University of Electronic Technology MIET

The paper considers the ways to organize student self-study within Electronics and Nano-Electronics education programs. The case-study is analyzed in terms of process approach to education and program interdisciplinarity.

MODERN APPROACHES TO CULTURAL AND PROFESSIONAL COMPETENCIES ASSESSMENT: INTERDISCIPLINARY ASPECT

G.I. Bragimov
Kazan National Research Technological University
EAI, Bragimova
Kazan Federal University

The authors have identified three approaches to understanding structure of competence regarded as an assessment object. The major challenges a university teacher faces when assessing student competences have been revealed. Different tool of competence diagnosis and assessment are considered in terms of their role and application. Based on interdisciplinary approach, basic trends in the development of competency assessment forms, methods, and tools have been identified.

ADOPTION OF MODERN STANDARDS FOR BACHELOR AND MASTER DEGREE PROGRAMMES (INFORMATION SYSTEMS AND TECHNOLOGIES)

V.A. Dubetsky, A.G. Kuznetsov, V.V. Tshekhanovsky
Saint Petersburg Electrotechnical University “LETI”

The paper considers different approaches to the use of models, which are applied in the sphere of information technologies and specified in modern standards and guidelines, for the development of bachelor and master degree programs, the specialty of Information Systems and Technologies. The authors give examples of educational process management based on Unified Modeling Language (UML).

DEVELOPMENT OF GLOBAL PROFESSION-RELATED FOREIGN LANGUAGE COMPETENCY ON THE BASIS OF INTEGRATIVE APPROACH AS AN IMPORTANT ASPECT IN INTERDISCIPLINARY TEAM WORK TRAINING FOR PETROLEUM WORKERS

T.A. Starshinova, V.G. Ivanov, O.A. Larionova
Kazan National Research Technological University

Interdisciplinary tasks of petroleum industry boost intensive international collaboration and intercultural cooperation. This necessitates development of global profession-related foreign language competency required for both engineers and middle-ranking staff since it is a crucial factor in interdisciplinary and international team work training for the next generation of petroleum workers. The authors of the present paper suggest educational process design based on integrative approach and relevant principles.

ECONOMIC, SCIENTIFIC AND TECHNICAL FACTORS IN QUALITY MANAGEMENT

V.P. Semenov
Saint Petersburg Electrotechnical University “LETI”

The article examines interaction of economic, scientific and technical factors in quality management training including not only development of new approaches, but also design of integrated systems based on the principles of total quality management. In order to estimate efficiency of interdisciplinary projects, multi-criteria and multi-model approaches are considered essential.

INTERDISCIPLINARITY IN PRACTICE-ORIENTED BACHELOR'S TRAINING IN COMPLIANCE WITH CDIO

A.M. Borzakhin, A.A. Minina, R.V. Shalymov
Saint Petersburg Electrotechnical University “LETI”

Under currently changing circumstances, professional success of alumni of technical higher education institutions is governed not only by the knowledge acquired, but also by the ability to conform to changes. The present paper deals with CDIO approaches implementation and development of required competencies at Saint Petersburg Electrotechnical University “LETI” and at the Faculty of Information Measurement and Biotechnical Systems, in particular.

IMPROVEMENT OF ACADEMIC AND RESEARCH COLLABORATION BETWEEN UNIVERSITIES AND ENTERPRISES IN THE CZECH REPUBLIC

L. Musilek
Czech Technical University in Prague

The universities are responsible for taking into account and satisfying the demands of high-tech industry. There are various measures that contribute to strengthening cooperation between universities and industrial companies: submitting mutual grant applications, companies...
The global economy in which engineers live is in constant change and evolution. The requirements for engineers today include not only solid technical knowledge but also make them know how to apply that knowledge to real world problems. For these reasons, engineering education must reach beyond the academic world and draw in industry. The real world experiences that engineering students must have to be effective come from industry and not the more research oriented university environment. This paper reviews and analyzes the national and US student majoring in engineering, repair and mounting of the equipment. The article considers the implementation of network as a form of training in the higher school. It highlights the necessity of implementing this form of training for numerous alternative solutions. The article describes the project of National Research University. It has been revealed that additional professional education based on the interdisciplinary approach enhances interdisciplinary competency of students, thus, increasing their competitiveness. Such a training requires not only application of universal education technologies, but also search for numerous alternative solutions.

**IMPROVING TRAINING OF YOUNG SPECIALISTS FOR THE ENTERPRISES FOR ENGINEERING, REPAIR AND MOUNTING OF THE EQUIPMENT**

R.G. Abdeeve, E.R. Abdeeve, E.V. Bakireva, M.A. Lobanov
Bashkir State University

The article considers the implementation of network as a form of training in the higher school. It highlights the necessity of implementing this form of training for numerous alternative solutions. The authors offer a model of interaction between engineering enterprises in the framework of network industry educational programs.

**CROSS-CULTURAL INTERDISCIPLINARY STUDY OF LEARNING MOTIVATION OF ENGINEERING STUDENTS IN RUSSIA AND THE USA**

P.A. Sanger
Purdue University, USA

The paper addresses cross-cultural analysis of the learning motivation of Russian and US students majoring in engineering. The study is carried out with the use of psychological and pedagogical support for applied research, involving students into applied research, project-based learning. The paper reviews different measures aimed at improving academic and research collaboration between universities and enterprises in the Czech Republic.

**THE VITAL COLLABORATION OF INDUSTRY AND ACADEMIA FOR THE CREATION OF INTERDISCIPLINARY REAL WORLD STUDENT PROJECTS**

P.A. Sanger
Purdue University, USA

The global economy in which engineers live is in constant change and evolution. The requirements for engineers today include not only solid technical knowledge but also make them know how to apply that knowledge to real world problems. For these reasons, engineering education must reach beyond the academic world and draw in industry. The real world experiences that engineering students must have to be effective come from industry and not the more research oriented university environment. This paper reviews and analyzes the national and US student majoring in engineering, repair and mounting of the equipment. The article considers the implementation of network as a form of training in the higher school. It highlights the necessity of implementing this form of training for numerous alternative solutions. The article describes the project of National Research University. It has been revealed that additional professional education based on the interdisciplinary approach enhances interdisciplinary competency of students, thus, increasing their competitiveness. Such a training requires not only application of universal education technologies, but also search for numerous alternative solutions.
The authors emphasize that developed Professional mobility is an important factor in the professional identity among engineering students. The article provides the results of tests that revealed a negative trend of professional identity development. Contextual education approach is proposed as a solution to the existing problem.

SYNERGY OF INTERDISCIPLINARY TEACHING IN HUMANITIES

L.V. Bogatova
Kazan National Research Technological University

The paper deals with synergy effect resulted from interdisciplinary teaching in humanities. The author identifies homogeneous and heterogeneous synergies and pays special attention to interdisciplinary aspect of the humanities. The analysis of interaction between moral and law components of the education process if higher school reveals that the synergy effect has a profound social and cultural context related to formation of personality of a certain type.

INTERDISCIPLINARY CONNECTIONS IMPLEMENTED IN MORAL EDUCATION OF STUDENTS IN THE FRAME OF HUMANITIES PROVIDED BY HIGHER ENGINEERING SCHOOL

E.N. Tarasova
Kazan National Research Technological University

The paper discusses the results of the study devoted to moral education of students in the frame of humanities provided by higher engineering school. The aim and content of humanities in terms of moral education has been identified. The issues specific for interdisciplinary connections in the frame of humanities provided for engineering students. Educational potential of humanities in the development of moral quality of students is defined. The paper also provides a brief review of the theoretical model of moral education of engineering students, which incorporate teaching of humanities in higher technical school.

EFFECTS OF INTERDISCIPLINARY EDUCATION ON THE ENGINEERING COMPETENCE

A.V. Szarka
University of Debrecen

Interdisciplinarity is discussed as one of the effective tools to support enthusiasm of young generation for engineering; to increase motivation of engineering students; and to enhance the efficiency of collaboration between professionals from different fields. The paper describes the history of interdisciplinarity in engineering education, and dual education system that trains new graduates for real industrial environment of inter- and multidisciplinary activities.

AN INTERDISCIPLINARY APPROACH FOR ACQUIRING SOCIAL RESPONSIBILITY-RELATED COMPETENCE

J.J. Perez
Universitat Politecnica de Catalunya

Graduate students should exhibit hard competences – specific knowledge – in their field of study and, also soft or transversal competences that provide complementary abilities to use the former in any specific environment. Social responsibility is among the list of transversal competences. This competence provides graduates a guidance to develop their activities as professionals within a framework of sustainable development, in such a way that projects include considerations concerning environmental, social and economic dimensions. In the present work we revise the concept of social responsibility and propose a quality assurance procedure to assess and improve the level of competence achieved by graduates.

DEVELOPMENT OF ECO-FRIENDLY TECHNOLOGY OF COLOIDAL DEPOSIT UTILIZATION IN PULP AND PAPER INDUSTRY

A.V. Bogdanov, A.S. Shatrova, O.L. Kachor
Irkutsk National Research Technical University

Development of eco-friendly technology for intensive processing of sludge-lignin deposits, which is based on the best available utilization methods, is one of the urgent task to be addressed. The proposed technology to recover deposits from the storage pits of Baikalsk Pulp and Paper Mill on the basis of natural freezing allows reducing the costs and enhancing environmental safety of the project.

FORMING PROFESSIONAL COMPETENCE AMONG GRADUATES OF ENVIRONMENTAL ENGINEERING PROGRAMS ON THE BASIS OF MULTIDISCIPLINARY APPROACH

A.E. Inremetov
Kazan National Research Technological University

The article discusses new professional require¬ments for environmental engineers, who should ensure environmental protection in new socio-economic conditions. It also provides the concept of professional competence of the environment engineer.

PROJECT MANAGERS: WHAT SHOULD THEY BE LIKE?

A.A. Dulzon
National Research Tomsk Polytechnic University

The article discusses working conditions and basic duties of project managers in comparison with those of line managers. It provides the main duties of project managers and basic requirements for their professional, communicative and professional characteristics.

STUDENTS’ SATISFACTION WITH QUALITY OF EDUCATION AS SYNERGY FACTOR

Kazan National Research Technological University

The article provides a method to evaluate the quality of educational process. The authors suggest evaluating the quality of education in terms of consumer’s satisfaction, taking into consideration the ponderability coefficient of each quality indicator. The analysis has revealed the dependence between positive tendencies in classroom management and satisfaction level of students.

PROFESSIONAL IDENTITY AS A FACTOR OF PROFESSIONAL MOBILITY

M.G. Reznichenko, V.I. Stychkova
Samara National Research University

Professional mobility is an important factor of engineer’s career development. The authors emphasize that developed status of professional identity is a precondition for the professional mobility. The article provides the results of tests that revealed a negative trend of professional identity development. Contextual education approach is proposed as a solution to the existing problem.
DEPENDENCE OF INTERDISCIPLINARY PROJECT MANAGEMENT ON DIFFERENCE BETWEEN CORPORATE CULTURES

P.A. Podrezova, V.M. Kizeev
National Research Tomsk Polytechnic University

The article discusses the influence of corporate culture on a large interdisciplinary project organization. In particular, in the case where large organizations involved in a project, have a vertical linear structure and unique corporate culture. The article describes the project "The Opening of the research and educational center «Modern manufacturing technologies» as an example.

LEADERSHIP AND CORPORATE CULTURE, THEIR IMPACT ON COMPANY GROWTH

M.S. Vaychuk
National Research Tomsk Polytechnic University

The term “values” is no longer used only in a political context. The intangible factors become the key of stability and a driver of development. In this regard, the article provides the correlation of corporate culture development and the presence of a strong leader in a company with dynamics of companies' profitability ratios.

Профессионально-общественная аккредитация образовательных программ (результаты)

Ассоциация инженерного образования России около 20 лет работает над созданием и развитием системы общественно-профессиональной аккредитации образовательных программ в области техники и технологии в России.


Профессионально-общественная аккредитация инженерных образовательных программ, проводимая АИОР, признана в большинстве развитых стран мира и является международной.

По результатам на 01.06.2016 процедуру профессионально-общественной аккредитации АИОР прошли 424 образовательные программы (первого и второго цикла) 67 ведущих вузов России, Казахстана, Киргизии, Таджикистана, Узбекистана. Европейский знак качества EUR-ACE label присвоен 343 программе. Кроме того, аккредитовано 3 образовательных программы среднего профессионального образования 3 российских техникумов. Списки аккредитованных АИОР программ регулярно направляются в Рособрнадзор и аккредитационным организациям стран-участниц Вашингтонского соглашения и ENAEE.

Наличие у вуза образовательных программ, имеющих международную аккредитацию, способствует укреплению престижа вуза в России и в мире, привлечению российских и иностранных студентов, расширению академической мобильности студентов, разработке совместных с зарубежными университетами образовательных программ, дает возможность выпускникам вуза претендовать на получение статуса профессионального инженера в международных регистрах APEC, FEANI.

Реестр образовательных программ, успешно прошедших процедуру профессионально-общественной аккредитации в АИОР, приводится далее.