

# **AC 2007-1888: THE NATIONAL PROJECT FOR THE INNOVATIVE DEVELOPMENT OF THE HIGHER ENGINEERING EDUCATION IN RUSSIA**

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# THE NATIONAL PROJECT FOR THE INNOVATIVE DEVELOPMENT OF THE HIGHER ENGINEERING EDUCATION IN RUSSIA

## **Abstract**

The new priority national project started in Russia in 2005, the main objective of this project being the realization by engineering universities of certain complex programs for perfection of academic and scientific activities. As a result, an effective segment of the national innovative system is to be formed on the basis of the leading technical universities of the Russian Federation. Selection of the project participants is done in the form of an open competition, and universities – the winners of this competition – receive a governmental grant in the amount from two to five annual budgets for the period of two years.

The programs, being realized by these universities, envisage a whole complex of pedagogical innovations, including such as:

- introduction of a two-level system “bachelor-master”;
- introduction of a credit-modular construction of academic programs;
- wide usage of information technologies and active (involved) methods of teaching;
- combination of academic, scientific and practical (production) activities;
- evaluation of the quality of education on the basis of actual competencies.

Priority support is given to training of engineers in the spheres of nanomaterials, nanotechnologies, microelectronics, power engineering and energy saving, info-communicational technologies, aerospace technologies, new materials, etc.

The project also provides for institutional transformations with establishment in engineering universities of scientific-educational centers and innovative infrastructure.

The national project, which is nowadays being realized in Russia, is a pilot one; a new generation of the state educational standards of the higher engineering education is being worked out on the basis of this project. These standards will determine the content, methodical and resource provision of higher engineering education, as well as principles and forms of monitoring and control of results of academic process.

The modern innovative changes in the national system of the higher engineering education in Russia are specified in more detail below in the present paper of the Russian Association of Engineering Universities.

## **Necessity of changes in the higher engineering education in Russia**

Unfortunately we have to state that both traditional Russian governmental universities and newly established non-governmental universities together with Russian business (which is mainly concentrated in the sphere of primary product) turned out to be incapable of creating a strategy for the necessary large-scale transformations in the post-soviet system of university education, as well as of reforming this system under new conditions of market economy. Regardless of certain successful achievements of some universities, at present the Russian

system of higher education as a whole runs risks to find itself at the outskirts of the global educational space and, therefore, to become unable to serve as a source of innovative activities.

### **Initiative of a new national educational project**

Under the current conditions in Russia it was the government that took the role of initiator of a transformation process in the Russian system of higher education, as the government is especially interested in increase of competitive capacity of the Russian economy and consequently aims at establishing of an effective segment of the national innovative system on the basis of Russian engineering universities.

A new priority national project “Education” started in Russia in 2005. Within the framework of this project Russian engineering universities have to realize (with a substantial resource support from the government of the Russian Federation) certain complex programs for perfection of their academic and scientific activities.

Conception of the mentioned national project provides for priority governmental support of certain programs for innovative transformation, those programs being specially selected in an open competition mainly on a criterion of their possible multiform and many-sided effect both on the higher education system as a whole and on the development of science intensive business.

### **Selection of the project participants**

Selection of the project participants is organized in the form of an open competition among innovative programs, those programs being evaluated by invited experts from the spheres of business, academic community and international agencies. Universities – the winners of that competition – receive a governmental grant in amount from two to five annual budgets for the period of two years.

On the 1<sup>st</sup> stage of the competitive selection in May 2006 (with participation of 197 engineering universities) programs, presented by 17 universities from different regions of the Russian Federation, were announced as winners. It is anticipated that not less than 300 universities will participate in the 2<sup>nd</sup> stage of competition in March 2007 and not less than 40 universities will be selected out of the competitors to receive the governmental support for their innovative programs.

### **Possibilities provided to participating universities**

Universities may use the grant funds in accordance with the tasks they have to resolve, but in average 65-75% of the funding is used to purchase the most modern laboratory equipment and computer technique, 20-25% is used to obtain or work out special software and methodic provision and 5-10% is used for raising of the faculty skill level, including support of international mobility.

Improvement of methodological, material and staff potential is used by universities to resolve a complex of objectives in an effort to perfect the content of education, academic technologies and the structure of academic process, to develop the scientific research in topical areas and to establish such innovative infrastructure which can ensure the integration of universities into the regional innovative structures of the Russian Federation.

## **General directions of innovations in pedagogy and research**

General direction of pedagogic innovations consists in transition to training in “flexible” specialties using a competent approach to working out of academic programs and technologies. It is evident that there is the tendency of shift from “classroom-lecture” system of training to “involved activities” system. Academic programs of the universities – the competition winners – make provision for introduction of a module system of training, transfer of focus in training from lectures to self-dependent and group project work, including compulsory scientific-research work of students, alternation of theoretical studies with practical activities, using imitation systems, cases and other active forms of training.

It is expected that innovative academic programs will help to create a qualitatively new informational and educational environment necessary to train specialists with such level of informational and communication competence that is enough to meet the current requirements. In particular, the innovative programs stipulate for usage of up-to-date technologies (CAE/CAD/CAM/PDM) for working out of a new methodology of training and also for optimization of design and technological solutions and methods of their application in organizing of the production and management processes of an enterprise.

Modernization of material and technical base for scientific research substantially advances facilities and potential of a scientific segment in universities, allows exercising scientific research and technological development of current importance and integrating their results both into academic process and into a relevant sector of economics. Priority support is given to innovations in the spheres of nanomaterials and nanotechnologies, microelectronics and optical electronics, informational and communication technologies, aerospace technique, rational nature management, biomedicine and so on.

Within the framework of the innovation programs, being realized at present, special attention is given to training in the field of innovation management, for example under such special programs as “Engineering business and management”, “Management of high technologies”, “Science intensive technologies and economics of innovation”, etc. In order to train a new generation of entrepreneurs of a science intensive business provision is made for creation of a well-developed innovative infrastructure (i.e. laboratories for group project work, student design bureaus, business incubators and techno parks) and for establishment of a cluster of companies in certain science intensive businesses with a university as its centre. Students are more and more actively involved into real project work for large corporative clients. A module of a specialized innovative training at the final stage of university studies is based on the principles of individualization and mobility of students, who have the right to choose form, place and extent of their involvement into realization of practical innovative projects.

## **Important effect on the higher education system and economy of Russia**

Actualization of academic programs, modernization of material base of scientific research and technological development, forming of an up-to-date informational environment of universities – all these factors even at the beginning of the national innovative project realization have considerably increased the investment attractiveness of the engineering universities participating in the project. Alongside with investments of funding by regional administration and Russian and foreign corporations, various scientific-academic centers are being established on the basis of private-governmental partnership, for example, centers of competence in priority directions of technique and technology, which render a wide spectrum

of scientific and educational services according to principal and additional programs of continuous education.

The national project under discussion is a pilot one and development of a new generation of the state educational standards for the higher engineering education is envisaged on the basis of its results, those standards determining the content of engineering education, its methodical and resource provision, as well as principles and forms of quality monitoring and control of results of academic process.

Governmental support of innovatively active universities is also aimed at formatting of new “points of growth” of the national innovative system by means of establishing of centers for integration of fundamental and applied science, fundamental and technological education and business. Further development of such centers of innovative activities on the basis of the leading Russian engineering universities is planned within the framework of a large-scale national project, which is now being prepared for realization with participation and support of the World Bank. The main purpose of the project will be to set up conditions for forming of effective partnerships (consortiums) of universities, scientific and design institutions, enterprises and corporations with a view to enter the global market of educational services, technologies and science intensive products.