

Education of students for the staffing of high-tech industries at the GDD Department at Novosibirsk State Technical University

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Abstract. The paper deals with the aspects of staff education for the high-tech industries of Russia at the GDD Department at Novosibirsk State Technical University. The peculiarity of training is the development and implementation of targeted educational modules, taking into account the peculiarities of the enterprises where the graduates will work. The annual All-Russian student conference is held to develop the skills of scientific activities, public presentation, and approbation of the results. In the process of training and holding the conference the resources and employees of the institutes of the Siberian Branch of the Russian Academy of Sciences are involved.

1 Introduction

The Department of Gas Dynamic Impulse Devices (GDD) was created in 1985, by the decision of the Ministry of Higher Education No. 701 from 4.11.1985 [1].

The department concentrated on the training of mechanical engineers in the specialty 0546 “Production of shells”. At present this specialty is called 170103 “Means of Defeat and Ammunition”.

This specialty produces highly qualified engineers with a wide profile, specializing in the design and production of a wide range of weapons and ammunition, methods of processing, and creation of materials and products with unique properties. Students receive in-depth knowledge in a complex of basic engineering disciplines, explosion physics, deformable solid mechanics, internal and external ballistics, design, and technology of ammunition production.

Graduates are trained to develop modern high-energy devices and technologies for using explosion energy in various industries:

- in mechanical engineering—for shaping, hardening, welding, and cutting materials;
- in materials science—for the synthesis of diamonds, cubic boron nitride, and high-temperature superconductors;
- in mining—for exploration and extraction of minerals;
- in construction—for moving large volumes of rocks, for drilling works, for the destruction of old structures and etc.

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2 Targeted education

Each year the number of applicants for the special-purpose places by orders of high-tech industries of the city of Novosibirsk and the Novosibirsk region increases, and the number of the enterprises that send school graduates for training at Novosibirsk State Technical University also expands. At present, the Department of GDD carries out point annual special training of about 10–12 students for 5 enterprises of Novosibirsk region: JSC Institute of Applied Physics, JSC NMZ Iskra, Kuibyshev Chemical Plant, FKP Novosibirsk pilot plant of measuring instruments, Novosibirsk plant of artificial fiber, Novosibirsk cartridge plant.

Within the target program “New Personnel for the High-Tech Industries”, since 2015 the department has been training the following educational modules:

“Training of highly qualified specialists in the field of development of firing means” for the enterprise JSC “Institute of Applied Physics”. The developed courses “Fundamentals of Designing Engines for Dischargeable Means”, “Designing Weapons, Ammunition, and Dischargeable Means”, “Industrial (pre-diploma) Practice: Practice to Obtain Professional Skills and Experience”, “Ammunition and Dischargeable Means Design” of the educational module are taught not only at the department but also on the premises of the enterprise.

The educational module developed together with the employees of IPF JSC takes into account all the requirements for the competencies of students in the “Ammunition” direction, which are laid down in the design of new, modernized and advanced firing means.

Students who passed the training and attestation on the educational module are ready for the production, design, and technological and research professional activities in the design and technological preparation of the production of ammunition as a designer, research engineer, and developer.

The material and technical base of JSC NMZ Iskra was used to train highly qualified specialists in the field of explosive devices development for some disciplines of the educational module: research work, internships, and graduate qualification works.

Due to the customer’s new requirements for the efficiency and economy of blasting equipment and the expansion and modification of the product range, the company needs qualified personnel capable of designing, developing production processes, and testing modern blasting equipment for various purposes and adapted to the company’s possibilities. In this regard, the developed educational module will be in demand and will have a significant scientific and production significance.

Students who have passed training and certification on the educational module are ready for industrial, design, and technological and scientific research professional activities in the design and technological preparation of the production of explosive devices as a designer, research engineer, and developer of technological production processes.

The educational module “Development, production, testing and utilization of cartridges for small arms and small-caliber artillery weapons” is developed in cooperation with JSC “NPZ”. Students of the department annually undergo practical training, where they are given the opportunity to get acquainted with the production, technological process of cartridges, and cartridge cases production.

Students who have passed training and certification on the educational module have competencies in designing and developing technological processes for the production of shells and cartridges.

Graduates of the department upon graduation are employed as design engineers, as well as process engineers, where they gain experience in cooperation with experienced engineers at the plant, and subsequently implement their skills becoming leading specialists.

The educational program of retraining of personnel—designers, researchers, testers, technologists for the defense industry in the field of the life cycle of manufactured products is conducted.

3 Conferences

Within the framework of approbation of the results students of the target, direction takes part in all-Russian and international conferences: “Science. Industry. Defense”, “Science. Technologies. Innovations” Novosibirsk, “Reshetnev readings” Krasnoyarsk, “Actual problems of modern continuum mechanics and celestial mechanics” Tomsk.

All-Russian Conference of Students, Young Scientists and Postgraduate Students “Science. Industry. Defense” has been held annually since 2000 [2]. The conference was initiated by the NSTU Department of Gas Dynamic Impulse Devices, which trains specialists for the high-tech industries. Since 2001, students and graduate students from other universities in different Russian cities started to participate in the conference: Novosibirsk, Vladimir, Moscow, Saint Petersburg, Nizhny Tagil, Novokuznetsk, Samara, Tomsk, and others. The aim of the conference is to intensify scientific research, establish contacts between institutes of higher education in the country, create common information and scientific space, instill in students an interest in scientific research. Representatives of industry and interested organizations have the opportunity to meet and discuss their problems with scientists-specialists, make a presentation and participate in the discussion.

The conference was also attended by scientists from institutes of the Siberian Branch of the Russian Academy of Sciences (the Sobolev Institute of Mathematics, the G.K. Boreskov Institute of Catalysis, the A.V. Nikolaev Institute of Inorganic Chemistry, S.A. Khristianovich Institute of Theoretical and Applied Mechanics, the S.S. Kutateladze Institute of Thermophysics, Russian Academy of Sciences, Institute of Solid State Chemistry and Mechanochemistry, Institute of Systematics and Ecology of Animals, Institute of Petroleum Geology and Geophysics, Institute of Computational Mathematics and Mathematical Geophysics), staff of scientific-industrial enterprises (S.A. Chaplygin Siberian Research Institute of Aviation, V.P. Chkalov Novosibirsk Aircraft Plant, Nanostructured Coatings Ltd, Scientific and research Research Institute of Electronic Devices, M.F. Reshetnev Information Satellite Systems).

The conference is divided into 14 sections: design and operation of weapons and munitions; high-energy condensed systems; industrial processes; rocket and space technology; aircraft control systems, dynamics and strength of machines, aircraft and helicopter construction and operation of aircraft and engines, technique and physics of low temperatures; aircraft life support and protection systems; hydroaerodynamics; safety of technological processes and industries; ecology; environmental management; environmental protection; economics and management in the industry.

Each conference is held with a patriotic focus in honor of a grand event in the historical calendar of the Fatherland or a person who has left an indelible memory in the minds of his contemporaries. For example, in 2001 it is the thirtieth anniversary of “Means of Defeat and Ammunition” specialty, in 2002—the memory of A.I. Belosokhov, graduate of “Means of Defeat and Ammunition” specialty, in 1996—appointed the first deputy minister of the Russian Federation on atomic energy, in 2003—110th anniversary of Novosibirsk, in 2005—60th anniversary of the victory in the Great Patriotic War, in 2006—90th anniversary of the professor, doctor of technical sciences, Honored Worker of Science and Technology, Rear Admiral G.S. Migirenko, in 2007—the 50th anniversary of the Siberian Branch of the Russian Academy of Sciences, in 2008—115th anniversary of Novosibirsk, in 2009—50th anniversary of the Faculty of Aircraft NSTU, in 2010—65 Anniversary of Victory in Great Patriotic War, in 2011—50th anniversary of the first space flight, in 2012—200th anniversary of the Battle of Borodino, in 2013—100th anniversary of Novosibirsk pilot, thrice Hero of the Soviet Union, Air Marshal A.I. Pokryshkin. In 2015—the 70th anniversary of Victory in the Great Patriotic War.

The conference consists of three days: first day—registration of participants and their resettlement. Plenary session, where prominent scientists speak.

Day 2—speeches of the participants, day 3—departure to the territory of the Military Training and Research Center of the Ground Forces “Combined Arms Academy”, which includes laying flowers on the alley of heroes, visiting the Museum of Military Glory and the exhibition of weapons: small arms, communication devices, military equipment. Then—a trip to the range with the performance of training shooting with Makarov pistol, machine gun Kalashnikov, machine gun, and sniper rifle. Shooting ends with a lunch from the field kitchen.

The winners and participants of the conference are awarded according to the results of the work of the sections.

4 Partnership

In connection with the targeted training the range of specialists, professors and teaching staff with the involvement of highly qualified scientific staff of SB RAS, such as the leading scientists of the Lavrentev Institute of Hydrodynamics, Gennady Anatolyevich Shvetsov, Vladimir Yuryevich Ulyanitsky, and the leading scientists of the Institute of Hydrodynamics of the Russian Academy of Sciences. The specialists from the applied research institute JSC "IPF" Polynovsky Anatoly Anisimovich, Chemeris Alexey Vasilievich, Braguntsov Egor Yakovlevich and others are also involved.

The department has prepared textbooks and manuals for the basic disciplines it reads [3–8].

In connection with the organization of cooperation and joint interaction on training highly qualified specialists under the program “New personnel for the high-tech industries”, it is planned to organize a scientific and educational laboratory on the basis of the GDD department, which would be engaged not only in training personnel, but also in carrying out research work, both in fundamental and in applied tasks.

References

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