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Fashilenko V.N



## REPORT

on the results of an independent evaluation of the main professional educational programs of higher education **11.04.03 "Design and technology of electronic facilities" University "Dubna"**

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## **REPORT ON THE RESULTS OF AN INDEPENDENT EVALUATION OF THE MAIN EDUCATIONAL PROGRAM**

The basic educational program «*Design and technology of electronic facilities*» specialization «*Design and technology of radio-electronic means*» is implemented within the 11.04.03 «Design and technology of electronic facilities» direction by the department «*Personal Electronics*» and leads to the award of the master qualification. The program is run by the *head of the Department of «Personal Electronics» Juriy S. Sakharov*.

An independent external assessment of the educational program has been conducted by AKKORK experts on the Oct. 25th - December 12th, 2016.

### **1. CURRENT STATUS AND TRENDS OF DEVELOPMENT OF THE REGIONAL MARKET OF EDUCATIONAL SERVICES IN THIS DIRECTION OF TRAINING**

#### ***Analysis of the role and place of the program***

The educational program 11.04.03 «Design and technology of electronic facilities», implemented by "University "Dubna" at the Department of «Personal Electronics» prepares specialists demanded in the labor market. Analysis of the needs of the labor market was carried out in four different ways: expert analysis of specialists of the analytical center "Education and Career", monitoring of vacancies in the media, research results on the analysis of the staffing needs of the cluster of nuclear physics and nanotechnology "Dubna".

The rapid development of electronics is a worldwide trend. According to <http://edunews.ru>, most popular professions in the world in the ranking of 2016, the first place is occupied by specialists in engineering. Engineering staff received a good education makes a rapid career growth. Demand of graduates of the direction of «Design and technology of electronic facilities» in the labor market is one hundred percent.

Direction of preparation 11.04.03 «Design and technology of electronic facilities» in the Moscow region exists in the following universities:

- Bauman Moscow State Technical University - 86 budget places;
- National Research University "Moscow Institute of Electronic Technology" - 55 budget places;
- Moscow Technological University (Moscow State Institute of Radio Engineering, Electronics and Automation, Moscow State University of Instrument Engineering and Computer Science, Moscow State University of Fine Chemical Technologies) - 35 budget places.

However, it should be noted that, on the one hand, due to the geographical location and specific transport infrastructure of the region, and on the other hand, due to orientation of the majority of the so-called "backbone companies", ie enterprises-employers of science city of Dubna (Russia's largest center for nuclear physics research), there is no direct competitors of the educational program in the Moscow region. These competitors could be: "Moscow Technological University. Fryazino Branch» (Moscow Oblast, Fryazino, the name until May 5th, 2015 is "Moscow State University of Information Technologies, Radio Engineering and Electronics Branch in Fryazino", State accreditation: Rosobrnadzor Order of August 7th, 2013 No 645\_1 up to July 8th, 2019, The founder: Ministry of education and science, the number of students - 113, issue of 2015 on the direction of preparation of 11.04.03 «Design and technology of electronic facilities» is 0 people) <http://f-mirea.ru/sveden/common/>). Thus, graduates of the University "Dubna", who were educated in the direction of preparation 11.04.03 «Design and technology of electronic facilities», have a high demand (100%) both directly in the city of science and in the nearby regions; a priority place of employment of graduates in Dubna - Moscow - other regions of the Russian Federation has the city of Dubna.

The main enterprises that provide base of employment of graduates of the University "Dubna" in the direction of preparation 11.04.03 «Design and technology of electronic facilities», are:

- *Joint Institute for Nuclear Research* is an international intergovernmental scientific research organization. Laboratory of High Energy Physics named after Veksler and Baldin is a research center for a wide range of works on the physics of elementary particles and atomic nuclei. *Laboratory of Information Technologies*: the main activity is the organization and development of high-speed telecommunications links, the development of high-speed and secure local area network, the development of high-performance distributed data-processing infrastructure of the Institute.
- JSC "Experimental Design Bureau "Aerospace Systems" (CJSC experimental design bureau "Aerospace systems"), part of the holding "Industrial Technologies" specializes in the development, integration and modernization of on-board systems, general aircraft and electronic equipment of aircraft.
- JSC "Scientific and Production Complex "Daedalus" (JSC "Scientific-Industrial Complex "Daedalus") whose main activity is the development and production of components of automatic process control systems, as well as devices and systems for the technical means of physical protection of complex objects of special importance and increased danger of both civil and military purposes.
- LLC "Communication Engineering Design Bureau" is a group of companies "Communication Engineering", specializing in the development and manufacturing of electronic and electrotechnical equipment for the telecommunications, energy, housing and utilities, rail, defense, oil and gas industries. The main activity of LLC "Communication Engineering Design Bureau" is prototyping of printed circuit boards for radioelectronic equipment.
- JSC Scientific Research Institute "Atoll" (JSC Science and research Institute "Atoll") realizes fundamental and applied research in Hydroacoustics and seismology, and also creates software and hardware systems for collection, transmission and processing of hydrophysical information.
- JSC "State Engineering Design Bureau "Raduga" named after Bereznyak A.Y." (JSC "State Moscow Design Bureau "Raduga" n.a. Bereznyak A.Y."), which is one of the world leaders in the field of high-precision missile performing the development, production and modernization of the domestic samples guided missiles "air-to-ground", "vehicle-to-vehicle" and "ground-to-ground".
- Special Design Bureau "Tensor" (SDB "Tensor") within the group of companies "Tensor" and deals with development and production of equipment of integrated security systems, fire alarm systems and Extinguishing Control, automatic and autonomous gas fire-extinguishing systems, automated systems for technical process control, monitoring and control systems of fire protection.
- others.

The main competitive advantages of the educational program in the direction of preparation 11.04.03 «Design and technology of electronic facilities», implemented in "Dubna" University are:

- modern teaching and laboratory facilities in the field of electronics, nuclear physics and information technology;
- a wide range of enterprises - bases of practices and, as a result, practice-oriented of term and graduate qualification works performed during learning process in the direction of training;
- a high level of integration of the specificity of backbone companies' activities in the main educational program (in curriculum, programs of disciplines, the final state examination, as well as in teaching materials of disciplines);
- opportunities for international cooperation within student and teaching staff mobility, including Russian mega-project NICA (Nuclotron-based Ion Collider

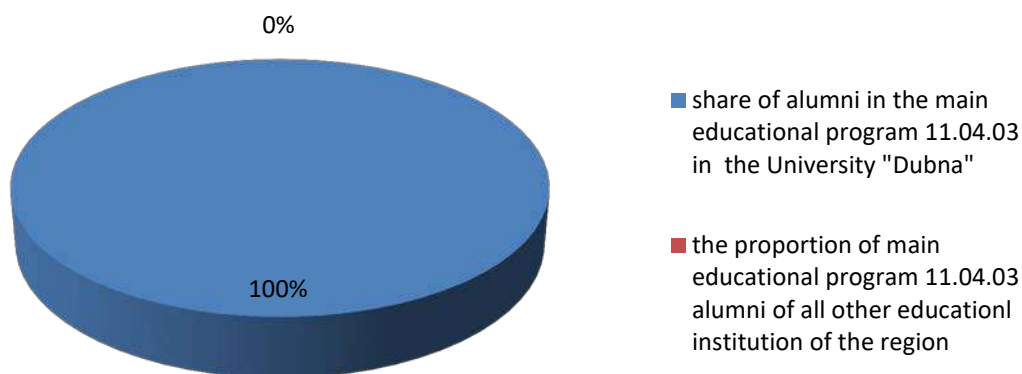
Facility) to establish the Russian collider protons and heavy ions, performed at the Laboratory of High Energy Physics n.a. Veksler and Baldin Joint Institute for Nuclear Research, performing a wide international scientific cooperation with CERN (Conseil Européen pour la Recherche Nucléaire - European Organization for Nuclear Research), physical centers of Russia, the countries of the Joint Institute for Nuclear Research, USA, Germany, Japan and other countries;

- Organization of various youth schools in the framework of the additional (optional) activities (eg International Youth Scientific School "Devices and methods of experimental nuclear physics. Electronics and Automation of experimental installations"), and master classes on various subjects with the involvement of management of companies - employers (the list and the dates for the 2016-2017 academic year has been approved at a meeting of the department "Personal Electronics" with invited representatives of major companies-employers: JSC Scientific Research Institute "Atoll", Laboratory of Nuclear Problems - Joint Institute for Nuclear Research, CJSC experimental design bureau "Aerospace systems", LLC "Communication engineering"; Protocol No 9\_16 of Feb. 9th, 2016);
- regular organization of research activities by the Department, including section "Innovative information and pedagogical technologies in IT-education" in the framework of the International Symposium on Nuclear Electronics and NEC Computing (Nuclear Electronics & Computing), organized in collaboration with the Joint Institute for Nuclear Research;
- Dubna University is a leading university that provides staff support for innovative special economic zone Dubna, created to solve the strategic objectives of the state and development, in priority areas of which the electronics and communications equipment, precision and analytical instrumentation, microwave technology. The largest companies-residents of special economic zone, implementing the design of complex technical systems and being a major employer for graduates on field of study 11.04.03 «Design and technology of electronic facilities» are: CJSC experimental design bureau "Aerospace systems", JSC "Scientific-Industrial Complex" Daedalus" Ltd. "Communication engineering Design Bureau".

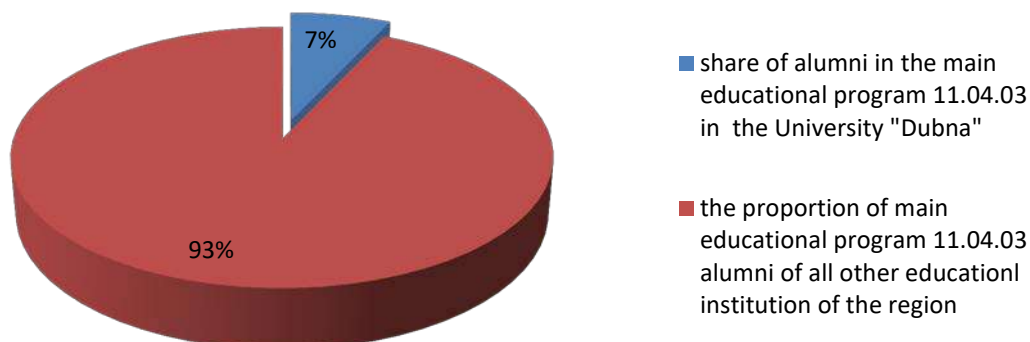
The "Dubna" University has developed a technique that allows to detect the level of employers' satisfaction and alumni (at the Department of Sociology and Human Sciences at the center of social research (Office of Applied and Social Research under the project "Modernization of the training system for the enterprises of the military-industrial complex, located on the in the Moscow region" (Order of the Ministry of Education of the Moscow region No 315 of January 30th, 2014, the order of the rector No 702 of June 03th, 2014) are held regularly the quality of education studies at the University "Dubna" assessing students, alumni, employers), performed public examination of the graduate competency model developed at the University. Such studies allow, firstly - to maintain and often to establish a close relationship with employers, and secondly - to monitor the quality of training of students and thirdly - to identify objects (common cultural and professional competence), requiring adjustment. The need for corrective action occurs when the value of a particular competence exceeds the level of satisfaction of its mastering.

A result of analyzing the role and place of the educational program in the direction of preparation 11.04.03 «Design and technology of electronic facilities» and peculiarities of forming of regional educational market, in accordance with the data provided by the educational institution, is a diagram reflecting the percentage of alumni provided by this program at the regional labor market.

### The role of the University "Dubna" in the formation of the labor market in science city



### The role of educational institution in the formation of the labor market in the region of Moscow and Moscow Oblast



#### ***Analysis of informational indicators provided by the university (conclusions)***

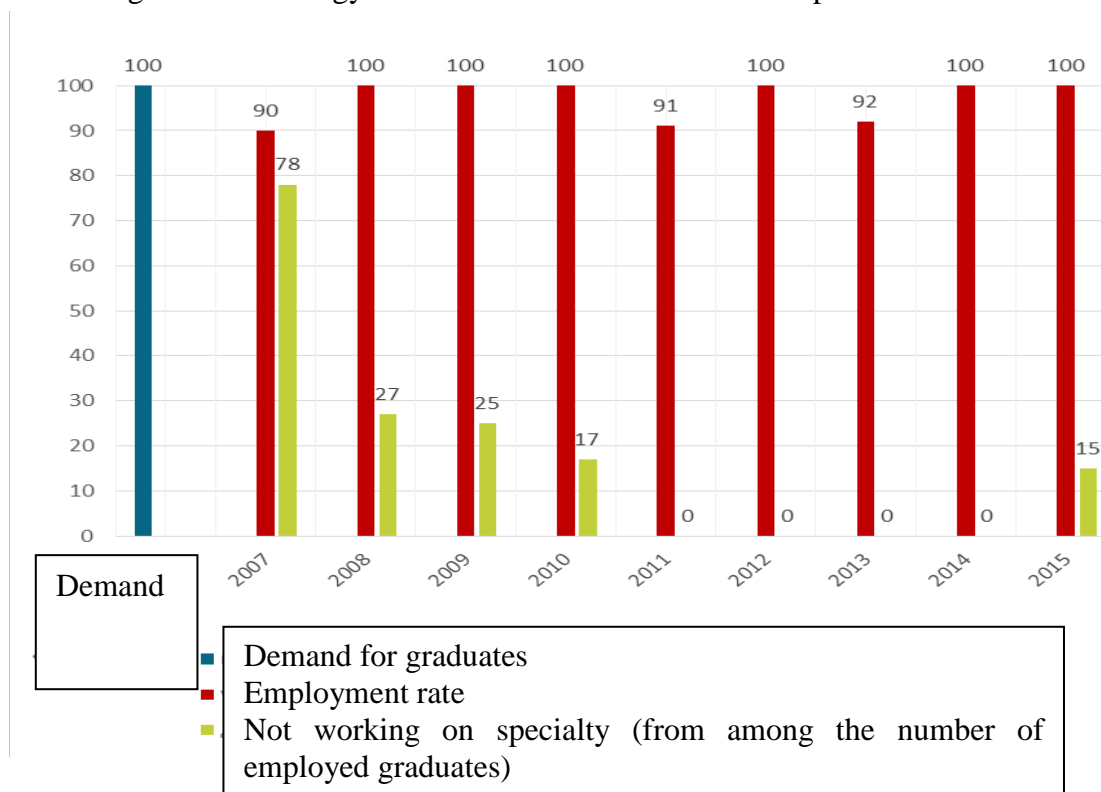
The number of alumni in the direction of 11.04.03 «Design and technology of electronic facilities» is averagely 15 people. The release of the specified field of study in 2016 is 13 people. 11 alumni found jobs on a specialty in Dubna: (Joint Institute for Nuclear Research - Laboratory for High Energy Physics - two persons, "Micronpribor" - 1 person, Joint Institute for Nuclear Research and research Institute "Atoll" - 1 person, LLC "Ramos" - 1 person, Unified DATA processing center, Dubna - 1 person, "Communication Engineering Design Bureau" - 1 person, CJSC "Technokomplekt" - 1 person, CJSC experimental design bureau "Aerospace systems" - 2 persons, LLC "Real Geo Project" - 1 person). and the rest are at the Joint Institute for Nuclear Research and research Institute "Atoll". One graduate continuing postgraduate studies.

7 positive comments about the work of alumni are available in the training office of the educational program, and no complaint on the alumni.

The distribution of alumni at the place of employment keep the same ratio of Dubna - Moscow - other Russian regions, where Dubna remains as a priority place of employment for

graduates. Today, according to data provided by the University "Dubna", 25 alumni / students are working in the companies-residents of special economic zone "Dubna", and 20 persons are working in the Joint Institute of nuclear research.

The chart shows the dynamics of indicators of employment of graduates of the direction "Design and technology of radio-electronic means" for the period of 2007 - 2015



The dynamics of indicators of employment of graduates of the direction "Design and technology of radio-electronic means"

- *The Percentage of students combining an education with work on major 11.04.03 «Design and technology of electronic facilities» – 87%;*
- *The Percentage of alumni contingent employed within one year after the end of the main education in the direction of training (specialty) obtained as a result of training on the main educational program 11.04.03 «Design and technology of electronic facilities» - 100%;*
- *The Percentage of the number of students enrolled on order of employers, for example, on the basis of tripartite (target) Treaty - 0%;*
- *The Percentage of alumni contingent working on the profile of training in the Moscow region – 100%;*
- *The Percentage of alumni contingent working on the profile of training outside the region –0%;*
- *the number of complaints to the alumni - 0%;*
- *Number of positive feedback of organization on the work of alumni - 7.*

## 2. SUMMARY OF THE PROGRAM

The quality of education (program's learning outcomes) of graduates in the direction of preparation 11.04.03 «Design and technology of electronic facilities» (level of higher education - master's degree), implemented by the University "Dubna" was assessed by the experts as high enough, as evidenced by the following factors:

- The Percentage of students combining an education with work on major 11.04.03 «Design and technology of electronic facilities» – 100%;
- 7 positive comments about the work of alumni are available in the training office of the educational program, and no complaint on the alumni;
- by results of the survey provided by the university with companies, none of the surveyed employers have not appreciated the competence of graduates as not corresponding to requirements to the bachelor's degree in engineering and technology of electronic means; together with positive feedback, available in the school office, and the results of interviews with representatives of employers at full-time visit of the experts it is an evidence of a sufficiently high degree of satisfaction of employers with the quality of training of graduates of the educational program 11.04.03 «Design and technology of electronic facilities»;
- by the results of the survey of students provided by the university, 86% of the students are advised University "Dubna" to their friends (on the results of interviews with students, master students and graduates, this percentage reaches 95%);
- The results of the direct competencies assessment demonstrated that 100% of students have an adequate and acceptable level of knowledge, of which 80% of the students have coped with 75-100% of tasks, and 20% of students have coped with 50-74% of tasks.

The experts assessed the guarantee of education quality (factors forming conditions for the implementation of the program), provided by the institution in the implementation of the program, as sufficient to achieve the learning outcomes.

Employers of the region are actively involved in the development, analysis, design and implementation of the educational program, including such companies as: JSC Scientific Research Institute "Atoll", CJSC experimental design bureau "Aerospace systems", JSC "Scientific-Industrial Complex" Daedalus", LLC "Communication engineering Design Bureau", the brigades of JSC "State Engineering Design Bureau "Raduga" named after Bereznyak A.Y.", specialist of Special Design Bureau "Tensor", LLC "Laboratory of Applied Information Technology "INFARD", Engineering and Technical Center - Autonomous Non-Commercial Organisation "Aerospace Research and Testing and Production Association" and others.

The educational process of the program is implemented by highly qualified teaching staff in which 40% of teachers are from among the active managers and leading employees of specialized organizations, enterprises and institutions, more than 50% of the lecturers providing the training process have Russian or foreign academic degrees and academic titles, while degrees of doctor of Science (including the degree of PhD) or the title of professor have for more than 20% of lecturers.

Classrooms equipped with computers and appropriate software (mechanical and electronic CAD: Autodesk inventor, OrCAD, Quartus, Labview) are used for training sessions, basic and applied scientific research in the field of electronics; wired and wireless Internet access is organized; there is open access (including remote) to the resources of the electronic library. Most of the classrooms "Dubna" University are equipped with modern multimedia devices.

The department is fundamental for the training of specialists involved in the mega-project of the Russian Federation NICA / MPD (<http://nica.jinr.ru/ru/>) to establish the Russian collider protons and heavy ions, performed at the Laboratory of High Energy Physics n.a. Veksler and Baldin of Joint Institute for Nuclear Research.

The educational process in the study of the innovative items is focused on the use of infrastructure of specific companies (both of backbone enterprises and enterprises of a special



economic zone) that provides a level of education complying with the requirements of the professional community.

There are subdivisions at the University "Dubna" which functionality includes continuous monitoring of education quality, extra-curricular work with students, employment of graduates and their career development, the realization of scholarships and charitable programs, and others.

However, in order to create stable assurances of quality of educational services, it is possible to give several recommendations, among which:

1) Putting into practice of the educational program documentary registration of employers' requests for development topics actual for their research and employment of graduates.

2) To apply more widely interactive types of studies (business, organizational activity games, group problem work; discussions; "brainstorming", and analysis of real situations of professional activity).

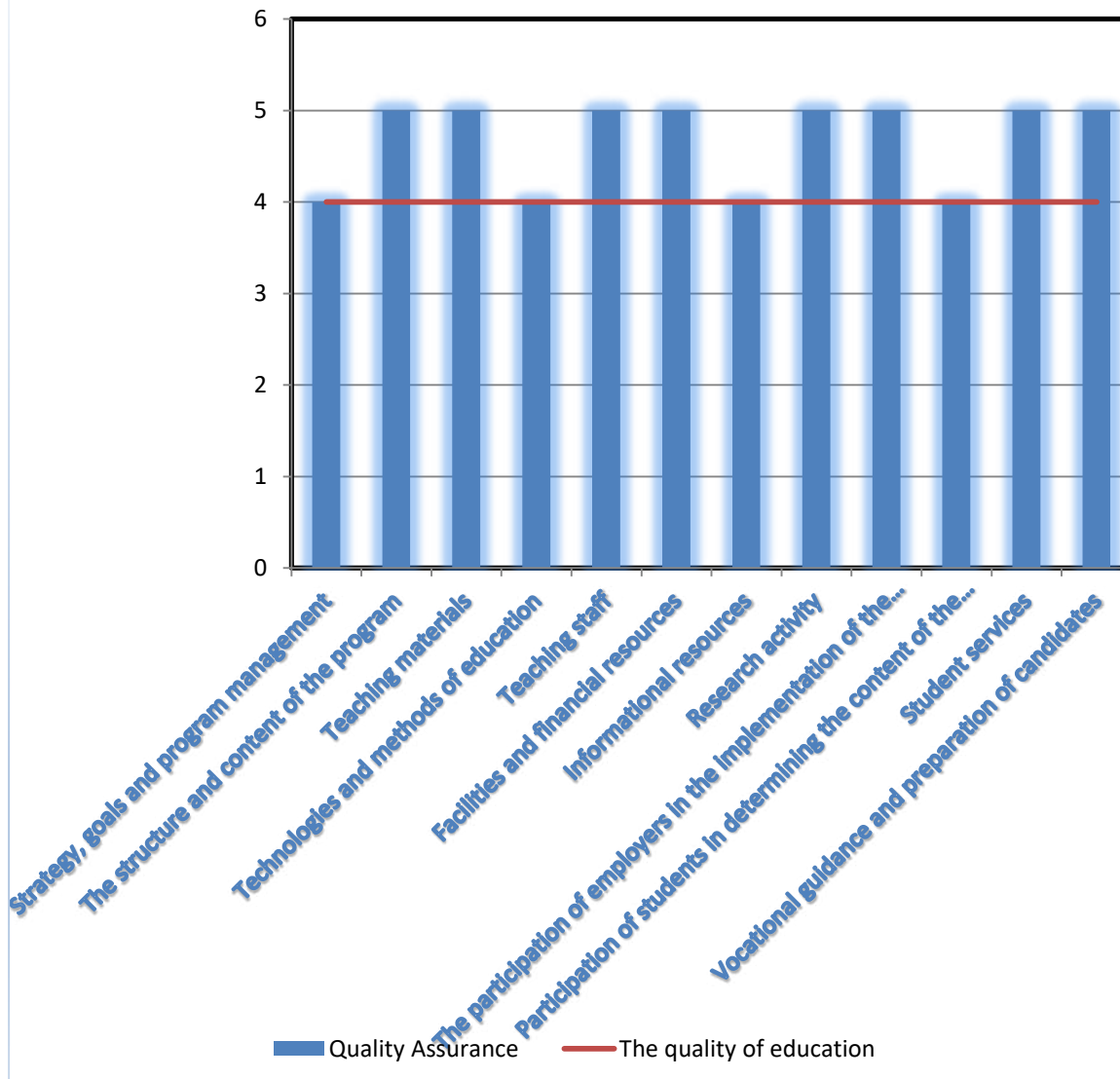
3) To develop mechanisms for additional financing of the educational program (Business, private investment attracting, increasing the proportion of students enrolled on a fee basis, etc.).

In general, the bachelor's program 11.04.03 «Design and technology of electronic facilities» is characterized by a very high quality of educational activities, meets the modern requirements of the labor market and can be recommended for accreditation.

***Assessment Profile for learning outcomes and quality of education guarantees***

No	Criterion	Mark
<i>I</i>	<b>Quality of education outcomes</b>	
	1. Demand for graduates of the program on labor market	5
	2. Satisfaction of all customers	4
	3. The results of direct assessment	5
<i>II</i>	<i>Quality Assurance:</i>	
	1. Strategy, goals and program management	4
	2. The structure and content of the program	5
	3. Teaching materials	5
	4. Technologies and techniques of educational activities	4
	5. Teaching staff	5
	6. Physical facilities and financial resources	5
	7. Informational resources	4
	8. Research activities	5
	9. The participation of employers in the implementation of educational programs	5
	10. Participation of students in determining the content of the program	4
	11. Students' services	5
12. Career guidance and preparation of applicants	5	

## Profile assessment of learning outcomes and guarantees of the quality of education



### 3. QUALITY OF LEARNING OUTCOMES

#### *Direct assessment of competence by the experts*

The direct assessment of competencies of graduates was conducted during the on-site visit. 2st year students, representing 56% of the graduating course, participated in the direct assessment.

Measurement and control materials developed by the experts were used during the procedure of direct assessment of alumni.

The experts chosen following competencies for the analysis of the competencies formation:

PC-8 - the ability to design the modules, blocks, systems and complexes of electronic means according to the defined requirements;

PC-4 - the ability to plan and conduct experiments, process and analyze their outcomes;

GPC-5 - the ability to use basic methods of processing and presenting of experimental data..

When implementing the direct competence assessment procedure, the experts used the following measurement and control materials:

1. Printed circuit design: basic principles and steps. Routes of multilayer printed circuit boards.
2. Basic methods of ensuring reliability of electronic equipment. The problem of prediction of degradation failures of electronic modules. Methods of accelerated tests on the reliability and durability of electronic equipment.
3. Basic statistical treatment of experimental data.
4. Relevance, goals, objectives and main hypotheses of your Master's work research. The main results and their experimental confirmation.

As a result of the direct assessment of competencies experts revealed that 80% of students have coped with 75-100% of tasks and 20% of students have coped with 50-74% of tasks.

Level Students ratio	Sufficient level (have managed with 80% of the proposed tasks)	Acceptable level (the percentage of solved tasks from 50 to 79%)	Low level (percentage of solved tasks is less than or equal to 49%)
80%	+		
20%		+	

In assessing the quality of education, experts have acquainted with 4 graduate qualification work, representing 31% of the graduate works of the last year in this area.

During the direct assessment of education quality, experts have familiarized with graduate qualification works of students: Egorov D.A., Kuzmin D.A., Makhnev Y.V., Sitnik S.S.

Topics of diploma work performed by graduates of the department in 2016 and passed directly to experts are provided in the table below:

No	Student	Topics of graduate qualification work	Supervisor
1	Egorov D.A.	The system of monitoring of parameters and control of equipment installation on the study of baryonic matter at the Nuclotron.	Gorbunov N.V.
2.	Kuzmin D.A.	Diagnostic system of proportional NIS installation of cameras.	Bogoslovskiy D.N.
3.	Makhnev Y.V.	Sonar signal processing apparatus in the receiving system on the basis of a	Trofimov A.T.

		phased array antenna	
4.	Sitnik S.S.	The laboratory complex "The system of robot control for the movement of objects with heterogeneous properties"	Trofimov A.T.

The chosen graduate qualification work correspond to all the requirements stated below:

#### **GRADUATE QUALIFICATION WORKS**

<b>No</b>	<b>Objects of assessment</b>	<b>Comments of the experts</b>
1.	Subject of graduate qualification work corresponds to the direction of training and modern level of science, technology and (or) software technology.	relevant
2.	Tasks and contents of graduate qualification work are aimed at confirmation of graduate competences.	relevant
3.	Utilization rate of materials collected or obtained during the passage of pre-degree practice and implementation of course papers in the graduate qualification work.	relevant
4.	Subject of graduate qualification work is defined by demands of industrial organizations and tasks of experimental activities solved by faculty of the institution.	relevant
5.	The results of graduate qualification work find practical application in the workplace.	Relevant, confirmed by reviews from enterprises
6.	Utilization rate of the results of research activities of the department, faculty, and third-party research and production and / or research organizations when performing independent research parts in the graduate qualification work.	The share of use of the scientific work results in graduate qualification work is not specified

### **Conclusions and recommendations of the Experts**

**Evaluation:** Excellent

#### **Conclusions**

According to the analysis of quality of student learning outcomes, it is possible to conclude that there is sufficiently high quality of training of graduates, which is confirmed by quantitative estimates for all criteria of quality assessment:

- The demand for alumni labor market - excellent;
- Satisfaction of all consumers - good;
- The results of direct assessment - excellent.

- The Percentage of alumni contingent employed within one year after the end of the main education in the direction of training (specialty) obtained as a result of training on the main educational program 11.04.03 «Design and technology of electronic facilities» - 100%;

- 7 positive comments about the work of alumni are available in the training office of the educational program, and no complaint on the alumni;

- by results of the survey provided by the university with companies, none of the surveyed employers have not appreciated the competence of graduates as not corresponding to requirements to the bachelor's degree in engineering and technology of electronic means; together with positive feedback, available in the school office, and the results of interviews with representatives of employers at full-time visit of the experts it is an evidence of a sufficiently high degree of satisfaction of employers with the quality of training of graduates of the educational program 11.04.03 «Design and technology of electronic facilities»;
- by the results of the survey of students provided by the university, 86% of the students are advised University "Dubna" to their friends (on the results of interviews with students, master students and graduates, this percentage reaches 95%);
- The results of the direct competencies assessment demonstrated that 100% of students have an adequate and acceptable level of knowledge, of which 80% of the students have coped with 75-100% of tasks, and 20% of students have coped with 50-74% of tasks.

### **Recommendations**

- revitalization of the management of the program at the conclusion of contracts for training at the expense of legal entities (including targeted training agreements);
- implementation a documentary registration of employers' requests for development actual for their research topics and employment of graduates in practice of the functioning of the educational program;
- Development of clearly regulated the main educational program control procedures and its annual updating with higher weighted assessments of satisfaction of consumers, the development of control and measuring equipment (including for questioning of students, of graduates and employers) on the basis of competence model with special attention to the organization of workshops and all types of practices in the learning process (to enhance the validity of assessment methods and management efficiency of the main educational program); determination of the degree of utilization of the results of research activities of the department, faculty, and third-party research and production and / or research organizations in the performance of research parts of students' graduate qualification works.

## 4. QUALITY ASSURANCE OF EDUCATION

### 4.1. Strategy, goals and program management

#### 4.1.1. Evaluation of criteria: good

#### 4.1.2. Strengths of the program

- The content of the program is based on analysis and forecasting of the regional labor market demand for specialists of this directions of preparation in view of specificity of requirements of backbone enterprises;
- the heads of the program performs analysis of the program, identify its strengths, determine the direction of development of the program.

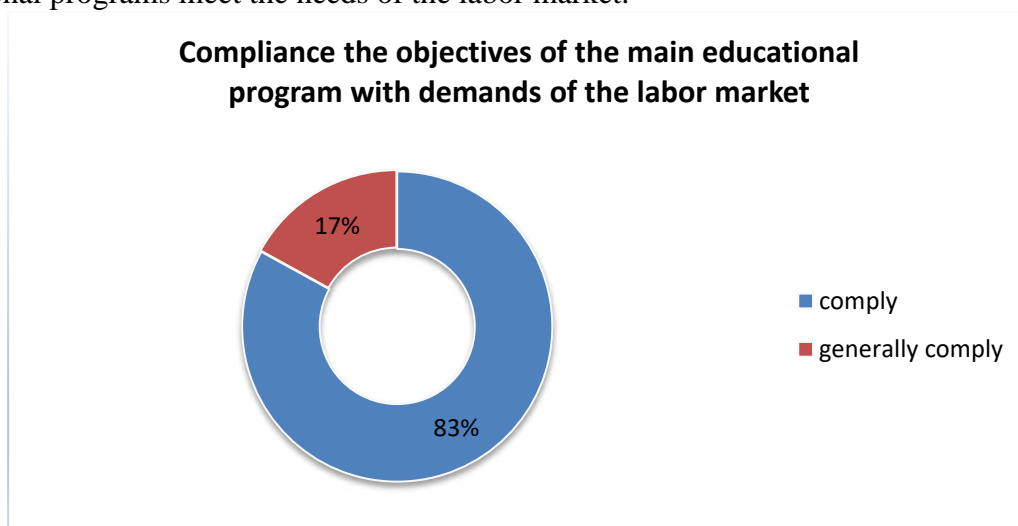
#### 4.1.3. Recommendations

- informing the students of the program 11.04.03 «Design and technology of electronic facilities» about the objectives of the educational program and the sources of information about it (the organization of placement the actual data for the main educational program on public resources);
- to develop and implement at the system level procedures to involve students in the process of improving the quality and assurances of education quality with bringing information about the management decision-making on the improvement of educational programs to all stakeholders, including students.

#### 4.1.4. Additional information

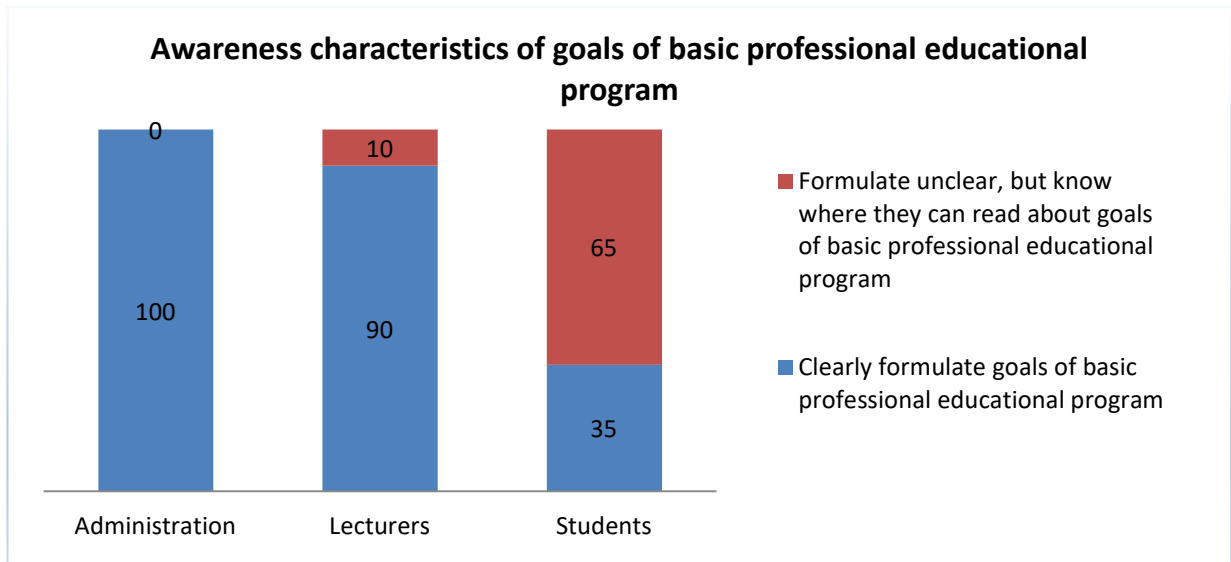
During the full-time visit, interviews with employers have been conducted, which resulted in the chart.

The data presented in the chart allow the experts to conclude that the objectives of the educational programs meet the needs of the labor market.



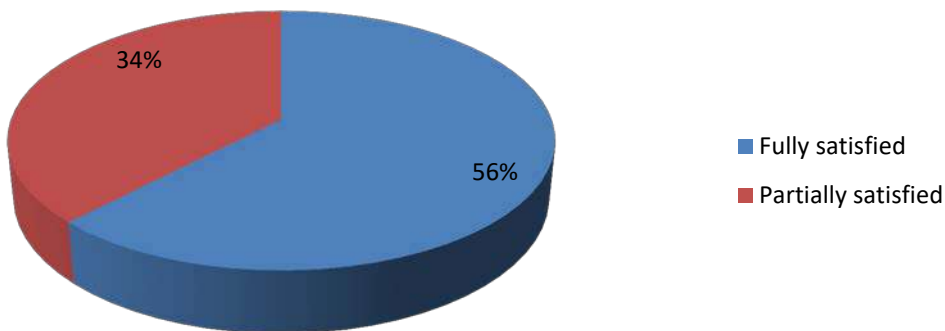
During the full-time visit, the experts conducted interviews with students, faculty, staff and got the data that allow the experts to conclude that most of the representatives of the administration and lecturers clearly formulate goals of educational program, in contrast to the students, who generally can not formulate the objectives of the program but know where this information is

available.

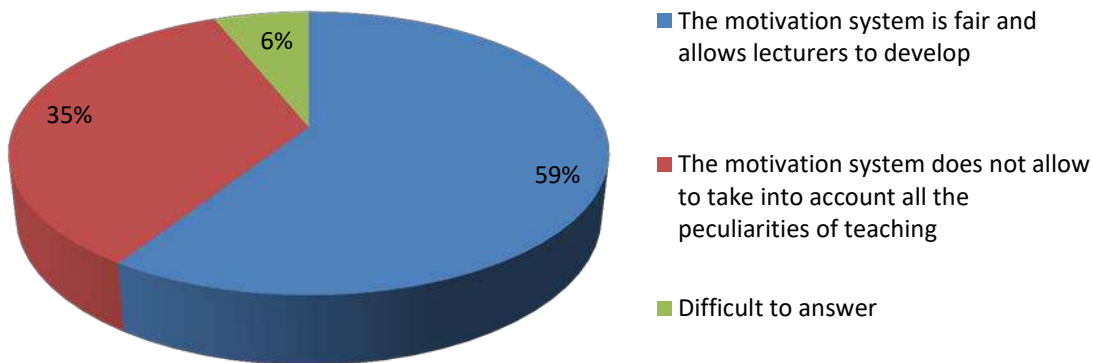


According to the results of the self-assessment, the educational institution presented data on the satisfaction professors with personnel policy and the current motivation system.

### Satisfaction with the personnel policy

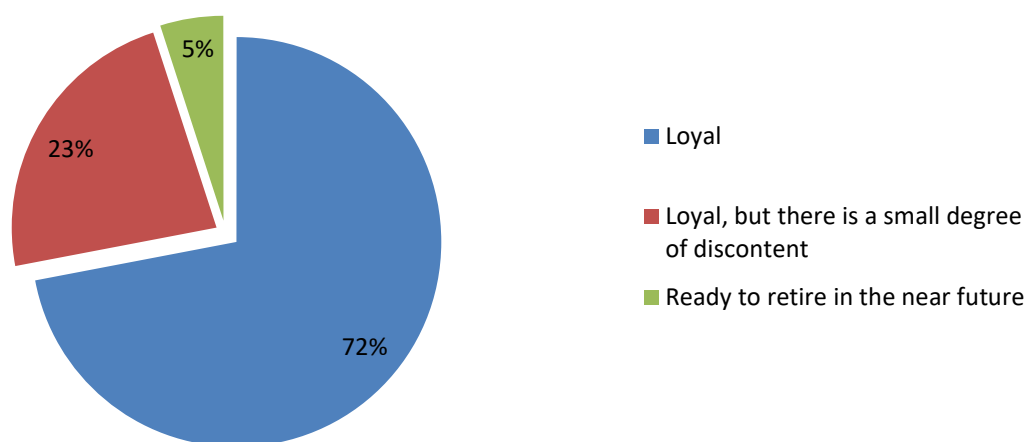


### Satisfaction with current motivation system



During the full-time visit, professors involved in the implementation of the program were interviewed. Interviewing results are presented in the diagram "The level of employee loyalty."

### The level of employee loyalty



As a result of the charts data analysis, experts conclude that more than 70% of the teaching staff are loyal to the organization, but about 35% of lecturers are partially satisfied with the personnel policy and motivation system in the organization, which makes it necessary to identify and address the causes of the decrease of loyalty to the institution.

#### ***4.2. The structure and content of the program***

##### **4.2.1. Evaluation of criterion: Excellent**

##### **4.2.2. Strengths of the program**

The main objective of the program is the professional training of highly qualified professionals allowing to successfully perform research and development work.

The objective of the educational program is achieved through:

- highly qualified lecturers;
- the involvement of students, from the first courses, into research work, conferences, seminars and round tables;
- introduction in the educational process of scientific work results;
- development of material-technical base;
- Development of information resources.

The degree of achievement of objectives and the effectiveness of the implementation of the educational program is evaluated by the results of the interim and final attestation of students, as well as by the conclusion of the State attestation commission by student achievement in science, as well as by the employment of graduates in the branches related to the creation of modern high-tech electronic means, career and scientific growth of graduates.

Graduates in the direction of preparation 11.04.03 "Design and electronic technology" in terms of professional activity, "latitude of powers and responsibilities" (handle general competence) is provided the qualification within the framework of independent professional activities in the field of design and production of electronic tools, involving the setting of objectives of their own work , and / or subordinates, responsible for the result of the work at the level of division or organization. Practices and scientific work provided by the curriculum are of particular importance in the formation of knowledge and skills for this indicator. The content of



the basic educational program in the direction 11.04.03 "The construction and electronic technology" within the index of the complexity of the activities (the character of skills) ensures the readiness of graduates to the activities aimed at solving problems of technological or methodological nature, suggesting selection and variety of ways in the development of solutions, production and operation of electronic media for various purposes. In terms of research intensity activities (the nature of knowledge) of graduates of the analyzed area of training, basic educational program provides the ability to synthesize professional knowledge and experience (including innovation), to search independently, analyze and evaluate professional information. It is generated due to master classes of employers set out in part of the learning process, due to use of interactive teaching methods and assessment tools sections of the Fund, based on real projects. Thus, it may be concluded that the structure and content of the training program in the direction 11.04.03 "Design and technology of electronic means" ensure achievement of the seventh level of qualification (in accordance with the national qualifications framework of the Russian Federation).

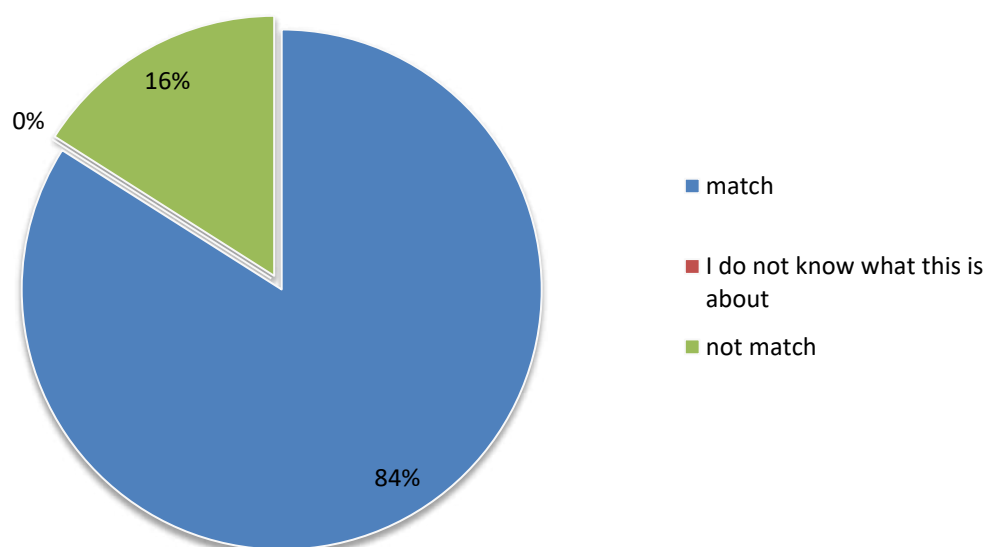
#### 4.2.3. Recommendations

The development of regulations of the active participation of students in the process of curriculum formation (its structure and content) within the framework of elective courses in order to provide greater flexibility and adaptability in the management of vocational training according to professional interests, formed as a result of training, training in baccalaureate, during the first year of magistracy and experience work on a specialty, as well as to enhance various trajectories planning of educational opportunities leading to the provision of the seventh (and subsequently, if desired, and higher) level of qualifications of graduates and their career development.

#### 4.2.4. Additional information

During the full-time visit, the experts conducted meetings with the students of the program being evaluated. One of the issues discussed is matching the structure and content of the program to expectations of immediate consumer programs - students.

#### Matching the structure and content of the main educational program to expectations of students



The data collected on the basis of interviewing are presented in the chart and allow the experts draw a conclusion about a sufficiently high level of confirmation by students (more than 80% of respondents) of compliance with the structure and content of their expectations of the educational program.

### **4.3. Teaching materials**

#### **4.3.1. Evaluation of criterion: Good**

#### **4.3.2. Strengths of the program**

- the institution designed regulations on development, coordination and approval of educational disciplines programs, describing the interaction between the different units and departments in the development and implementation of teaching materials of academic disciplines;

- working programs of disciplines are required to attend a negotiation procedure with key partners from the labor market, since they are a major components of educational program of higher education, which are developed and subjected to examination by representatives of employers. In addition, when developing the curriculum, it is encouraged to nominate reviewers from the leading specialists of research and other organizations on the profile of the discipline or professors (Associate Professors) are similar in profile departments or universities. Thus, 100% of curriculum subjects (modules) and practices agreed with key partners;

- Practical orientation of the program «Design and technology of electronic facilities», in which 82% of test materials are developed based on real practical projects.

#### **4.3.3. Recommendations**

- activation of the processes of development of such elements of teaching materials as the guidelines for laboratory work and homework, study guides, assessment tools fund and so on with employers;

- increasing the depth of annual updating of educational and methodical complex of disciplines (in the paradigm of competency approach) with a time control of standards for the classroom and independent work;

- increasing transparency of the basic educational program 11.04.03 "Design and technology of electronic means" within the publication on the site of the University of actual versions of the work programs of disciplines and other elements of the educational and methodical complex;

- increasing publication activity of teaching materials on the disciplines of the educational program;

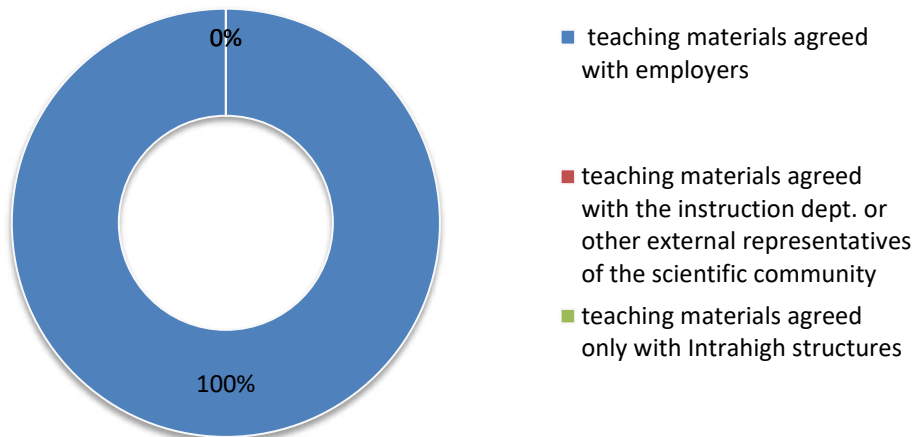
- developing mechanisms to attract students to the updating of teaching materials.

#### **4.3.4. Additional information**

During the full-time visit, the experts familiarized with the teaching materials developed in the educational institution. As a result of the study of 25% of the teaching materials of curriculum disciplines, following diagram has been compiled.

These data allow the experts to conclude that 100% of teaching materials are agreed with employers.

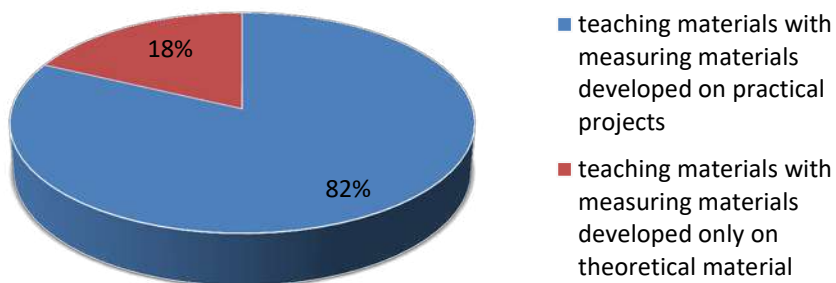
## Teaching materials



During the full-time visit, the experts analyzed the measurement and control materials, which are used in the educational institution for the ongoing monitoring of progress. Data for the analysis of test materials are shown in the following chart.

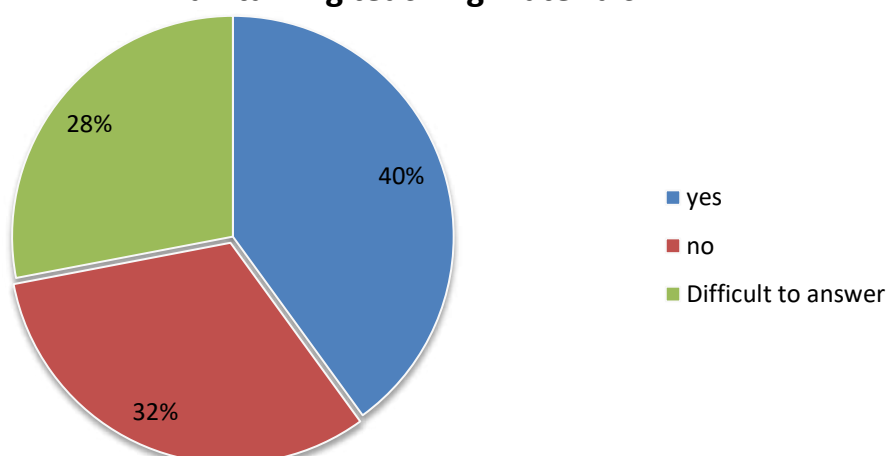
It is allowed to make an experts conclusion on prevalence of measuring materials developed on practical projects.

## Measurement and control materials



By results of the questionnaire represented by the educational institution, the results of which were confirmed during the full-time visit, most students think that their opinion is not taken into account when developing and maintaining teaching materials.

### Accounting students opinion when developing and maintaining teaching materials



In accordance with the obtained results, the experts recommend educational organizations to develop mechanisms for attracting students to the development and updating teaching materials.

#### *4.4. Technologies and techniques of educational activities*

##### **4.4.1. Evaluation of criterion: Good**

##### **4.4.2. Strengths of the program**

- introduction of "barrier-free environment" system, whose main goal is to create conditions to ensure the inclusive education of disabled in higher education programs, pre-university training and vocational guidance work with disabled students, to support inclusive education for disabled students, addressing the development and maintenance of information technology base of inclusive education, the disabled distance learning programs, socio-cultural rehabilitation, promoting employment of disabled graduates, creating a barrier-free architectural environment;

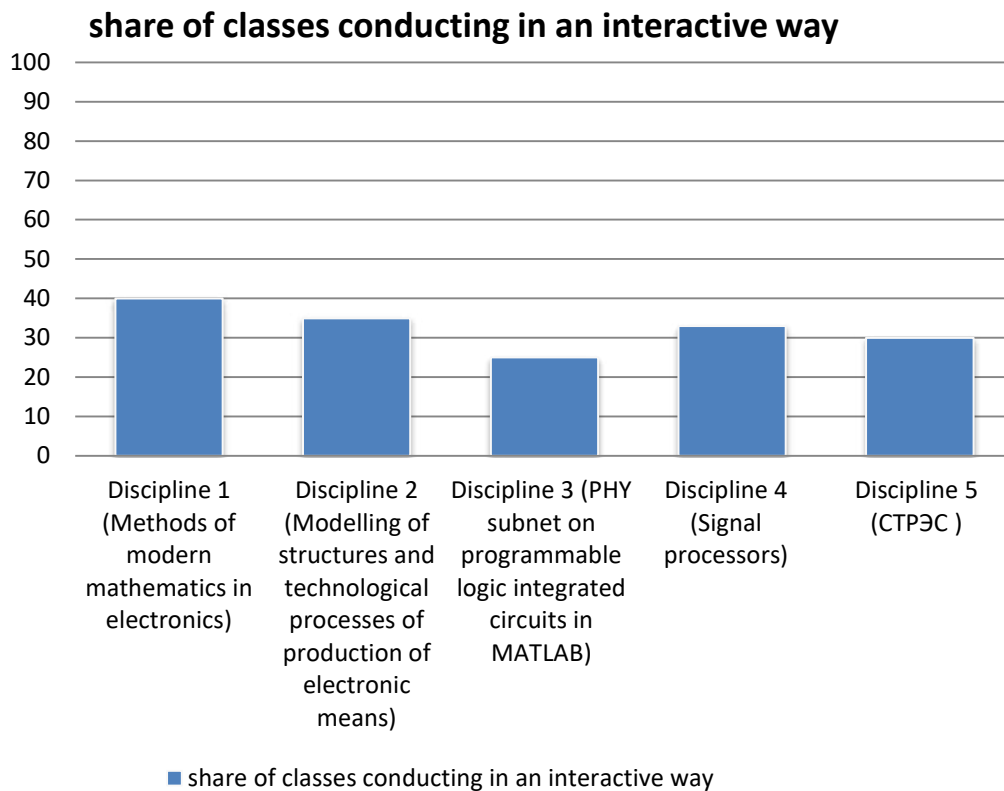
- conducting by leading professors of the Department seminars on the procedure of the active classes conducting, conducting by leading instructors of business games with the young faculty on the use of CAD software and LabView in the learning process, mutual visiting faculty of classes and lectures with discussion at faculty meetings, continuous work of faculty on content of lectures and classes, tests, term papers and examination cards.

##### **4.4.3. Recommendations**

- increasing the share of educational programs implemented using the platforms and e-learning tools;
- increasing the share of classes conducted in an interactive form with practice-oriented approach.

##### **4.4.4. Additional information**

After the desk review of self-assessment report, analysis of curriculum and class schedules, the experts determined that the share of classes conducting in an interactive way for the whole program is 23%. In the course of full-time visit, teaching materials of five subjects were studied. Information on classes held in an interactive manner in the context of the studied teaching materials are presented below.



#### ***4.5. Teaching staff***

##### **4.5.1. Evaluation of criterion: Excellent**

##### **4.5.2. Strengths of the program**

- 40% of lecturers from among existing managers and employees of specialized organizations, enterprises and institutions are attracted to educational process on the disciplines of the professional cycle of the program;
- More than 50% of lecturers providing the training process, have Russian or foreign academic degrees and academic titles, and the degrees of Doctor of Science (including the degree of PhD) or the title of professor have for more than 20% of lecturers;
- attracting young professionals who graduated from the University of "Dubna" and having professional experience in large enterprises in the city, in postgraduate study for an active research activities and the formation of "personnel reserve" with the participation in various activities to ensure successful completion of tender procedures, provided for the formation of teaching staff of the Department.

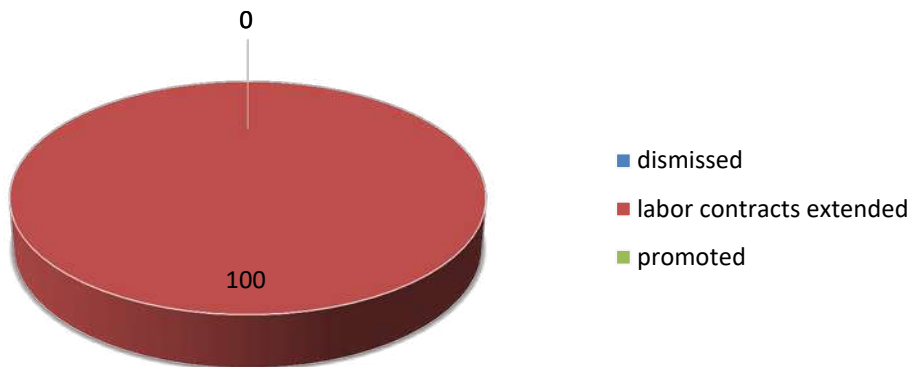
##### **4.5.3. Recommendations**

- to increase the share of professors who have certificates of compliance with the requirements of professional industry standards and qualifications frameworks;
- to improve academic degree holders rate of faculty structure.

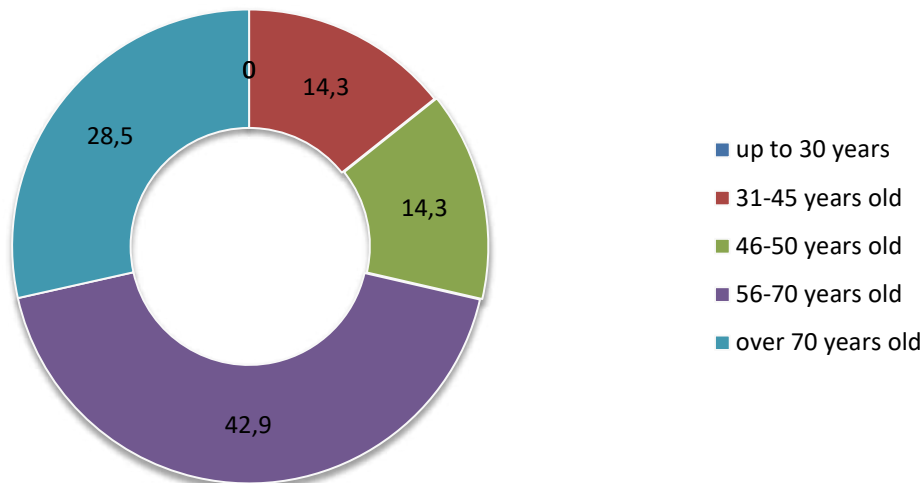
##### **4.5.4. Additional information**

Analyzing the facts outlined by the educational institution in the report on self-assessment, the experts concluded that the data are relevant and reliable. The results of a comprehensive evaluation of faculty (for last year), and the age structure of professors participating in the program are presented in the following charts.

**According to the results of a comprehensive assessment of  
faculty members  
within the educational program realisation**



**Age of full-time teaching staff**



As a result of the analysis of the data provided, experts conclude that there is an effective system of selection and advanced training of lecturers in the institution and the teaching staff structure implementing educational programs and corresponding to the requirements of normative documents.

***4.6. Logistical and financial resources of the program***

**4.6.1. Evaluation of criterion: Excellent**

**4.6.2. Strengths of the program**

- the institution classrooms are equipped with modern multimedia devices and computer equipment;
- for basic and applied academic research, the building is equipped with stationary computers and special software, as well as with the equipment necessary for laboratory work in the direction the preparation of 11.04.03 «Design and technology of electronic facilities»;
- students and faculty have access to electronic library resources and systems (EBS), on the basis of direct contracts with rightholders.

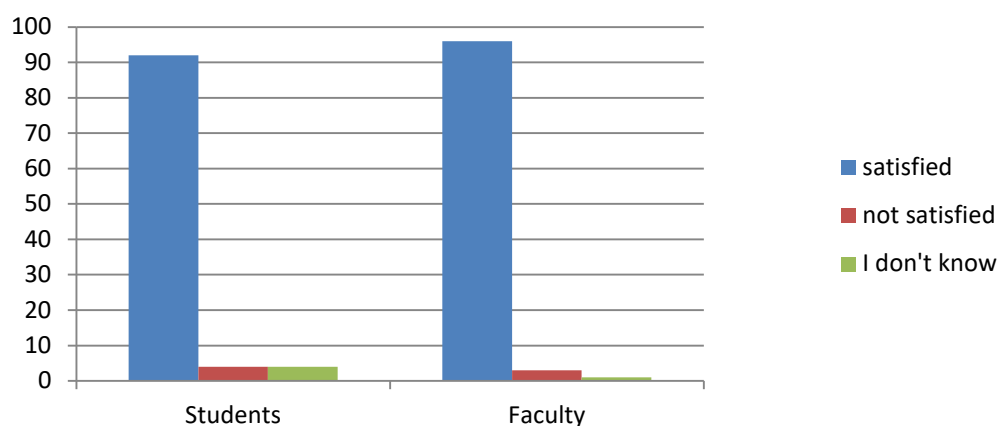
### 4.6.3. Recommendations

- implementation of mechanisms of additional financing of the program (Business, attracting private investment, increasing the proportion of students enrolled on a fee basis, etc.);
- creation of conditions for disabled (equipping classrooms, a reading room, a buffet).

### 4.6.4. Additional information

During the full-time visit, the experts conducted interviewing with students and faculty participating in the program on satisfaction with the quality of classroom fund. The findings are presented in the following chart and allow the experts draw a conclusion about a high level of satisfaction of students and faculty with the material and technical base of the institution.

**Satisfaction with the quality of classrooms,  
laboratories and facilities of departments, funds and  
the reading room of the library**



During the full-time visit to the educational institution, the material and technical base was examined by experts. Below are data on laboratory equipment..

**Laboratory for High Energy Physics of Joint Institute for Nuclear Research - Laboratory of design and prototyping of electronics** - laboratory is equipped and has account materials at the expense of social parterres (employers). Part of the equipment:

1. Computer with installed development environment OrCAD16.5 4pcs.
2. Working place adjuster of radio electronic facilities 4 pieces.
  - Oscilloscope 1pc.
  - Programmable Signal Generator 1 pc.
  - Power supply -30V 2x0, 1h5V 1pc.
  - Soldering station 1pc.
  - Radio wireman desk 1pc.
3. Set of semiautomatic assembly of SMD components 1pc.
4. Muffle furnace 1pc.
5. Evaluation Boards ALTERA SoC 2 pcs.
6. Evaluation board Xilinx SoC 2 pcs.
7. Educational stand Analog System Kit 5 pcs.
8. Box of radio components 1 pc.
9. Video Projector 1 pcs.
10. Interactive board 1pc.
11. A computer with licensed software: 14 pcs. (AutoDesk Inventor, Altera Quartus II, OrCAD).
12. Video projector full HD 1 pc.

13. Projection screen 1 pc.

14. Demonstration systems crates CAMAC, VME, FastBUS, NIM. 1 set.

**Educational laboratory of system modeling:**

12 computers. Projector AR12. Printer. Velleman Oscilloscopes, Velleman generators, power supplies, prototyping boards, CAMAC crate.

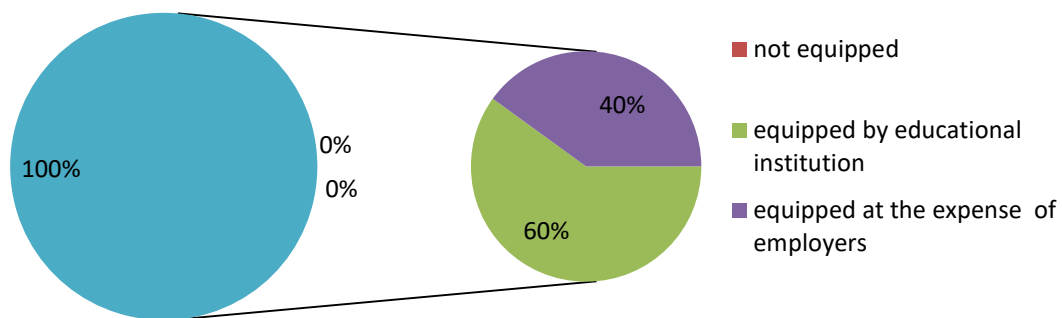
**Laboratory of design of electronic means:**

12 computers. Projector AR12. Debugging card NI USB-6009, CRIO. The complex on the study of transceiver systems NI - 2 system, NI Complexes for troubleshooting and tuning of electronics.

**Software:**

MathCAD, LabVIEW 8.2, AVR Studio 4.2, AutoCAD 2010, OrCAD 16.5, Quartus - II, AutoDesk Inventor 8.

**laboratory equipping**



These data allow to make a conclusion on fairly high level of equipment of laboratories of the institution and to recommend to the program management to attract employers for improving the material and technical base of the institution.

**4.7. Program's information resources**

**4.7.1. Evaluation of criterion: Good**

**4.7.2. Strengths of the program**

- presence of the students Personal account allowing to work with personal data (to display the current academic progress; to use the electronic library the institution, to work with educational online courses, to subscribe to newsletters, etc.).

**4.7.3. Recommendations**

- to enhance information transparency of the basic educational program 11.04.03 "The construction and electronic technology" within the publication on the site of the University of actual versions of the work programs of disciplines and other elements of the educational and methodical complex (outdated information was provided at the time of the examination on the websites of the Department <http://electronics.uni-dubna.ru/> and University [http://uni-dubna.ru,](http://uni-dubna.ru/)



<http://saudubna.ru>. For example, at the accessed date of November 03rd, 2016, the schedule classes at <http://uni-dubna.ru/obuchenie/students/?id=2532> - spring semester of the 2015-2016 academic year on <http://saudubna.ru/learningwork/raspisanie-isau> - fall semester of 2015-2016 academic year; on <http://electronics.uni-dubna.ru/kites.htm> - spring semester of 2012-2013 academic year. On <http://electronics.uni-dubna.ru/page> (reference date of March 11th, 2016): a training schedule for 2012-2013. Program of state examination in the direction 210200 (unapproved edition), 2011, the summary educational program and educational-methodical documentation is not available, main professional educational program for 2014 - not actual, the curriculum under the FSES- 2009, unapproved programs of disciplines of 2011 without a competence-based approach, and so on);

- developing of interactive e-learning resources: multimedia tutorials, training videos, network training courses;
- placement on the site of the Department of scientific and educational resources (monographs, textbooks, teaching aids, articles and conference papers).

#### **4.8. Research activity**

##### **4.8.1. Evaluation of criterion: Excellent**

##### **4.8.2. Strengths of the program**

- organization of research activity of professors of the department is implemented not only at the external expense, but also due to internal financing;
- most of the research work of students is conducted in the framework of the JINR major research projects;
- The majority of lecturers have published scientific articles and monographs, participate in national and international conferences;
- participation of students in scientific circles and student design bureau.

##### **4.8.3. Recommendations**

- to increase activity of students' participation in scientific research, their participation in grant competitions and scientific works;
- to increase the share of professors who participate in scientific conferences in the country and abroad as guest (plenary) speakers.

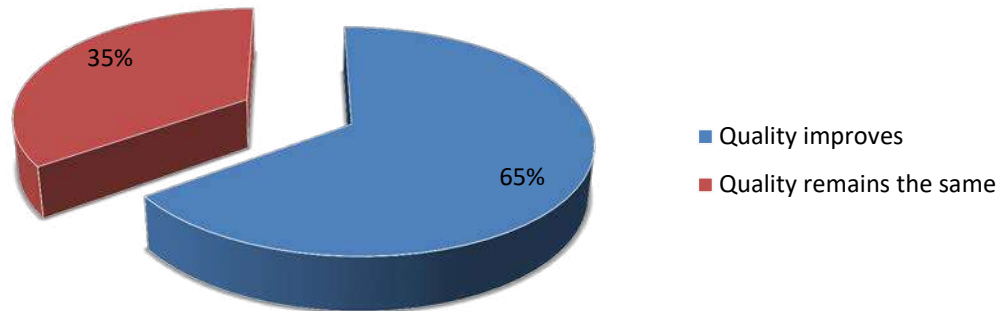
##### **4.8.4. Additional information**

• Involvement and participation of students and masters to implement scientific research, allows to form analytical and research competence of graduates. Examples of R & D topics performed with the participation of Masters preparation of the direction 11.04.03 "Design and technology of electronic facilities":

- testing of front-end electronics for flat resistive multigap camera;
- mathematical computer modeling of physical processes on the basis of ROOT software packages, the GEANT4 et al. (Particle production, transport, interaction with matter, the response of detectors, identification and studying properties of the particles, design, development, testing and optimization of particle detectors. In particular, it is: fast time-of-flight (the ToF) detectors for charged particle identification (Camouflage radioabsorbing set), the electromagnetic calorimeter (ECAL) for the identification of leptons and neutral particles;
- development and production of fast readout electronics, optimized for use with the particular type of detector;

- organization of mass production and testing of full-scale detector for the creation of detecting systems of experiments BM @ N and MPD;
- methodical research aimed at improving the existing procedures of registration and identification of elementary particles.

### **The results of monitoring of students opinions about the impact of R & D and outcomes on the quality of education**



Science club operates for students studying in the direction of preparation 11.04.03 «Design and technology of electronic facilities» in the educational institution: Student Design Bureau "NIKA" (Research and design of the equipment). The main purpose of the organization of science club is formation of analytical and research competencies of masters.

The amount of students who regularly attend science club is 90%. As a result of the work in the science club, students perform at conferences and publish articles, perform bachelor works.

The department created and successfully operates a Student Design Bureau in which are actively involved 20% of the students. Members of the students of the design office have received for the past 2 years more than 10 awards at various exhibitions, they made more than 15 reports.

#### ***4.9. Participation of employers in program implementation***

**4.9.1. Evaluation of criterion:** excellent

#### **4.9.2. Strengths of the program**

- the functioning of the academic council of the educational program, a part of which includes employers;
- practice-oriented direction of study, which is shown in the content of academic disciplines, the performance of term and graduation papers;
- the existing practice of employers of workshops for students of the educational program;
- diverse forms of employers involvement in the program.

#### **4.9.3. Recommendations**

- attracting employers to participate in the program by providing additional resources, including financial;
- involvement of employers in the formation of the fund of tests materials for intermediate control, business cases.

#### **4.9.4. Additional information**

By results of the questionnaire of enterprises provided by the university, none of the surveyed employers have not appreciated the competence of graduates as not corresponding to the requirements proposed by them to the bachelor's degree in engineering and technology of electronic means. According to the findings, 80% of employers are satisfied with the quality of preparation of graduates of the educational program «Design and technology of electronic facilities». At the same time, employers have noted that personal competences of graduates are formed insufficiently.

### ***4.10. Participation of students in defining the program's content***

#### **4.10.1. Evaluation of criterion: Good**

#### **4.10.2. Strengths of the program**

- students are involved in the management of the program through student's government, participation in monitoring, the use of the feedback system, etc.;
- current system of faculty rating in which students take part.
  - Involvement of Masters in teaching and research activities promotes their involvement in the development and improvement of educational program.

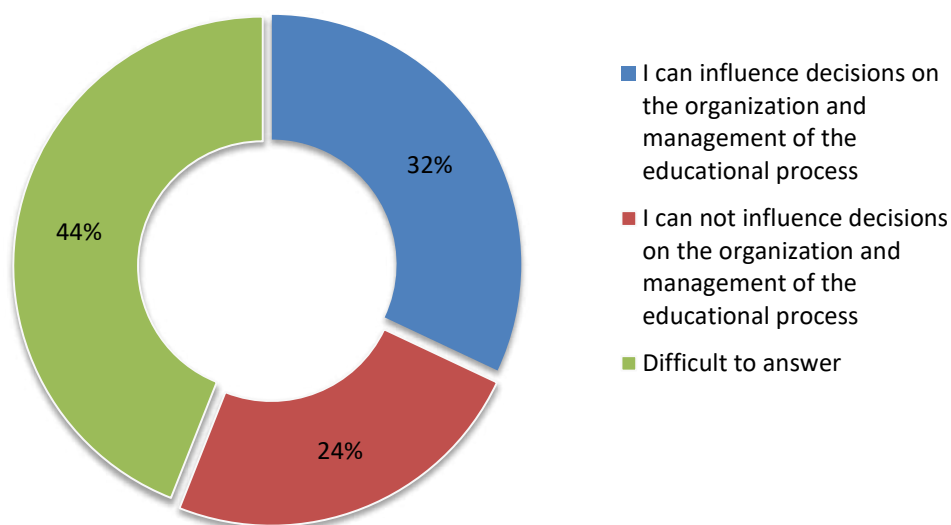
#### **4.10.3. Recommendations**

- to intensify efforts to engage students in the formation and development of the program's teaching materials, including the development of case tasks;
- to provide opportunities for students of gaining comments from professors on their proposals for changes in the content of the program;
- to implement a plan of the University "Dubna" in the functioning of section of the student council on the quality of education. The main objective of the section is the analysis of a condition of processes of educational activities at the University, determination ways to improve training and development directions of activity of the university in modern conditions of development of higher education.

#### **4.10.4. Additional information**

During the full-time visit, the experts analyzed the opportunity for students to influence the decision on the organization and management of the educational process. This diagram illustrates data that reflect this possibility. Based on the analysis of the data provided, experts conclude that only 32% of students are involved in the management of the educational process, and recommends to the management of the program to intensify the activities of students in this direction.

## Participation of students in the management of the educational process



### *4.11. Services for students on a program level*

#### **4.11.1. Evaluation of criterion: Excellent**

#### **4.11.2. Strengths of the program**

- operation in the organization of the Division for the extra-curricular work with students, which the function is to organize extracurricular activities, activities to support student organizations and student initiatives;
- the current system of encouraging students for achievements in extracurricular activities, including summer vacation tourist camps and scholarships, estimated on the basis of standard documents;
- Availability of the Department of career development, which organizes individual consultation for students and for graduates on resume writing, holds Career Days, where students are training for employment, counseling of employers.

#### **4.11.3. Recommendations**

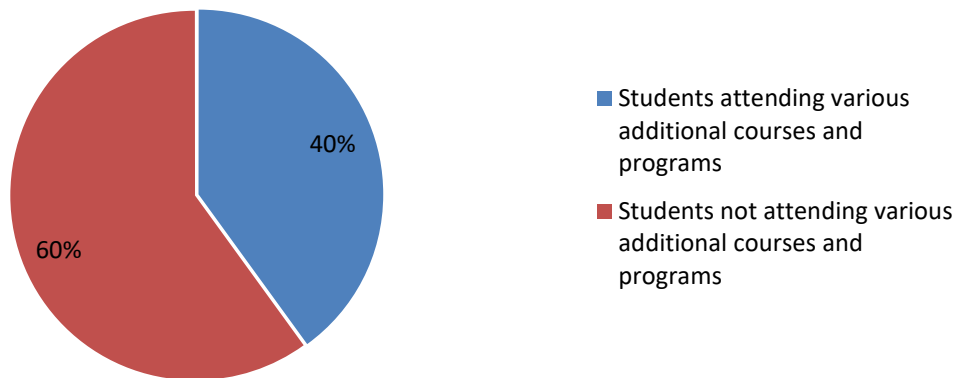
To create a training center for social and psychological support, in which one can get advice on problems associated with stress, rejection of bad habits, etc..

To strengthen the work on the involvement of masters for the development of a variety of additional programs and courses, promoting vocational training, development of common cultural and professional competences, particularly paying attention to language training (foreign languages).

#### **4.11.4. Additional information**

During full-time visit, the documents confirming the visiting by students of additional courses and programs were presented to the experts. Based on the analysis of the data provided, the experts conclude that there is the low students activity on attending additional courses and programs and recommends to stimulate students to achieve additional qualifications.

## Visiting additional courses, programs



### *4.12. Occupational guidance. Quality assessment of applicants' knowledge*

#### **4.12.1. Evaluation of criterion: Excellent**

#### **4.12.2. Strengths of the program**

- preparation of bachelors to Master program at the base of the department at JINR High Energy Physics Laboratory and at enterprises of the city;
- Organization of consultations for applicants, the existence of a specialized feedback system, such as the University website.

#### **4.12.3. Recommendations**

- to record and publish in the global network at the university website or at popular social networks, including YouTube, workshops and special courses conducted by guest lecturers or produce electronic copyright courses to educate and attract larger audience, enhance the university's popularity not only in the surrounding region;
- considering the orientation of the university on the regions and the relative remoteness of the university, it is necessary to develop a system of remote vocational guidance and attracting applicants through the organization on the university website of the video course of prominent scientists involved in the educational process.

## CV of Experts

Name of the Expert: **Natalia A. Vetrova**

Place of work, position	Baumann Moscow State Technical University, Associate Professor ;
Academic degree, academic title	PhD in Technical Sciences
Deserved titles, degrees	none;
Education	higher;
Professional achievements	Member of the Academic Council of Scientific-Educational Complex "Radio electronics, laser and medical equipment" of Bauman MSTU, author of 37 scientific papers in the area of reliability of technical systems and nanotechnology;
Research interests	Nanotechnology, devices operating on quantum effects, the reliability of technical systems;
Practical experience in the direction of the program subject to assessment	Teaching experience- 10 years, teaching a variety of disciplines, including "The reliability of technical systems" in the direction of preparation 04.11.04 "Electronics and Nanoelectronics". Passage a state accreditation in Bauman MSTU in the direction of preparation 654300 Design and technology of electronic means in 2014.

Name of the Expert: Eduard Petlenkov

Place of work, position	Tallinn University Of Technology (TUT) Associate Professor, Department of Computer Systems; Head of the Centre for Intelligent Systems
Academic degree, academic title	PhD
Deserved titles, degrees	–
Education	higher
Professional achievements	Member of the Qualification Assessment Council in Information Technology and Telecommunication (established by the Estonian government) Member of the Council of the TUT Computer System Department Member of the Management Committee for Project COST CA15225 "Fraction Order Systems: Analysis, Synthesis, and Their Importance for Further Programming".
Research interests	Natural Sciences and engineering, telecommunications
Practical experience in the direction of the	

program subject to assessment	
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Name of the Expert: Mishakov Artem

Place of work, position	BMSTU student, direction Construction and technologies of electronic means
Academic degree, academic title	
Deserved titles, degrees	–
Education	higher
Professional achievements	
Research interests	
Practical experience in the direction of the program subject to assessment	