Ministry of Science and Higher Education of the Russian Federation
Federal State Autonomous Educational Institution of Higher Education
"Perm National Research Polytechnic University"
(PNRPU)

Electrical Engineering Faculty
Department "Information Technologies and Automated Systems"

APPROVED BY
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BASIC PROFESSIONAL EDUCATIONAL PROGRAM OF HIGHER EDUCATION
BACHELOR'S COURSE PROGRAM
GENERAL CHARACTERISTIC
Competency-based model of the graduate (CMG)

Training program (degree):	15.03.06 Mechatronics and Robotics
Direction (Profile) of educational program:	Robotics and computer-aided manufacturing (CAM)
Graduate's qualification:	Bachelor's degree
Form of education:	Full-time
Training time:	4 years
Graduate department:	Information technologies and automated systems

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Introduction

Basic professional educational program (BPEP) of higher education – Bachelor's course program "Robotics in computer-aided manufacturing", developed in accordance with the requirements of PNRPU Institutional Educational Standard of Higher Education in the field of study 15.03.06 «Mechatronics and Robotics» is approved by the decision of the Academic Council of PNRPU from 18.06.2020, minutes № 10, is revised on 25.09.2020, minutes № 1 due to the appearance of FSES HE (3++) and put into action in the revised form by the Order of Rector of university from 01.10.2020 № 2402-B.

General characteristics of the basic professional educational program, which also includes competency-based model of the graduate (CMG), corresponds the description of educational program provided by the Regulations of arrangement in the "Internet" on the official site of educational institution and refreshment of information about educational institution (approved by the RF Government Regulation from July 10, 2013, № 582).

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1. Terms, definitions, notations and abbreviations

1.1. Terms and definitions

The following terms and definitions have been used in the document:

1.1.1 **Directivity** (profile) **of educational program** – orientation of the educational program towards the definite fields of knowledge and (or) activities and determining its subject matter, prevailing types of students' learning activity and requirements for the results of its mastering;

1.1.2 **PRNPU educational standard** – complex of requirements compulsory in all subdivisions of PRNPU participating in development and realization of the basic professional educational programs on the given directivity profile or specialty of higher education;

1.1.3 **basic professional educational program of higher education** – complex of the main parameters of education (volume, contents, intended outcomes), organizational and pedagogical conditions and forms of assessment presented in the form of general characteristic of EP, curriculum, academic time schedule, academic courses working programs (modules), programs of practice, materials of assessment and methodics;

1.1.4 **suggested basic educational program** – educational documentation (suggested curriculum, suggested academic time schedule, suggested academic courses working programs (modules), other components) determining the recommended scope of education of the definite level and (or) the definite field of study, intended outcomes of mastering educational program, suggested conditions of educational activity including approximate estimation of standard costs of rendering public service aimed at educational program realization;

1.1.5 **intended outcomes of mastering educational program** – students' competences determined by educational standard and students' ***competences*** prescribed by educational program taking into consideration the directivity (profile) of the educational program (in case of such competences determination);

1.1.6 **universal competences** – graduates' competences reflecting society and persons' demands for the cultural and socially-individual qualities of the graduate of higher education program of the corresponding level which involve professional characteristics defining the conformity of the level of education with the national system of vocational qualification;

1.1.7 **general professional competences** – graduates' competences reflecting demands of labor market concerning graduates' mastering the programs of higher education in the field of training general fundamentals of professional activity taking into consideration potential development of the spheres of activity (irrespective of the program directivity to the definite objects of activity or fields of knowledge);

1.1.8 **professional competences** – graduates' competences reflecting the demands of labor market concerning preparedness of the graduate of higher education program of the corresponding level and directivity to fulfill the tasks of professional activity and related labor functions of professional standards for the level of qualification confirmed with profession;

1.1.9 **indicators of competences achievement** – generalized characteristics specifying and uncovering competences statement. Indicators can be presented in the form of summarized outcomes of learning and in the form of definite actions carried out by the graduate who mastered the given competence. Indicators of competences attainment should be measured by means of resources available in the educational process;

1.1.10 **outcomes of education** (intended) – knowledge, working knowledge, mastering skills obtained by students after the completion of course leaning (module) or practice;

1.1.11 **professional standard** – characteristic of qualification necessary for definite kind of employee's professional activity;

1.1.12 **field of professional activity** (of the graduate) – complex of the graduates' professional activities having the common ground (similar or close purpose, objects, technologies, including means of labor) and expecting analogous set of labor functions and corresponding competences for their fulfillment; it is corresponded with one or several types of business;

1.1.13 **sphere of professional activity** (of the graduate) – segment of professional activity or related fields of professional activity including types of professional activity and characterized by the collection of special objects of professional activity; also the sector (or field) of work which has the definite bounds of application;

1.1.14 **type of professional activity** (of the graduate) – complex of generalized labor functions which can be fulfilled by the graduates and which have the analogous conditions, character and results of work;

1.1.15 **generalized labor function** – complex of interrelated labor functions formed as a result of division of labor in the specific industrial (business) process;

1.1.16 **labor function** – a set of interrelated labor actions aimed at the solution of one or several tasks of work, fulfillment of relatively autonomous and completed part of working process in the frames of generalized labor function;

1.1.17 **working action** – the process of worker's interaction with the subject of labor when the definite goal is achieved;

1.1.18 **object of professional activity** (of the graduate) is the event, subject or process influenced by professional activity. Terms "object" and "subject of professional activity" are considered as the synonyms in professional activity connected with material production. It is necessary to differentiate these notions in the sphere of non-material production connected with research work, creative work and etc. In this case the notion of subject is not the synonym of the object notion, and it involves the properties and relations of the object perception of which is important for the professional tasks solution;

1.1.19 **task of professional activity** (of the graduate) – the goal specified in the definite conditions and which can be achieved in the process of realization of the definite actions concerning the object (complex of objects) of professional activity;

1.1.20 **types of the tasks of professional activity** – conventional subdivision of the tasks of professional activity according to the actions made for the achievement of the specified goal.

1.2. Notations and Abbreviations

The following notations and abbreviations have been used in this document:

GQW – graduate qualification work;
HE – higher education;
SE – state examination;
CU – credit unit;
RW – research work;
GPC – general professional competences;
BPEP – basic professional educational program of higher education;
GLF – generalized labor function;
PA – professional activity;
PC – professional competence;
PNRPU – Perm National Research Polytechnic University;
SBEP – suggested basic educational program on the field of study;
PS – professional standard;
RPC – required professional competence;
SIS – student's independent study;
IES – institutional educational standard;
UC – universal competence;
AEP – administration of educational programs of PNRPU;
FSBEI – Federal State Budgetary Educational Institution;
FSES – Federal State Educational Standard.

Standard References

References to the following standard legal and local acts have been used in this document:

Federal law from December 29, 2012 № 273-FL "About education in the Russian Federation";

Rules of employers' communities participation in monitoring and prediction of economics demand in experienced personnel, and in the development and realization of state policy in the field of secondary professional and higher education approved by the Russian Federation government Regulation from February 10, 2014, № 92;

The order of organization and implementation of educational activity according to the educational programs of higher education – Bachelor's course programs, specialist's programs, Master's course programs, approved by the Order of the Ministry of Education and Science of the Russian Federation from 05.04.2017 № 301;

The procedure of the state final assessment on the educational programs of higher education – Bachelor's course programs, specialist's programs and master's course programs approved by the Order of the Ministry of Education and Science of Russia from June 29, 2015 № 636;

Federal State Educational Standard of Higher Education in the field of study 15.03.06 "Mechatronics and Robotics", approved by the Order of Ministry of Science and Education of the Russian Federation from 17.08.2020 № 1046, registered in Department of Justice on 09.09.2020, № 59722;

Institutional educational standard in the field of study 15.03.06 "Mechatronics and Robotics", adopted by the Academic Council of PNRPU on 18.06.2020, minutes № 10, revised on 25.09.2020, minutes № 1 due to the appearance of FSES HE (3++);

Charter of PNRPU;

Regulations of procedure for development and approval of institutional educational standards of higher education of PNRPU and introduction of changes in them.

Regulations of procedure for development and approval of the basic professional educational program of higher education – Bachelor's course program, specialist's program, master's course program.

2. General Characteristics of Educational Program

2.1. *Goals and objectives of BPEP*

The goal of BPEP realization is students' mastering the program of Bachelor's course of directivity "Robotics in computer-aided manufacturing", the result of which is graduates' competences formation in accordance with IEP HE PNRPU in this field of study and professional competences stated for this directivity of BPEP.

The objectives of BPEP realization are forming knowledge and skills, experience of professional activity in the frames of learning definite disciplines (modules) and professional internship necessary for implementing definite objectives by the graduate

2.2. *Form of education*

Training bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics" of directivity (profile) "Robotics in computer-aided manufacturing" is implemented by full-time and extra-mural (distant) forms of education.

2.3. *Requirements for the entrants*

The persons having general secondary education, secondary professional education or higher education are permitted to master educational programs in the field of study 15.03.06 "Mechatronics and Robotics" of the directivity (profile) "Robotics in computer-aided manufacturing".

Acceptance for studies at the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics" of the directivity (profile) "Robotics in computer-aided manufacturing" is based on the results of the competition in accordance with the Admission Regulations of PNRPU. .

2.4. *Language of Teaching*

Bachelor's course program academic activity in the field of study 15.03.06 "Mechatronics and Robotics" of the directivity (profile) "Robotics in computer-aided manufacturing" in PNRPU is implemented in the official language of the Russian Federation.

2.5. *The scope of the program and time of its mastering*

The scope of Bachelor's program 15.03.06 "Mechatronics and Robotics" amounts to 240 credit units defined as labor intensiveness of student's academic load in the process of mastering the mentioned program and includes all types of learning activity specified by the curriculum for the achievement of the intended outcome of learning.

The scope of bachelor's course program of full-time education realized during one academic year amounts to 60 credit units.

The scope of bachelor's course program of extra-mural (distant) form of education realized during one academic year amounts to 70 credit units.

The period of mastering bachelor's course program of full-time studies comes to 4 years, of extra-mural education – to 5 years.

3 Competence model of the graduate

3.1. Characteristic of graduate's professional activity

3.1.1. Field and sphere of graduates' professional activity

The field of professional activity and the sphere (spheres) of professional activity in which the graduates of PNRPU mastered the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics" in the directivity (profile) "Robotics in computer-aided manufacturing" may be occupied are as follows:

– Open kinds of professional activity in industry (in the sphere of development, design and research of mechatronic and robotic devices and systems).

The graduates can realize professional activity in other fields and spheres of professional activity provided that the level of their education and obtained competences meets the requirements for the workers qualification.

3.1.2. Objects of professional activity of graduates or field of knowledge

The objects of professional activity of PNRPU graduates mastered the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics" in directivity (profile) "Robotics in computer-aided manufacturing" are mechatronic and robotic systems and their components.

3.1.3. Type (types) of Tasks and Tasks of Graduates' Professional Activity

In the frames of mastering Bachelor's course program in the field of study 15.03.06 "Mechatronic and Robotics" in the directivity (profile) "Robotics in computer-aided manufacturing" the graduates of PNRPU prepare for solving the following types of professional activity tasks:

– design.

The tasks of the graduates' professional activity are given in section 4 of the supplement 1.

3.2. Passport of BPEP competences

Certificate of BPEP competencies includes their list (Table 3.1); Indicators for the achievement of competencies (supplement 1); table of relations between competencies and educational disciplines (supplement 2) and stages of competence formation (supplement 3). Moreover, the last document plays the role of a link between assessments on discipline (practice) obtained during intermediate certification and the results of the development of BPEP in the form of acquired by the graduate competencies. The result of BPEP mastering

in the form of the developed competence presented in the table of Supplement 3 is considered to be achieved in the case of positive grades obtained during intermediate certification for all disciplines and practices indicated in the line corresponding to the index of this competence.

3.2.1. Intended outcomes of mastering the basic educational program

Intended outcomes of mastering the Bachelor's course program in the field of study 15.03.06 "Mechatronic and Robotics" in the directivity (profile) "Robotics in computer-aided manufacturing" are defined by the competences developed by the graduate, i.e. his ability to apply knowledge and skills as well as personal qualities in accordance with the tasks of professional activity.

As a result of mastering the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics" in the directivity (profile) "Robotics in computer-aided manufacturing" the graduate should possess the competences developed in the process of mastering BPEP defined by IES HE PNRPU in the field of study 15.03.06 "Mechatronics and Robotics" and professional competences independently identified by the Bachelor's course program, developed on the basis of professional standards corresponding to the graduates' professional activity, and other demands including regional ones made for the graduates in the labour market. The categories (groups) of competences and corresponding codes and graduates' competences formulation are given in Table 3.1.

The list of Developed Competences

Table 3.1 – **The list of formed competences**

Name of the competencies' category (group)	Code and name of the graduate's competence of educational program
Universal competencies	
Systemic and critical thinking	**UC-1**. Is able to search, to make critical analysis and synthesis of information, to apply systemic approach aimed at given problems solutions.
Development and realization of projects	**UC-2**. Is able to define the scope of tasks in the frames of the given target, to choose optimal ways of their solution in terms of the current legal regulations, available resources and restrictions, and is able to adopt reasonable economic decisions in different spheres of vital activity.
Teamwork and leadership	**UC-3**. Is able to carry out social interaction and to realize his role in the team.
Communication	**UK-4**. Is able to put into practice business communication in oral and written forms using official language of the Russian Federation and foreign languages.
Cross-cultural interaction	**UC-5**. Is able to perceive cross-cultural diversity of society in social-historical, ethical and philosophical context.
Self-organization and self-development (including health protection)	**UC-6**. Is able to control his time, to construct and realize the trajectory of self-development on the basis of educational principles during the whole life.
	UC-7. Is able to maintain the necessary level of physical fitness for ensuring efficient social and professional activity.

Life Safety	**UC-8**. Is able to create and ensure safe conditions for life and professional activity aimed at maintenance of the environment and sustainable development of society including in the case of emergency situations and military conflicts.
Inclusive competence	**UC-9.** Is able to apply basic defectologic knowledge in social and professional spheres.
Economic culture including financial literacy	**UC-10**. Is able to make reasoned economic decisions in different fields of life activity.
Civil stand	**UC-11**. Is able to form intolerable relation to corrupt behavior.
General professional competences	
Mathematical modelling in engineering, reliability and diagnostics	**GPC-1**. Is able to apply scientific and engineering knowledge, methods of mathematical analysis and modelling in professional activity.
Mastery of information technologies	**GPC-2.** Is able to apply general methods and instruments of information receiving, storage and processing during professional activity problems solution.
Business analysis in the field of developing new engineering objects and new technologies.	**GPC-3.** Is able to perform professional activity with reference to economic, ecological, social and other restrictions at all stages of life.
Using IT	**GPC-4.** Is able to use modern technology and software assets in technological processes modeling.
Working with technical documentation	**GPC-5.** Is able to work with normative technical documentation which concerns professional activity, with respect to the standards, norms and regulations.
Information culture and application of global information resources	**GPC-6.** Is able to solve common tasks of professional activity on the base of information and bibliographic culture with the application of information & communication technologies.
Planning and engineering production support work	**GPC-7.** Is able to develop modern ecological and safe techniques for efficient use of raw materials and energy resources in engineering.
Planning of business activity	**GPC-8.** Is able to make analysis of the expenditures involved in maintenance of production unit's activity.
Manufacturing engineering	**GPC-9.** Is able to integrate and utilize new processing equipment.
Safety protection	**GPC-10.** Is able to control and provide occupational safety.
Mechatronics and Robotics units, nodes and systems design	**GPC-11.** Is able to create and apply algorithms and modern software-based methods and design of definite units and subsystems of mechatronics and robotics systems using standard agents and controllers, automation equipment, computation engineering in accordance with requirements specification, to develop digital algorithms and robotic systems control programs.
Introduction of prototype samples of mechatronic and robotic systems	**GPC-12.** Is able to participate in assembling, check-out, adjustment and put into operation the prototype samples of mechatronic and robotic systems, their subsystems and separate modules.
Quality management and control	**GPC-13.** Is able to use methods of products and objects quality control in the sphere of professional activity.

Professional competences	
Required professional competences in the field of study 15.03.06 "Mechatronics and Robotics"	
Scientific research	**CPC-1**. Is able to participate in R&D work
Professional competences in direction of study "Robotics in computer-aided manufacturing"	
Type of professional activity tasks: ***Design and engineering***	
Design	**PC-1.1**. Is able to choose software for flexible automated manufacturing systems control.
	PC-1.2. Is able to make technical project of flexible automated manufacturing systems.
	PC-1.3. Is able to make a corrected feasibility study of a project of flexible automated manufacturing systems.

Professional competencies determined on the basis of professional standards corresponding to the graduates' professional activity:

– open kinds of professional activity in industry (in the sphere of working out, design and research of mechatronic and robotic devices and systems): professional standard 40.152 "Specialist in operation of flexible production systems in engineering", approved by the Order of the Ministry of Labour from 01.02.2017, № 117n (PC-1.1, PC-1.2, PC-1.3).

The combination of competencies determined by the Bachelor's course program provides the graduate with the ability to carry out professional activity in at least one field of professional activity and sphere of professional activity, defined in accordance with paragraph 4.9 of IES HE PNRPU, and solve the tasks of professional activity of no less that one type determined according to the paragraph 4.10 of IES HE PNRPU.

Indicators of competence achievement are given in the Supplement 1.

3.2.2. Table of competences and training courses relationship

The division of all declared competencies into disciplinary parts was carried out on the basis of an analysis of their substantive structure and presented in the table of relations of competencies, academic disciplines and practices involved in formation of each competency (see Supplement 2).

If there is a connection between the declared competence and the academic discipline (practical training) an element (part) of the competence formed within the framework of this discipline (practical training) appears in the corresponding cell of the table. The distribution of academic disciplines according to the formed competencies is based on the results of the analysis of the component composition of all competencies.

Thus, the substantiation of relationship between the declared competencies and academic disciplines (practical training) makes possible to assess the focus of the basic professional educational program, determine the distribution of competencies according to academic disciplines and types of practical activity, and optimize the content of the educational program on the basis of internal and interdisciplinary ties.

3.2.3. Stages of forming the graduate's competency-based model

Competence formation is a process and the level of its formation is a characteristic which varies over time. The development of the components of an individual competence takes place gradually.

The stages of each of the declared competencies' formation are presented in the Supplement 3. It should be noted that the components of competence (knowledge and skills) can be formed during lectures and practical classes in the process of learning various academic disciplines, while the components (possess skills or experience of activity) are acquired at the stage of preparing a master's thesis or during the course of various types of practice.

4. Terms of BPEP realization

Conditions of the Bachelor's course program realization in the field of study 15.03.06 "Mechatronics and Robotics", the directivity (profile) "Robotics in computer-aided manufacturing" in PNRPU correspond to the requirements stated by IES HE PNRPU in the given direction of training. The requirements for the conditions of realization include system-wide conditions; requirements for logistic and methodological support; requirements for personnel conditions of the program realization; requirements for financial conditions of the program realization; requirements for the applied tools of quality assessment of educational activity and students' learning the program..

4.1. System-wide Requirements for BPEP Realization

"PNRPU" dispose of the necessary logistic support of educational activity (premises and equipment), owned or otherwise legally owned, for the realization of the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics", directivity (profile) "Robotics in computer-aided manufacturing" by Block 1 "Disciplines (modules)" and Block 3 "Final State Assessment" according to the curriculum.

Students of the Bachelor's course program are provided with the individual unlimited access to the electronic information educational environment of PNRPU during the whole period of studies.

The electronic information educational environment of PNRPU provides the access to the Curricula, Academic Courses Working Programs (modules), practical training, electronic educational publications and electronic educational resources given in the working programs (modules), practical training, creation of student's electronic portfolio including the storage of his papers and their assessment.

Counting on 100 persons of the research and educational personnel the average annual number of their publications amounts to 2 ones (not less) in the database of journals with the index of Web of Science or Scopus, or not less than 20 in the journals with the Russian index of scientific quotation.

4.2. Requirements for Logistic and Methodological Support of BPEP

Logistic and methodological support of the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics", directivity (profile) "Robotics in computer-aided manufacturing" involves the characteristic of educational process realization conditions, including availability and equipping of premises for conducting academic

studies provided by the program, rooms for students' individual work, availability of licensed and open courseware, library stock (when printed matters are used in the educational process), access (remote access) to the modern high-end database and informational reference tools.

In the *Supplement 4* the information about logistic support of the basic professional educational program of higher education – program of Bachelor's course – is presented.

4.3. Requirements for the Personnel Realizing BPEP

Basic professional educational program realization is provided by the high-level personnel and academic staff of PNRPU, as well as by the persons engaged in the realization of the program on other terms.

The level of the academic staff proficiency should confirm with the qualification profile prescribed by the Unified skills guide for positions of managers, specialists and non-manual workers, section "Qualification profile for positions of managers and specialists of higher professional and additional professional education" approved by the Order of the Ministry of Health and Social Development of the Russian Federation from January 11, 2011 № 1n (registered by the Department of Justice of the Russian Federation on March 23, 2011 № 20237) and professional standards (if available).

The number of the Learning and Research pedagogical staff of PNRPU participating in the program realization, and the persons attracted by the University to the realization of the program on other terms (in reduced to the tenures integral values) who carries out research, teaching and learning or practical work corresponding the field of studies of the taught discipline (module) including the teachers realizing the program of Bachelor's course amounts no less than to 70%.

The number of the Learning and Research pedagogical staff of PNRPU participating in the program realization, and the persons attracted by the University to the realization of the program on other terms (in reduced to the tenures integral values), having the academic degree (including the academic degree created in the foreign state and recognized in the Russian Federation) and/or academic rank (including the rank created in the foreign state and recognized in the Russian Federation), from the total number of the academic staff makes up at least 60%.

The number of University employees participating in the program realization and persons attracted by PNRPU to the realization of the program on the other terms (in reduced to the tenures integral values) from among the managers and employees of organizations whose activity is connected with directivity/field of study/specialization of the realized program of Bachelor's course (having the record of work in this professional field at least 3 years) makes up no less than 5% in the total number of the University personnel realizing the program of Bachelor's course.

The general management of the scientific content of the Bachelor's course program is carried out by a full-time scientific and pedagogical worker of PNRPU with a degree, carrying out independent research projects/participating in the implementation of such projects in the field of study "Mechatronics and Robotics", having annual based on the results of these research activity publications in the leading domestic and (or) foreign peer-reviewed scientific journals, as well as performing annual testing of the results of these research activity at national and international conferences.

Information about personnel support of the basic professional educational program of higher education – the Bachelor's course program is given in the Supplement 5.

4.4. Requirements for Financial Conditions of BPEP Realization

Financial support for the realization of the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics", directivity (profile) "Robotics in computer-aided manufacturing" is made in the amount which is no less than basic standard costs of the state services concerning the realization of educational programs of Higher education and adjusting factors to the basic standard costs defined by the Ministry of Science and Education of Russia.

4.5. Requirements for the Applied Tools of Quality Control of Educational Activity and Students Preparedness in accordance with BPEP

Quality of education and students' preparedness on the Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics", directivity (profile) "Robotics in computer-aided manufacturing" is determined in the frames of the internal assessment system and also the system of external assessment in which PNRPU participate on a voluntary basis.

To improve the Bachelor's course program University attracts employers and/or their communities, other legal persons and/or individuals including teachers of PRNPU in the process of regular internal quality assessment of academic activity.

Bachelor's course program in the field of study 15.03.06 "Mechatronics and Robotics", directivity (profile) "Robotics in computer-aided manufacturing" was considered at the enlarged meeting of the Department "Information Technologies and Automated Systems" with the participation of employers' representatives and positively received.

Internal system of quality support of the academic activity and students' preparedness of learning BPEP in PNRPU is determined by the complex of internal processes in the frames of QMS PNRPU and described in the Quality Manual "PNRPU".

In the frames of internal system of academic activity quality assessment it has been developed the scheme of processes interaction, has defined the centers of responsibility for the realization of the main processes, has developed documentary procedures, approximate list of the general indicators for the internal quality assessment. In the frames of internal system of quality assessment of academic activity on the Bachelor's course program students are given an opportunity to estimate conditions, contents, organization and quality of the educational process in whole and separate disciplines (modules) and practicals.

External quality assessment of academic activity on the Bachelor's course program in the frames of state accreditation procedure is implemented for the purpose of confirming the correspondence of academic activity on the Bachelor's course program with the requirements of IES HE.

External quality assessment of academic activity and preparedness of students, learning the Bachelor's course program, can be implemented in the frames of professional public accreditation carried out by employers, their communities and authorized organizations, including foreign organizations or authorized national professional and public organizations being the parts of the international structures. The purpose of such

assessment is to recognize the quality and level of graduates' proficiency which meets the requirements of professional standards (in the presence of them), demands of labor market made for the professionals in the appropriate field.

Supplement 1. Indicators of competences achievement

1. Indicators of the Universal Competences Achievement

Universal competences category (group)	Code and name of the universal competence of educational program graduate	Code and name of the indicator for the universal competence attainment
Systemic and critical thinking	**UC-1.** Is able to search, to make critical analysis and synthesis of information, to apply systemic approach aimed at given problems solution.	**IA-1$_{uc-1}$. Knows** how to search, to make critical analysis and synthesis of information aimed at solution of the given professional tasks. **IA-2$_{uc-1}$. Is able to** apply systemic approach on the basis of search, critical analysis and synthesis of information aimed at solution of science-oriented problems of professional field **IA-3$_{uc-1}$. Has the skill of** search, synthesis and critical analysis of information in his professional field; is a master of systemic approach aimed at solution of the given tasks
Development and realization of projects	**UC-2**. Is able to define the scope of tasks in the frames of the given target, to choose optimal ways of their solution in terms of the current legal regulations, available resources and restrictions	**IA-1$_{uc-2}$. Knows** the approaches to the problems statement aimed at the achievement of the given target, possesses knowledge in choice of optimal ways of their solution. **IA-2$_{uc-2}$.** In terms of the current legal regulations, available resources and restrictions **is able to** choose optimal ways of solution of science-oriented tasks in professional field aimed at achievement of the given target. **IA-3$_{uc-2}$. Has the skills** of determining the scope of professional tasks in the frames of the given target; the skills of the choice of optimal ways of their solution considering the current legal regulations and available resources.
Teamwork and leadership	**UC-3**. Is able to carry out social interaction and to realize his role in the team.	**IA-1$_{uc-3}$. Knows** different means and ways of personal socialization and social interaction. **IA-2$_{uc-3}$. Is able to** build a relationship with human environment, with colleagues. **IA-3$_{uc-3}$. Has the skill of participation** in team-work, in social projects, in team's interaction casting.
Communication	**UC-4**. Is able to put into practice business communication in oral and written forms using official language of the Russian Federation and foreign languages.	**IA-1$_{uc-4}$. Knows** general lexical minimum of the Russian and studied foreign languages, basic Russian thesaurus of classroom disciplines (History and Philosophy); literary standard and distinctive features of

		business functional style, requirements for the Russian and foreign oral and written forms of business communication **IA-2$_{uc-4.}$ Is able to** analyze, to compare, to generalize and to assess information (facts, events, phenomena, views) in the Russian and foreign languages; logically, reasonably and clearly express thoughts in oral and written forms in the Russian and studied foreign language in situations of interpersonal, professional and business communication. **IA-3$_{uc-4.}$ Has the skills of** oral and written business communication in the Russian and studied foreign language; the skills of preparing and presenting oral and written report; has the attainments of business speech etiquette, basic terminology of the Russian and foreign business sphere.
Cross-cultural interaction	**UC-5**. Is able to perceive cross-cultural diversity of society in social-historical, ethical and philosophic context.	**IA-1$_{uc-5.}$ Knows** fundamentals of philosophic analysis and social-historic context of cultural diversity formation in society (ethno-cultural and confessional peculiarities), theoretical basis for cross-cultural communication ethics. **IA-2$_{uc-5.}$** In the process of interaction **is able to** take into consideration historical conditionality and ontological basis of cross-cultural diversity in Russian society (ethno-cultural and confessional peculiarities); to carry on dialogue with representatives of different cultures; to show cross-cultural tolerance as the ethic norm of behavior in social medium. **IA-3$_{uc-5.}$ Has the experience** of cultural phenomena estimation, the skill of cross-cultural communication in professional sphere in terms of ethical norms, historical conditionality and ontological basis of ethno-cultural, confessional peculiarities of partners of communication
Self-organization and self-development (including health protection)	**UC-6**. Is able to control his time, to construct and realize the trajectory of self-development on the basis of educational principles during the whole life.	**IA-1$_{uc-6.}$ Knows** the process of personal self-development and the main principles of self-education. **IA-2$_{uc-6.}$ Is able to** plan his working time or time for self-development, to determine the aims of personal and professional development as well as the conditions for their achievement

		reasoning from the tendencies of professional activity progress and the individual characteristic features. **IA-3$_{uc-6.}$ Has the skill of** self-development and time management.
	UC-7. Is able to maintain necessary level of physical fitness for ensuring efficient social and professional activity	**IA-1$_{uc-7.}$ Knows** the requirements and principles of estimating the level of physical fitness for social and professional work; the ways and procedures for the rise of human fitness level. **IA-2$_{uc-7.}$ Is able to** appraise the level of physical fitness for further professional activity; to control the level of self-fitness and manage this state. **IA-3$_{uc-7.}$ Has the experience** of appraisal, control and management of physical development; the skill of determining comfortable (good) state for efficient social and professional activity.
Life safety	**UC-8**. Is able to create and ensure safe conditions for life activity, conservation of environmental media, supporting sustainable development of society including in the cases of emergency situations and military conflicts.	**IA-1$_{uc-8.}$ Knows** the level of requirements of creation and ensuring safe conditions of life and professional activity for conservation of environmental media, supporting sustainable development of society including in the cases of emergency situations and military conflicts **IA-2$_{uc-8.}$ Is able** to create and ensure safe conditions for life activity, conservation of environmental media, supporting sustainable development of society including in the cases of emergency situations and military conflicts. **IA-3$_{uc-8.}$ Has the skill of** safety measures in the process of professional activity; creation and observance of safe conditions for life activity; has the experience of behavior in conditions of emergency situations.
Inclusive competence	**UC-9**. Is able to apply basic defectologic knowledge in social and professional spheres	**IA-1$_{uc-9.}$ Knows** the general principles of non-discriminative language with respect to the handicapped persons (correct wording concerning the disability and limited possibilities due to poor health) as well as of empathy and psychological support. **IA-2$_{uc-9.}$** In the process of communication with handicapped persons **is able to** focus not on the problem but on the handicapped person in terms of his possibilities and

		conditions of social environment. **IA-3$_{uc-3.}$ Has the skill of** inclusive voluntary work (involving handicapped persons in voluntary social activity), the experience of interaction with such persons on the basis of humanitarian values, their support in difficult situations.
Economic culture including financial literacy	**UC-10**. Is able to make reasoned economic decisions in different fields of life activity	**IA-1$_{uc-10.}$ Knows** basic principles of operation of economy and economic development, aims and forms of state participation in economy. **IA-2$_{uc-10.}$ Is able to** apply methods of personal economic and financial planning aimed at achievement of current and long-term financial goals. **IA-3$_{uc-10.}$ Has the skill of** using financial instruments for personal finances management (personal budget), controls economic financial risks of himself. .
Civil stand	**UC-11**. Is able to form intolerable relation to corrupt behavior	**IA-1$_{uc-11.}$ Knows** the concept of corrupt activity **IA-2$_{uc-11.}$ Is able to** reveal the signs of corrupt behavior **IA-3$_{uc-11.}$ Has the skill** of detecting the features of corrupt behavior and its suppression.

2. Indicators of achieving general professional competences

General professional categories (groups)	Code and name of general professional competence of educational program graduate	Code and name of indicator for achieving general professional competence
Mathematical modeling in engineering, reliability and diagnostic	**GPC-1.** Is able to apply scientific and general engineering knowledge, methods of mathematical analysis and modeling in professional activity.	**IA-1$_{gpc-1.}$ Knows** basic areas of applying mathematical methods for scientific and technical tasks solution in engineering, the aspects of scientific research systematization and mathematisation, mathematical methods for modeling designed processes, units, aids and systems of machinery production technological support in engineering practice and research; Basic definitions and concepts in the sphere of reliability and diagnostic of technological systems, quantitative characteristics of reliability functioning and methods of their calculation, methods and tools of technical diagnosis and reliability evaluation of instruments and processing equipment.

		IA-2$_{gpc-1.}$ Is able to evaluate and present the results of mathematical modeling of objects and processes during engineering preproduction, make problem definition and solution for mathematical analysis of designed situation, specific processes of machines functioning and materials processing, work up program logic for sensors maintenance and technical diagnosis; compute basic data of technological process reliability. **IA-3$_{gpc-1.}$ Has the skill of** using mathematical modeling for definition of technological, engineering and performance characteristics of mechanical products and facilities; estimation and presentation of results of engineering objects and processes mathematical modeling; computation of basic data of reliability and its control; analysis of technological systems reliability characteristics; drafting of measures aimed at addressing the cause of technological system failure.
Mastery of information technology	**GPC-2.** Is able to apply basic methods, ways and means of information receiving, storage, and processing at solving the tasks of professional activity.	**IA-1$_{gpc-2.}$ Knows** principles of local and wide area networks construction, fundamentals of IT, and common procedures of problem-oriented software application. **IA-2$_{gpc-2.}$ Is able to** use modern information and computer technology, means of communication promoting efficiency improvement of scientific and educational activity. **IA-3$_{gpc-2.}$ Has the skill of** mastering modern and advanced directions of engineering, progressive native and foreign experience in conducting research, design work, organization of technological processes and maintenance of mechatronic and robotic systems and/or their components.
Business analysis in the field of new technological items and new technologies	**GPC-3.** Is able to undertake professional activity with respect to economic, ecological, social and other restrictions at all stages of life.	**IA-1$_{gpc-3.}$ Knows** the rules, procedures of marketing research development of business plans for the advanced and competitive run-

development.		out production in the field of engineering. **IA-2$_{gpc-3.}$ Is able to** analyze the market structure in the defined area of engineering, select perspective directions of items and technologies development. **IA-3$_{gpc-3.}$ Has the skill** of work ing out and preparation of definite business-plans components for the advanced and competitive run-out production, realization of modern technologies in engineering. .
IT application	**GPC-4.** Is able to apply modern technologies and software tools at modeling technological processes.	**IA-1$_{gpc-4.}$ Knows** the rules of methods development for conducting research by working objects of mechatronics and robotics. **IA-2$_{gpc-4.}$ Is able to** make experiments and process research results. IA-**3$_{gpc-4.}$ Has the skill of** processing the results of experiments on the base of modern information technologies and technical facilities.
Work with technical documentation	**GPC-5.** Is able to work with regulatory and technical documentation related to professional activity with respect to standards, norms and rules.	**IA-1$_{gpc-5.}$ Knows** the procedure for registration and the structure of technical documentation in the fields of professional activity. **IA-2$_{gpc-5.}$ Is able to** evaluate the quality of content and form of documented information in engineering for compliance with the established document management requirements, the rules of registration and the specified criteria of scientific and technical developments. **IA-3$_{gpc-5}$. Has the skill of** analysis and examination of technical documentation in the course of professional activity.
Information culture and the use of global information resources	**GPC-6.** Is able to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies	**IA-1$_{gpc-6.}$ Knows** the structure, purpose and content of modern information resources used in research work. **IA-2$_{gpc-6.}$ Is able to** use modern information and communication technologies, global information resources at conducting research according to the specified topics. **IA-3$_{gpc-6.}$ Has the skill of**

		application of technical facilities, information technologies and resources for automation of scientific research and analysis of scientific and technical information in the information and telecommunications network "Internet" in engineering practice (professional activity).
Planning and preparation of engineering production. Planning of business activity.	**GPC-7.** Is able to develop modern eco-friendly and safe methods of rational use of raw materials and energy resources in engineering.	**IA-1**$_{\text{gpc-7.}}$ **Knows** basic techniques of applying rational use of resources in engineering. **IA-2**$_{\text{gpc-7.}}$ **Is able to** apply methods and approaches to ensuring the rational use of raw materials and energy resources at engineering enterprises. **IA-3**$_{\text{gpc-7.}}$ **Has the skill of** development and use of methods for ensuring environmental safety of engineering production.
	GPC-8. Is able to analyze the costs of ensuring the activities of production divisions.	**IA-1**$_{\text{gpc-8.}}$ **Knows** methods of costs optimization for ensuring the production activities of engineering enterprises' divisions. **IA-2**$_{\text{gpc-8.}}$ **Is able to** apply economic methods of reducing costs in engineering production. **IA-3**$_{\text{gpc-8.}}$ **Has the skill of** using tools and methods to optimize the costs of conducting specialized production activities.
Technological preparation of production	**GPC-9.** Is able to introduce and master new technological equipment	**IA-1**$_{\text{gpc-9.}}$ **Knows** the principles of construction of advanced technological equipment at mechatronic and robotic systems production. **IA-2**$_{\text{gpc-9.}}$ **Is able to** introduce components of engineering production technological support in the chosen subject area. **IA-3**$_{\text{gpc-9.}}$ **Has the skill of** introducing and mastering technological equipment in the field of mechatronics and robotics.
Ensuring industrial and environmental safety	**GPC-10.** Is able to control and ensure industrial and environmental safety in the workplaces	**IA-1**$_{\text{gpc-10.}}$ **Knows** basic provisions and content of the regulatory documentation for ensuring industrial and environmental safety at the workplaces of engineering enterprises. **IA-2**$_{\text{gpc-10.}}$ **Is able to** apply methods

		of control and ensuring industrial and environmental safety on the basis of regulatory and technical documentation. **IA-3$_{gpc-10.}$ Has the skill of** implementing methods of control and ensuring industrial and environmental safety.
Design of elements, assemblies and systems of mechatronics and robotics	**GPC-11.** Is able to develop and apply algorithms and modern digital software methods of calculation and design of individual devices and subsystems of mechatronic and robotic systems using standard actuators and control devices, automation, measuring and computing equipment in accordance with the terms of reference, to develop digital algorithms and control programs of robotic systems	**IA-1$_{gpc-11.}$ Knowst** methods and software tools for designing devices and subsystems of mechatronic and robotic systems. **IA-2$_{gpc-11.}$ Is able to** apply software tools for the development of hardware and software for mechatronic and robotic systems. **IA-3$_{gpc-11.}$ Has the skill of** using standard actuators and control devices, automation tools, measuring equipment for the creation of devices and systems of mechatronics and robotics.
Manufacturing application of prototype models of mechatronic and robotic systems.	**GPC-12.** Is able to participate in assembling, debugging, adjustment and putting into operation prototype models of mechatronic and robotic systems, their subsystems and definite modules.	**IA-1$_{gpc-12.}$ Knows** technologies of manufacturing application of prototype models of devices and systems **IA-2$_{gpc-12.}$ Is able to** perform basic acts aimed at putting into operation prototype models of mechatronic and robotic systems, their subsystems and definite modules. **IA-3$_{gpc-12.}$ Has the skill of** organizing assemblage, debugging, adjustment and putting into operation prototype models of mechatronic and robotic systems.
Quality control management	**GPC-13.** Is able to apply methods of quality control of products and objects in the sphere of professional activity.	**IA-1$_{gpc-13.}$ Knows** basic regulations of quality management system. **IA-2$_{gpc-13.}$ Is able to** apply methods of quality control in the process of designing mechatronic and robotic systems, their subsystems and definite modules. **IA-3$_{gpc-13.}$ Has the skill** of meeting the requirements of the system of products and objects quality control.

3. Indicators of achieving the Required Professional Competences

Category of professional competence	Code and name of competence	Code and name of indicator of competence achievement	Grounds (PS, analysis of experience)
Scientific	**RPC-1**. Is able to	**IA-1$_{rpc-1.}$ Knows** methodology of	An analysis of

research	participate in scientific research and projects development, to make theoretical research and computing experiments using standard software in order to produce mathematical models of processes and objects of mechatronics and robotics. .	scientific research, methods of mathematical models of mechatronics' and robotics' processes and objects. **IA-2$_{rpc-1.}$ Is able to** summarize, analyze and systematize information for the preparation of analytical reviews on a given topic, use standard software tools for mathematical modeling of processes and objects of mechatronics and robotics. **IA-3$_{rpc-1.}$ Has the skill of** independent study, critical reflection and systematization of scientific and technical information, conducting theoretical research and computational experiments in accordance with the use of selected standard software tools.	experience PS 40.148 "Specialist in operation of flexible production systems in engineering"
Design	**RPC-2** Is able to perform calculations and design of individual units and devices, as well as select standard measuring and computer equipment for the implementation of mechatronic and robotic systems.	**IA-1$_{rpc-2.}$ Knows** methods of calculating individual units and devices of mechatronic and robotic systems. **IA-2$_{rpc-2.}$ Is able to** apply techniques and tools for designing individual units and devices of mechatronic and robotic systems. **IA-3$_{rpc-2.}$ Has the skill of** use of standard measuring and computer equipment in designing and calculating individual units and devices of mechatronic and robotic systems.	Analysis of experiment PS 40.152 "Specialist in operation of flexible production systems in engineering"

4. Indicators of Achieving Professional Competences of Graduates

Tasks of PA / generalized labour function	Category of professional competence	Code and name of competence	Code and name of indicator of competence achievement	Grounds (PS, analysis of experience)
Type of professional activity tasks: *2. Engineering*				
Realization of design and calculation work for designing flexible production systems in engineering	Design	**PC-2.4** Is able to choose software for flexible production system management in engineering.	**IA-1$_{pc-2.4.}$ Knows** high-level programming languages and modern software environment for managing flexible production systems. **IA-2$_{pc-2.4.}$ Is able to** develop programs in high-level programming languages and management programs for flexible production systems. **IA-3$_{pc-2.4.}$ Has the skill of** choosing the optimal combination of software environment for managing flexible production systems and debugging software for the flexible production system control.	Analysis of experience PS 40.152 "Specialist in operation of flexible production systems in engineering"
		PC-2.5 Is able to develop technical design of flexible production systems in engineering.	**IA-1$_{pc-2.5.}$ Knows** principle of operation, technical characteristics and methods of calculating basic characteristics of flexible production system components. **IA-2$_{pc-2.5.}$ Is able to** develop technical projects using design automation and competitive product development best practices; draw up technical	

			documentation. **IA-3$_{pc-2.5.}$ Has the skill of** developing functional diagrams of flexible production systems components; explanatory note of flexible production systems' engineering design.	
		PC-2.6 Is able to perform accurately defined feasibility study of flexible production systems design in engineering.	**IA-1$_{pc-2.6.}$ Knows** methods of determining functional indicators of flexible production systems. **IA-2$_{pc-2.6.}$ Is able to** calculate performance indicators for flexible production systems. **IA-3$_{pc-2.6.}$ Has the skill of** definition of functional indicators of flexible production systems.	

Supplement 2.Matrix of competences and academic subjects' relationship

Department	Index	Name of academic subject	Competences according to the plan	Universal competences											General professional competences												Professional competences					Number of competences per academic subject
				UC-1	UC-2	UC-3	UC-4	UC-5	UC-6	UC-7	UC-8	UC-9	UC-10	UC-11	GPC-1	GPC-2	GPC-3	GPC-4	GPC-5	GPC-6	GPC-7	GPC-8	GPC-9	GPC-10	GPC-11	GPC-12	GPC-13	RPC-1	RPC-2	PC-2.4	PC-2.5	PC-2.6	
Block 1 (B.1). Academic subjects (modules)																																
Basic part (compulsory)																																
IYLP	B1.B.01	Foreign language	UC-4, UC-5				+	+																								2
GUiI	B1.B.02	History	UC-5					+																								1
FiP	B1.B.03	Philosophy	UC-1, UC-5, UC-11	+				+						+																		3
SiP	B1.B.04	Social science	UC-3, UC-6, UC-9			+			+			+																				3
EF	B1.B.05	Economics	UC-1, UC-2, UC-10	+	+								+																			3
VM	B1.B.06	Mathematics	GPC-1												+																	1
PF	B1.B.07	Physics	GPC-1												+																	1
HTB	B1.B.08	Chemistry	GPC-1												+																	1
ITAS	B1.B.09	Computer science	GPC-2													+																1
VMMB	B1.B.10	Theoretical mechanics	GPC-1												+																	1
OOS	B1.B.11	Ecology	GPC-7																		+											1
IYLP	B1.B.12	Russian language and culture of speech	GPC-3														+															1

DGNG	B1.B.13	Engineering geometry and computer graphics	GPC-5																+														1
MTO	B1.B.14	Materials science	GPC-13																								+						1
AT	B1.B.15	Metrology, standardization and certification	GPC-12 RPC-1, RPC-2																							+		+	+				3
BZH	B1.B.16	Life safety	UC-8 GPC-10								+													+									2
MSA	B1.B.17	Automatic control theory	GPC-4															+															1
ITM	B1.B.18	Mechanical engineering	GPC-8																		+												1
MKMK	B1.B.19	Applied mechanics	GPC-13																							+							1
FK	B1.B.20	Physical training	UC-7							+																							1
ITAS	B1.B.21	Academic and research work	GPC-6 RPC-1																	+								+					2
AT	B1.B.22	Electronic Devices of Mechatronic and Robotic Systems	GPC-11 RPC-1, RPC-2																						+			+	+				3
MSA	B1.B.23	Electrically powered mechatronic and robotic systems	GPC-9																			+											1
ITAS	B1.B.24	Data bases	GPC-2													+																	1
ITAS	B1.B.25	Robotics design	GPC-11																						+								1
ITAS	B1.B.26	Fundamentals of identification	GPC-4															+															1
Elective course																																	
IYLP	B1.DV. 01.1	Business foreign language	UC-4				+																										1
EUPP	B1.DV. 01.2	Economics and business	UC-1, UC-2	+	+																												2
MiM	B1.DV. 01.3	Innovative economy and technopreneurshi	UC-1, UC-2	+	+																												2

		p																															
SiP	B1.DV. 01.4	Business communication	UC-3, UC-6			+			+																								2
SiP	Б1.DV.0 1.5	Social adaptation of disabled persons	UC-7							+																							1
VM	B1.DV. 02.1	Mathematics, special chapters	GPC-1												+																		1
OF	B1.DV. 02.2	Physics, special chapters	GPC-1												+																		1
HTB	B1.DV. 02.3	Chemistry, special chapters	GPC-1												+																		1
ITAS	B1.DV. 02.4	Computer science as an application to the industry	GPC-2													+																	1
Profile part																																	
ITAS	B1.V.01	Theoretical background of computer-aided manufacturing control	PC-2.6																													+	1
ITAS	B1.V.02	Mechatronic and Robotic Systems software	PC-2.4																												+			1
ITAS	B1.V.03	Ergatic systems	PC-2.6																													+	1
ITAS	B1.V.04	Signal filtering theory	PC-2.6																													+	1
ITAS	B1.V.05	Artificial intelligence methods in information management and processing	PC-2.6																													+	1
ITAS	B1.V.06	Fundamentals of distributed robotics control science	PC-2.6																													+	1
ITASC	B1.V.07	Information Networking and Telecommunicati	PC-2.5																													+		1

		ons																															
ITAS	B1.V.08	Microcontroller Technology	PC-2.5																											+		1
ITAS	B1.V.09	Algorithmic programming languages.	PC-2.4																										+			1
ITAS	B1.B.10	Computer-based mathematics	PC-2.6																												+	1
ITAS	B1.B.11	Computer graphics	PC-2.5																											+		1
ITAS	B1.V.12	Digital circuit design of control and information systems	PC-2.5																											+		1
ITAS	B1.V.13	Workshop on modeling robotic technological process	PC-2.5																											+		1
ITAS	B1.V.14	Production systems with artificial intelligence	PC-2.4																										+			1
Number of academic subjects per one competence:				**4**	**3**	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**7**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**3**	**2**	**3**	**5**	**6**	**63**
Блок 2 (Б.2). Практики																																	
Basic part																																	
ITAS	B2.V.01	Internship, research work	RPC-1, RPC-2																									+	+				2
Profile part																																	
ITAS	B2.V.01	Practical training, introductory	PC-2.4																										+			1
ITAS	B2.V.02	Practical training, technological (engineering design)	PC-2.4, PC-2,5																										+	+		2

ITAS	B2.V.03	Practical training, technological (engineering design)	PC-2.5, PC-2,6																													+	+	2
ITAS	B2.V.04	Production training, pre-graduation	PC-2.5, PC-2,6																													+	+	2
Total number per one competence:				**4**	**3**	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**7**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**4**	**3**	**5**	**8**	**9**				

Supplement 3. Stages of competences formation

Formed competences	Disciplines or practicals - credit units (semesters – kind of final assessment)								Number of discipline parts
	stage 1	stage 2	stage 3	stage 4	stage 5	stage 6	stage 7	stage 8	
UC-1	B1.B.03-4 c.u. (1-Gr.test)	B1.B.05-4 c.u. (4- Gr.test)	B1.DV.01.2-6 c.u. (3,4- Gr.test)	B1.DV.01.3-6 c.u. (3,4- Gr.test					4
UC-2	B1.B.05-4 c.u (4- Gr.test)	B1.DV.01.2-6 c.u. (3,4- Gr.test)	B1.DV.01.3-6 c.u. (3,4- Gr.test)						3
UC-3	B1.B.04-4 c.u (3- Gr.test)	B1.DV.01.4-6 c.u (3,4- Gr.test)	B1.DV.01.5-6 c.u (3,4- Gr.test)						3
UC -4	B1.B.01-6 c.u. (1,2- Gr.test)	B1.B.02-4 c.u (2- Gr.test)	B1.DV.01.1-6 c.u (3,4- Gr.test)						3
UC -5	B1.B.03-4 c.u (1- Gr.test)	B1.B.01-6 c.u (1,2- Gr.test)	B1.B.02-4 c.u. (2-Gr.test)						3
UC -6	B1.DV.04-0 c.u (1-Test)	B1.B.04-4 c.u (3- Gr.test)	B1.DV.01.4-6 c.u (3,4- Gr.test)						3
UC -7	B1.B.20-2 c.u. (1- Test)	B1.DV.03-0 c.u. (1,2,3,4,5,6- Test)							2
UC -8	B1.B16-3 c.u. (7- Test)								1
UC -9	B1.B.04-4 c.u (3- Gr.test)	B1.DV.01.5-6 c.u (3,4- Gr.test)							2
UC -10	B1.B.05-4 з.е. (4- Gr.test)	B1.DV.01.2-6 з.е. (3,4- Gr.test)							2
UC -11	B1.B.03-4 c.u (1- Gr.test)								1

GPC-1	B1.B.08-3 c.u. (1- Test)	B1.B.07-9 c.u (1,2- Exam)	B1.B.06-21 c.u (1,2,3,4- Exam)	B1.B.10-5 c.u. (4- Gr.test)	B1.DV.02.1-3 c.u (5- Test)	B1.DV.02.2-3 c.u (5- Test)	B1.DV.02.3-3 c.u. (5- Test)		7
GPC -2	B1.B.09-5 c.u. (2-Exam)	B1.DV.02.4.1-3 c.u (5- Test)	B1.DV.02.4.2-3 c.u. (5- Test)	B1.B.24.1-4 c.u. (7- Gr.test)	B1.B.24.2-4 c.u. (7- Gr.test)				5
GPC -3	B1.B.12-3 c.u (2- Test)								1
GPC -4	B1.B.17-4 c.u. (5-Exam)	B1.B.26.1-6 c.u. (7- Exam)	B1.B.26.2-6 c.u (7- Exam						3
GPC -5	B1.B.13-4 c.u (1- Gr.test)								1
GPC -6	B1.B.21.1-8 c.u (1,2,3,4- Gr.test)	B1.B.21.2-8 c.u. (1,2,3,4- Gr.test)							2
GPC -7	B1.B.11-3 c.u (2- Test)								1
GPC -8	B1.B.18-5 c.u (6- Exam								1
GPC -9	B1.B.23-5 c.u (8- Gr.test)								1
GPC -10	B1.B.18-5 c.u (6- Exam								1
GPC -11	B1.B.22-3 c.u (5- Test)	B1.B.25.1-4 c.u. (7- Gr.test)	B1.B.25.2-4 c.u (7- Gr.test						3
GPC -12	B1.B.15-3 c.u (6- Test)								1
GPC -13	B1.B.14-3 c.u (5- Test)	B1.B.19-3 c.u (7- Test)							2
RPC-1	B1.B.21.1-8 c.u (1,2,3,4- Gr.test)	B1.B.21.2-8 c.u. (1,2,3,4- Gr.test)	B1.B.22-3 c.u. (5-Test)	B1.B.15-3 c.u (6-Test)	B2.B.03-6 c.u (7,8- Gr.test)	B2.B.08-6 c.u (7,8- Gr.test)			6

RPC-2	B1.B.17-4 c.u. (5- Exam	B1.B.23-5 c.u. (8- Gr.test)	B2.B.03-6 c.u. (7,8- Gr.test)	B2.B.08-6 c.u (7,8- Gr.test)					4
PC-2.4	B2.B.06-3 c.u (2- Gr.test)	B1.V.209-4 c.u (3- Gr.test)	B1.V.202-5 c.u (4- Exam)	B2.B.07-3 c.u. (4- Gr.test)	B1.V.214-5 c.u (7-CP;7,8-Gr.test)				5
PC-2.5	B1.V.211-4 c.u (3- Gr.test)	B2.B.07-3 c.u. (4- Gr.test)	B1.V.208-6 c.u (5-CP;5- Gr.test)	B1.V.213-5 c.u. (5- Exam)	B1.V.207-7 c.u. (6-CP;6- Gr.test	B2.B.09-9 c.u (6- Gr.test)	B1.V.212-4 c.u. (7-Exam)	B2.B.10-6 c.u. (8- Gr.test)	8
PC-2.6	B1.V.210-3 c.u (3-Cr.test)	B1.V.201-6 c.u (4-CP;4-Exam)	B1.V.204-5 c.u. (5-CP;5-Exam)	B1.V.205-3 c.u. (6-Test)	B1.V.206-6 c.u. (6- Exam)	B2.B.09-9 c.u (6- Gr.test)	B1.V.203-4 c.u (8- Gr.test)	B2.B.10-6 c.u (8-Gr.test)	8

Supplement 4. Information about logistical support of the Basic professional educational program

№	Course title (module), internship according to the curriculum	Special rooms and rooms for independent work	Equipment of special rooms and rooms for independent work	The list of licensed software. Required information of supporting document
1.	Philosophy	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin Region, 15, Academician Korolyov str. , room 36	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
2.	History	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin Region, 15, Academician Korolyov str., room.36	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
3.	Social science	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin Region, 15, Academician Korolyov str., room.36	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
4.	Economics	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin Region, 15, Academician Korolyov str., room.46	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
5.	Foreign language	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment.	Desks, teacher's desk, blackboard	Not required

		614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 408		
6.	Physical culture and sport	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 401	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
7.	Mathematics	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin Region, 15, Academician Korolyov str, room.3б. 3б	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
8.	Physics	Classroom for lectures, seminars, consultations, ongoing monitoring and interim assessment. 614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 411	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft Windows (contract № 7149 from12.10.2007) Software package – Microsoft Office (contract № 7201 from 15.10.2007)
		Laboratory 614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 106	Desks, teacher's desk, blackboard Laboratory facility (stand "Mechanical phenomena – 7 units)	Not required
		Laboratory 614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 110	Desks, teacher's desk, blackboard Laboratory facility (stand "Electrical phenomena – 7 units)	Not required
		Laboratory 614013, Perm Krai, Perm, Lenin region, 7, Prof. Pozdeev Str., room 118	Desks, teacher's desk, blackboard Laboratory facility (stand "Optical phenomena – 8 units)	Not required
9.	Computer science	Classroom for lectures, seminars, consultations, ongoing	Desks, teacher's desk, laptop Acer Aspire 9414Z, projector Panasonic PT-FW430, screen, marker board	Software package – operational system Microsoft