

MINISTRY OF SCIENCE AND HIGHER EDUCATION  
OF THE REPUBLIC OF KAZAKHSTAN

M.AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

Chairman of the Board – Rector  
d.h.s., academician of NAS RK D.Kozhamzharova



2023

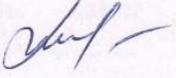
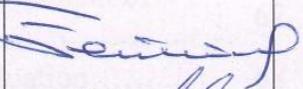
**EDUCATIONAL PROGRAM**

6B07120 – MACHINE ENGINEERING

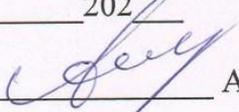
Registration number	6B07100221
Code end classification of education sphere	6B07 Engineering, Processing and Construction Branches
Code end classification of training direction	6B071 Engineering and Engineering Business
Group of educational programs	B064 Mechanics and Metalworking
Type of EP	Functioning
ISCED level	6
NQF level	6
IQF level	6
Language of learning	Kazakh, Russian
Labor intensity of the EP, at least	240 credits
Distinctive features of the EP	-
Partner University (JEP)	-
Partner University (AEP)	-

Shymkent, 2023

**Drafters:**

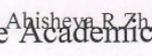
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The educational program is considered at the meeting of the academic committee in the direction of preparation «Engineering and Engineering Business», protocol No. \_\_ dated " \_\_ " \_\_\_\_\_ 202\_\_

Chairman of the AC  Aitureev M. Zh.

Considered and recommended for approval at a meeting of the Educational and Methodological Council of the M.Auezov SKU, protocol No. \_\_ dated " \_\_ " \_\_\_\_\_ 202\_\_

Approved by the decision of the Academic Council of the University, protocol No. \_\_ dated " \_\_ " \_\_\_\_\_ 202\_\_

Chairman of the EMC  Abisheva R. Zh.

## CONTENT

1.	Concept of the EP.....	4
2.	Passport of the EP.....	6
3.	The EP graduate competencies.....	11
3.1	Matrix of correlating learning outcomes in the EP as a whole with the formed competencies.....	13
4.	Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity.....	14
5	Summary table on the volume of disbursed credits in the context of EP modules.....	67
6.	Strategies and methods of teaching, monitoring and evaluation.....	68
7	Educational and resource support of the EP.....	70
	Approval sheet.....	72
	Appendix 1. Review from the employer.....	
	Appendix 2. Expert opinion.....	

## 1. CONCEPT OF THE EP

<b>Mission of the University</b>	Generating new competencies, training a leader who translates research thinking and culture.
<b>University values</b>	<ul style="list-style-type: none"> <li>• Openness – open to change, innovation and cooperation.</li> <li>• Creativity – generates ideas, develops them and turns them into values.</li> <li>• Academic freedom – free to choose, develop and act.</li> <li>• Partnership – creates trust and support in a relationship where everyone wins.</li> <li>• Social responsibility – ready to fulfill obligations, make decisions and be responsible for their results.</li> </ul>
<b>Graduate model</b>	<ul style="list-style-type: none"> <li>• Deep subject knowledge, their application and continuous expansion in professional activity.</li> <li>• Information and digital literacy and mobility in rapidly changing conditions.</li> <li>• Research skills, creativity and emotional intelligence.</li> <li>• Entrepreneurship, independence and responsibility for their activities and well-being.</li> <li>• Global and national citizenship, tolerance to cultures and languages.</li> </ul>
<b>Uniqueness of the EP</b>	<ul style="list-style-type: none"> <li>• Training of specialists with conceptual knowledge in the field of engineering, technology, capable of independently setting and solving tasks, using adequate methods and means to achieve them, to carry out professional, scientific and entrepreneurial activities.</li> </ul>
<b>Academic integrity and ethics policy</b>	<p>The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination:</p> <ul style="list-style-type: none"> <li>• Rules of academic integrity (Minutes of the Academic Council No. 3 dated 30.10.2018);</li> <li>• Anti-Corruption Standard (Order No. 373 n/a dated 27.12.2019).</li> <li>• Code of Ethics (Protocol of the Academic Council No. 8 dated 31.01.2020).</li> </ul>
<b>Regulatory and legal framework for the development of EP</b>	<ol style="list-style-type: none"> <li>1. Law of the Republic of Kazakhstan "On Education";</li> <li>2. Model rules for the activities of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by</li> </ol>

	<p>order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595;</p> <p>3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604;</p> <p>4. Rules for organizing the educational process on credit technology of education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152;</p> <p>5. Qualification directory of positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553.</p> <p>6. Guidelines for the use of ECTS.</p> <p>7. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the director of the Central Library and Medical Academy No. 45 o / d dated June 30, 2021</p>
<b>Organization of the educational process</b>	<ul style="list-style-type: none"> <li>• Implementation of the principles of the Bologna Process</li> <li>• Student-centered learning</li> <li>• Availability</li> <li>• Inclusiveness</li> </ul>
<b>EP quality assurance</b>	<ul style="list-style-type: none"> <li>• Internal quality assurance system</li> <li>• Involvement of stakeholders in the development of the EP and its evaluation</li> <li>• Systematic monitoring</li> <li>• Updating content (updating)</li> </ul>
<b>Entry requirements</b>	<p>Established in accordance with the Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Higher and Postgraduate Education Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 of 10/31/2018</p>

## 2. PASSPORT OF THE EP

<b>Purpose of the EP</b>	Training of specialists with conceptual knowledge in the field of mechanics and metalworking, having practical skills in the application of automated production design systems, proficient in state and foreign languages, demonstrating analytical and logical thinking skills, making decisions and taking responsibility at the level of departments.
<b>Objectives of the EP</b>	<ul style="list-style-type: none"> <li>- formation of socially responsible behavior in society, understanding the importance of professional ethical standards and following these standards;</li> <li>- providing basic training for bachelors, allowing them to improve their professional knowledge throughout their lives, easily adapt to changing conditions throughout their professional career;</li> <li>- acquisition by bachelors of a general intellectual level, the ability to apply modern methods of 3D modeling of products and technological processes, the introduction of scientific labor organization into production;</li> <li>- formation of the competitiveness of graduates in the field of higher education and modern machine-building and mechanical assembly industries, for their fastest possible employment in the specialty or continuing their studies in the master's degree;</li> <li>- formation of the ability to possess information and computational literacy, the ability to generalize, analyze and perceive information, setting Purposes and choosing ways to achieve it.</li> </ul>
<b>Harmonization of the EP</b>	<ul style="list-style-type: none"> <li>• 6th level of the National Qualifications Framework of the Republic of Kazakhstan;</li> <li>• Dublin skill level 6 descriptors;</li> <li>• 1 cycle of the Qualification Framework for the European Higher Education Area (A Framework for Qualification of the European Higher Education Area);</li> <li>• Level 6 of the European Qualification Framework for Lifelong Learning.</li> </ul>
<b>Communication of the EP with the professional sphere</b>	<ul style="list-style-type: none"> <li>• Professional standard «Conducting tests» (Appendix No. 13 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2019 No. 269);</li> <li>• Professional standard «Manufacturing of radio</li> </ul>

	<p>engineering and electronic products» (Appendix No. 39 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2019 No. 269);</p> <ul style="list-style-type: none"> <li>• Professional standard «Robotics (production of robots and their components)» (Appendix No. 42 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2019 No. 269);</li> <li>• Professional standard «Ensuring the reliability and mechanical integrity of equipment» (Appendix No. 19 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 6, 2022 No. 224);</li> <li>• Professional standard «Management of equipment maintenance and repair» (Appendix No. 19 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 6, 2022 No. 224);</li> <li>• Professional standard «Cast iron production» (Appendix No. 1 to the order of the acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 30, 2022 No. 257);</li> <li>• Industry qualification framework in the field of Mechanical Engineering. Industry Commission on social partnership and regulation of social and labor relations for the mining, metallurgical, chemical, construction and woodworking industries, light industry and mechanical engineering dated August 16, 2016 No. 1;</li> <li>• Atlas of new professions and competencies of Kazakhstan. Mechanical engineering. No.06, 2020. Professions: Reverse Engineering Design Engineer (Reverse Engineer), Household Robot Design Engineer, Digital Design Engineer, Welding Equipment Operator, Mechanical Engineer 2.0, Process Engineer 02, Flaw Detector 2.0, Composite Engineer, Automatic Assembly Line Operator, CNC Machine Operator.</li> </ul>
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<b>Name of the degree awarded</b>	After successful completion of this EP, the graduate is awarded a bachelor's degree in engineering and technology in the educational program 6B07120 - "Machine Engineering".
<b>List of qualifications and positions</b>	Bachelors in EP 6B07120 - "Machine Engineering" who have mastered the training program can carry out professional activities in the following positions: mechanical engineering specialist, engineer, process engineer, design engineer, chief mechanic, site foreman, industrial robotics designer, industrial robot maintenance operator , mechatronics engineer, head of the tool department, head of the workshop for automation and mechanization of production processes in (research institutions, design and engineering organizations), control foreman (section, workshop), chief welder, chief engineer, chief designer, adjustment technician and testing, process plant engineer, long-term maintenance planning engineer, mechanical engineer for maintenance and overhaul planning, dynamic equipment mechanical engineer, equipment mechanical integrity engineer, automated process control service engineer, teacher in vocational institutions without presentation requirements for work experience in accordance with the qualification requirements of the Qualification Directory of positions of managers, specialists and other employees, approved by Order No. 553 of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020.
<b>Sphere of professional activity</b>	The scope of professional activity is educational, industrial, commercial and financial business, which determine the need for specialists in training, planning the creation and reconstruction of production, ensuring the production process at enterprises for the design, design and manufacture of competitive mechanical engineering products.
<b>Objects of professional activity</b>	Enterprises of mechanical engineering, metallurgical and metalworking industries, as well as government bodies, universities and research institutions, state and non-state institutions, including industry, agriculture and utilities, the military-industrial complex, production and consumption.

<b>Subjects of professional activity</b>	Mechanical engineering and metalworking industries, production and technological processes of mechanical engineering enterprises, as well as enterprises working with equipment in various sectors of the economy, production and technological processes of enterprises related to ensuring the continuous operation of production.
<b>Types of professional activity</b>	<ul style="list-style-type: none"> <li>- design and technology;</li> <li>- design;</li> <li>- production and technological;</li> <li>- organizational and managerial;</li> <li>- educational.</li> </ul>
<b>Learning outcomes</b>	<p><b>LO1</b> Communicate freely in a professional environment and society in Kazakh, Russian and English, taking into account the principles of academic writing and academic integrity.</p> <p><b>LO2</b> Demonstrate natural science, mathematical, engineering, social and socio-economic knowledge in professional activities, master the methods of scientific and experimental research, mathematical modeling, normative and regulating documents and the basics of metrology.</p> <p><b>LO3</b> Perform engineering calculations, process information and experimental research results based on programming and modeling of mechanical engineering products using application software packages.</p> <p><b>LO4</b> Perform modeling of parts, mechanisms and structures in the form of spatial models and images, document the results in the form of technical design documentation.</p> <p><b>LO5</b> Manufacture machine parts and develop technological processing processes on machine tools with PU and machining centers using modern methods and software of computer-aided design (CAD), pre-production (CAM) and engineering research (CAE).</p> <p><b>LO6</b> Design technological processes for the manufacture and assembly of engineering products using modern methods of processing, casting and welding, appropriate machines, fixtures and tools; taking into account factors affecting the reliability, durability, quality and accuracy of parts processing; and requirements for organizing and conducting tests.</p> <p><b>LO7</b> Solve professional problems in the field of materials science, quality control and ensuring reliable, uninterrupted and trouble-free operation of technological</p>

	<p>equipment based on the optimal choice of materials, methods of forming parts on various types of machine-building equipment.</p> <p><b>LO8</b> Possess engineering methods for calculating machine parts and assemblies based on the integrated application of theoretical and practical knowledge of the development and planning of reliability control based on the criticality of pumping and compressor equipment.</p> <p><b>LO9</b> Design machine-building workshops based on layout solutions with the optimal choice of equipment, applied technologies and technical and economic indicators of production, solve basic metric and positional problems.</p> <p><b>LO10</b> Design production processes taking into account the main factors of technogenic impact and ensuring the environmental friendliness of mechanical engineering production.</p> <p><b>LO11</b> Demonstrate teamwork skills, self-education and a healthy lifestyle culture.</p>
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### 3. THE EP GRADUATE COMPETENCIES

<b>GENERAL COMPETENCES (SOFTSKILLS).</b> Behavioral skills and personality traits	
GC 1. Competence in managing one's own literacy	GC1.1. The ability to self-learn, self-develop and constantly update their knowledge within the chosen trajectory and in an interdisciplinary environment. GC1.2. The ability to express thoughts, feelings, facts and opinions in the professional field. GC1.3. The ability for mobility in the modern world and critical thinking.
GC 2. Language competence	GC2.1. The ability to build communication programs in the state, Russian and foreign languages. GC2.2. The ability to interpersonal social and professional communication in terms of intercultural communication.
GC 3. Mathematical and science competence	GC3.1. The ability and willingness to apply the educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university, to solve professional problems.
GC 4. Digital competence, technological literacy	GC4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of their lives and professional activities. GC4.2. The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information.
GC 5. Personal, social and academic competencies	GC5.1. The ability for physical self-improvement and focus on a healthy life to ensure a full-fledged social and professional activity through the methods and means of physical culture. GC5.2. The ability for socio-cultural development based on the manifestation of citizenship and morality. GC5.3 The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. GC5.4. The ability to successfully interact in a

	variety of socio-cultural contexts at school, at work, at home and at leisure.
GC 6. Entrepreneurial competence	GC6.1. Ability to be creative and entrepreneurial in a variety of environments. GC6.2. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, allocate resources and manage your time. GC6.3. Ability to work with consumer requests.
GC 7. Cultural awareness and ability to express yourself	GC7.1. The ability to show worldview, civil and moral positions. GC7.2. The ability to be tolerant of the traditions and culture of other peoples of the world, to have the highest spiritual qualities.
<b>PROFESSIONAL COMPETENCES (HARDSKILLS).</b>	
Theoretical knowledge and practical skills specific to this area	PC-1. Ability to independently design mechanical and mechanical assembly shops of various forms of production organization; develop a methodology for mastering new products and technologies; use modern application software packages to solve practical problems related to the selection of test products; take into account technological factors that cause errors in the manufacture of products, master methods for reducing the influence of technological factors that cause errors in the manufacture of products.
	PC-2. Ability to simulate technological processes using modern computer-aided design packages, perform strength calculations, know the principles of operation of the designed parts structures, perform quality control of work, make the necessary adjustments to adjustment methods and methods.
	PC-3. Ability to professionally solve problems in the field of metalworking machines, conduct qualitative analysis; apply knowledge in the field of basic design of technological equipment, methods of basing workpieces, the use of universal prefabricated fixtures, present schematic diagrams of the operation

	of main equipment, tools, accessories, features of the design of structures made of composite materials.
	PC-4. Ability to design technological processes for producing workpieces using casting methods, metal forming, manufacturing welded structures; understand the processes occurring during the processing of workpieces; independently choose the optimal technology and equipment for the production of mechanical engineering products.
	PC-5. Ability to plan engineering activities, conduct a comprehensive analysis of the state of the engineering industry, understand the features of materials and technological processes, develop technological processes for computer-controlled machines.

### **3.1 MATRIX OF CORRELATING LEARNING OUTCOMES IN THE EP AS A WHOLE WITH THE FORMED COMPETENCIES**

	LO1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11
GC1	+					+	+	+	+	+	
GC2	+										
GC3		+			+	+	+		+		
GC4		+	+	+	+	+	+		+		
GC5	+	+								+	+
GC6				+	+			+	+	+	
GC7	+							+		+	+
PC1	+		+		+			+	+	+	+
PC2		+	+	+	+	+	+				
PC3			+	+							
PC4			+			+	+		+		
PC5	+				+				+	+	



					academic discipline studies the history of philosophy, the essence of thinking, worldview, issues of consciousness and cognition. Also examines the anthropology of man, the national idea, the existence and value of man.												
2	Socio-Political Knowledges	GED	OC	Social and Political Studies	Formation of a holistic view of society: classical, modern theories that explain the main factors, driving forces, trends and possible consequences of local socio-political processes in particular and the global social process in general, the social and political structure of society, the specifics of individual socialization and the threats of socio-political conflicts, acquiring knowledge about political processes, norms of political behavior, democratic values.	4	v	v									
		GED	OC	Cultural Studies and Psychology	The purpose of the discipline is to develop students' knowledge about business culture, national values, etiquette and psychological development of the individual. The objectives of the discipline are: 1) students' mastery of the main sources and methods of	4	v	v									v

					obtaining cultural and psychological information; 2) instilling skills in using knowledge acquired in the process of mastering cultural studies and psychology in professional activities. 3) developing critical thinking skills and the ability to apply them in practice.													
3	Socio-Ethnic Development	GED	HsC	Ecosystem and Law	Purpose: Formation of integrated knowledge in the field of economics, law, anti-corruption culture, ecology and life safety, entrepreneurship, scientific research methods. Contents: Fundamentals of safe interaction between man and nature, productivity of ecosystems and the biosphere. Entrepreneurial activity in conditions of limited resources, increasing the competitiveness of business and the national economy. Regulation of relations in the field of ecology and human safety. Knowledge and compliance with Kazakh law, obligations and guarantees of subjects, state regulation of social relations to ensure social progress. Application of scientific research methods.	5		v										v
		BD	EC	Mukhtar	Purpose: Formation of a	3		v										

			Studies	historical, literary understanding of the work of M. Auezov in the context of the history of literature, patriotism and cultural and spiritual position. Development of artistic thinking and independent research skills. Contents of the discipline: Life and creative path of M. Auezov Semipalatinsk, Tashkent, St. Petersburg periods. Activities of M. Auezov in the magazines "Sholpan", "Abai". Journalism by M. Auezov. An artistic review of the stories "Korgansyzydyn kuni", "Kyr suretteri", "Okygan azamat", "Kokserek", the play Enlik-Kebek and the stories "Kily zaman", "Karash-karash" okigasy", the monograph "Abai Kunanbaev", the novel - epics "Abai Zholy."													
	BD	EC	Foundations of Anticorruption Culture	Purpose: formation of an anti-corruption worldview, strong moral foundations of the individual, civic position, and sustainable skills of anti-corruption behavior. Contents: Overcoming legal nihilism, forming the foundations of the legal culture of students in the field of anti-corruption legislation. Formation of		v											v

				conscious perception and attitude towards corruption. Moral rejection of corrupt behavior, corrupt morality, ethics. Mastering the skills necessary to combat corruption. Creation of an anti-corruption standard of behavior. Anti-corruption propaganda, dissemination of ideas of legality, respect for the law. Activities aimed at understanding the nature of corruption, awareness of social losses from its manifestations, the ability to reasonably defend one's position, and look for ways to overcome manifestations of corruption.													
		BD	EC	Actual Problems and Modernization of Public Consciousness	The purpose of the discipline: restoration of spirituality, deformed during the periods of tsarist and Soviet reality, the formation of a creative personality based on the modernization of the social consciousness of young people. Contents: Spiritual modernization: origin and prerequisites. Modern national identity. Pragmatism and competitiveness. National identity and national code. Experience and prospects for			v									v

				<p>evolutionary development. The triumph of knowledge and openness of consciousness. Alphabet reform: experience and priorities. The fatherland is the basis of the state. Education through national sacred places and history. Modern Kazakh culture is the cornerstone of spiritual revival. New humanitarian education and the future national intelligentsia. Abay Kunanbaev and Kazakh society.</p>													
		BD	EC	Service to Society	<p>Purpose: developing socially significant skills and competencies in students based on mastering academic programs, carrying out socially useful activities related to the disciplines studied at the university. Contents: The concept and meaning of Service learning, the history of the formation and development of the Service Learning concept. Key components of Service Learning, socially beneficial activities in children's and youth environments, organization of the volunteer movement in world and Kazakh practice, specialized focus of Service</p>			v									v

					Learning. International practice of learning through socially useful activities. General principles and methodology for developing social projects. Methods for analyzing implemented social projects.													
		BD	EC	Abai Studies	Purpose: Preservation of the “national code” in the “Kazakhtanu” project based on the work of A. Kunanbayev Contents: historical overview of the history of Kazakhstan and Kazakh literature of the 19th-20th centuries. Research into Abai's heritage in the 20th and 21st centuries. Chronology of Abai's creativity. Abay is a great poet, ethnographer, founder of Kazakh written literature. Abay is the compiler of the code of laws “Regulations of Karamola”, social significance. Abay is a thinker, religious scholar, philosopher. The role of Abai in education and science, the concept of the “Integral Man”. “Words of Edification” by Abai, epic novel by M. Auezov “Abai's Path”. K. Tokaev “Abai and Kazakhstan in the 21st century”, role, significance.			v										v
4	Communication	GED	OC	Kazakh (Russian)	The purpose is the formation of intercultural communicative	10	v											

and Physical Training Educa- tion Module			Language	competence in the educational process, ensuring high-quality acquisition of the Kazakh (Russian) language as a means of social, intercultural, professional communication. Contents of the EP. Levels A1, A2, B1, B2, C1 consists of topics and subtopics aimed at the formation and development of students' speech competencies through listening, reading, writing, speaking.												
	GED	OC	Foreign Language	The purpose is the formation of intercultural communicative competence in the process of foreign language education at a sufficient level and the level of basic sufficiency (A2-B1). Contents of the EP. Levels A1, A2, B1, B2 are presented in the form of cognitive-linguocultural complexes, consisting of spheres, topics, subtopics and typical communication situations of international standard: social and everyday, socio-cultural, educational and professional, modeled forms: oral and written communication, written speech works, listening.	10	v										
	GED	OC	Physical Training	The purpose of the discipline is to develop the social and personal competencies of	8											

				students and the ability to purposefully use means and methods of physical culture that ensure the preservation and strengthening of health in preparation for professional activity, for persistently enduring physical activity, neuropsychic stress and unfavorable factors in future work activity. The content of the discipline corresponds to four educational departments: basic, preparatory, special, sports. Practical classes provide for the development of knowledge, motor skills and abilities, and the formation of students' experience in implementing physical education, health and training programs.													
		BD	HsC	Professional Kazakh (Russian) Language	Purpose: Providing professionally oriented language training for a specialist who is able to adequately organize communication in professionally significant situations and who knows the language standards for special purposes. Contents: Professional language and its components. Professional terminology as the main feature of scientific style. Scientific vocabulary and scientific	3	v										v

				<p>constructions in educational-professional and scientific-professional spheres. Algorithm for analyzing and producing scientific texts in the specialty. Production of scientific and professional texts. Basics of business communication and documentation within the framework of future professional activities.</p>														
		BD	HsC	<p>Professionally Oriented Foreign Language</p>	<p>Purpose: Forms and develops practical skills in a foreign language, helps to understand texts of varying complexity on technical topics, learn basic words and expressions of a technical field, increases vocabulary, develops the ability to conduct dialogues in the field of professional activity to analyze various situations at work and conduct conversations with English-speaking company representatives. Contents: Mechanical engineering, technological process, mechanical processing of metals, abrasive materials, measuring instruments, cutters, heat treatment, casting, welding, metals and alloys, cast iron, steel, removable joints, plastics, mechanical processing of metals</p>	3	v											v

					on milling machines.													
		GED	OC	Information and Communication Technologies	<p>Purpose: developing the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies. Development of new “digital” thinking, acquisition of knowledge and skills in using modern information and communication technologies in various activities</p> <p>Contents: Introduction and architecture of computer systems. Software. OS. Human interaction with computers. Database systems. Database management. Networks and telecommunications. Cyber protection. Internet technologies. Cloud and mobile technologies. Multimedia technologies. Smart technologies. Electronic technologies. Electronic business. Electronic control.</p>	5		v										
5	Module of General Engineering Disciplines	BD	HsC	Higher Mathematics	<p>Purpose: perform the necessary measurements and related calculations, apply theorems, formulas and mathematical methods to solve professional problems. Contents: Matrices. Determinants. Inverse matrix.</p>	5		v										

				Methods for solving systems of linear equations. Vectors. Various equations of a line on a plane and a line and a plane in space. Curves and surfaces of the second order. Function. Function limit. Remarkable limits. Differential and integral calculus of a function of one variable. Derivatives and differentials of higher orders. Studying the function and plotting graphs. Indefinite and definite integrals. Functions of several variables. Differential equations of the first and second orders. Rows.													
		BD	HsC	Physics	Purpose: formation of knowledge of physical laws and skills in their application in engineering and production technology, development of scientific thinking based on an interdisciplinary approach. Laws of classical and modern physics (mechanics, molecular physics, thermodynamics, electromagnetism, optics, quantum and atomic physics). Application of knowledge of physical phenomena and processes to solve applied and technical problems. Scientific research methods, methods of	6		v									

				processing and analyzing the results of theoretical and experimental research.													
		BD	EC	Basics of Interchangeability	Purpose: Familiarization with methods for ensuring interchangeability, as well as skills in the practical application of methods of measurement and control and calculation of fits and dimensional chains. Contents: Interchangeability. The essence of standardization. Principles of interchangeability. Tolerances and landings. Standardization, methods and means of measuring and monitoring deviations in shape, location, roughness and waviness of the surfaces of parts, gears and worm gears. Interchangeability and control of smooth cylindrical, threaded, conical, keyed and spline connections. Calculation of dimensional chains.	5		v									
		BD	EC	Technological Measurements and Devices	Purpose: Formation of knowledge and skills necessary to justify the selection, creation, implementation and use of modern technological measurement tools. Contents: Concepts, definitions of measurement. Product control. Measures of length, plane angle.								v				

				Tools for linear measurements. Lever-mechanical, optical-mechanical devices. Measuring angles, cones. Methods and means for measuring deviations of shape and location, surface roughness, thread parameters. Control of gear parameters. Tools for measuring masses, forces, moments, temperatures and other physical quantities. Defect control. Automation tools for measurement and control.													
		BD	HsC	Standardization, Certification and Metrology	Purpose: Formation of theoretical knowledge and practical skills in the field of standardization, certification and metrology to solve problems of ensuring the uniformity of measurements and quality control of products, services and work in their professional activities Contents: Objects of standardization, certification and metrology. Legislative and regulatory technical framework for standardization systems, technical regulation, metrology and conformity assessment. General scientific and special methods of standardization. Certification and declaration schemes. Methods and types of measurements. Calculation of	4		v									

				errors and uncertainty of measurements. Technical basis of metrology. The role of international management systems in increasing the competitiveness of enterprises.													
	BD	EC	Chemistry of Metals	Purpose: Formation of a modern understanding of metals, the properties of various types of metals, their compositions, compounds, physical and chemical properties and metal alloys. Familiarization with methods for obtaining metals in modern technology and production, acquiring skills in setting up and conducting chemical experiments, solving problems, forming conclusions when discussing the results of chemical experiments. Contents: Basic concepts of metal chemistry. Metals in the periodic system of D.I. Mendeleev. General characteristics of metals. Physico-chemical analysis. Elements of groups of D. Mendeleev's periodic system. Methods for obtaining metals. Concepts about alloys. Preparation of alloys. The most important alloys.	3							<b>v</b>					
	BD	EC	Theoretical Fundamen-	Purpose: Development of chemical thinking to deepen								<b>v</b>					

				<p>tals of Inorganic Chemistry</p>	<p>knowledge of chemical laws and structural features and properties of the most important classes of inorganic compounds, modern theoretical ideas about the laws of chemical processes based on knowledge of chemical kinetics and thermodynamics. Contents: Demonstrate knowledge of the structure of matter and chemical bonds, understand the state of aggregation of matter and types of chemical transformations, have knowledge of the basic laws of thermochemical reactions, be able to change the direction of the reaction. Demonstrate knowledge of catalytic processes for the production of rare elements and complex coordination compounds. Demonstrate skills in using basic modern chemical processes.</p>													
6	Engineering Computer Simulation	BD	HsC	Engineering Computer Graphics	<p>Purpose: Formation of knowledge about the conceptual foundations of the theory of displaying objects on planes, readiness to use the theoretical principles of computer technology in the practice of design and engineering work. Contents: Projection. Point and line. Plane. Axonometric</p>	4				v								

				projections. Geometric surfaces and bodies. Basic information on graphic design of drawings. Views, sections and sections in the drawings. Methods for connecting parts. Threaded products. Making sketches of parts. Drawing up and designing, reading and detailing assembly drawings and general arrangement drawings. Initial setup. Shut down and save images. Constructing a drawing of a flat figure. Construction of drawings of parts. Editing images. Construction of a three-dimensional model of an object.												
		PD	EC	Machine Graphics	Purpose: studying modern methods for creating engineering and graphic works and documents that comply with ESKD standards and acquiring the necessary knowledge of executing flat and spatial models with tools, primitives and the necessary commands in the system Contents: Basic concepts of the AutoCAD system. Launch and configure drawing parameters. Tools menu and panels. Graphic primitives and working with them. Necessary commands for editing a drawing. Design of the drawing.	6			v							v

					Performing shading. Text on the drawing. Commands for creating text. Creating a block. Inserting a block. Creating a block with attributes. Solid modeling. Creation of standard volumetric bodies.													
		PD	EC	Fundamentals of Machine Design	Purpose: To contribute to the acquisition of knowledge on the basics of machine design, the acquisition of skills in the development of industrial design and the analysis of machine design from the point of view of design and ergonomics. Contents: Basic concepts and definition of machine design. History of design evolution. Theoretical design concepts. General requirements of technical aesthetics. Product design. Idea of form. Sequence of product creation. Properties of the spatial form of material objects. Form design methods. Compositions and means of composition. Analysis of the composition of industrial products. Ergonomics in design. Ergonomic assessment of industrial products.				v									v
7	Fundamentals of	BD	EC	Theoretical Mechanics	Purpose: Acquisition by the student of the necessary amount of fundamental knowledge in the	4			v									

Machine Parts Design				field of mechanical interaction, equilibrium and motion of material bodies, students obtaining theoretical knowledge about the basic principles of statics, kinematics and dynamics. Contents: Kinematics. The movement of a material point and rigid bodies from a geometric point of view, methods for specifying the movement of a material point and methods of kinematics. The simplest movements of a material point and a rigid body, complex movements of a rigid body. Basic theorems of statics, laws of friction, equilibrium conditions for convergent, plane and spatial systems of forces, types of connections. Basic laws of dynamics, movement of mechanical systems taking into account acting forces. Basic theorems of the dynamics of a material point and mechanical systems. Fundamentals of analytical mechanics.												
	BD	EC	Technical Mechanics	Purpose: Formation of knowledge about the general laws of equilibrium of material bodies, about methods for calculating structural elements and machines for strength,			v									

				rigidity and stability, about the laws of motion of material bodies and about the devices of machines and mechanisms, their parts and their areas of application. Contents: Basic concepts. Active forces, reactions of connections. Reduction and equilibrium of the spatial system of forces. Simple and complex motions of rigid bodies. Subject and tasks of dynamics. Modeling of the research object. Section method. Hooke's law. Condition of strength, rigidity. Deformations, movements. Improving the mechanical properties of materials and structures.												
		BD	EC	Strength of Materials	Purpose: Formation of a complex of knowledge in the field of engineering calculations with simple and complex resistance to strength, rigidity and stability of structural elements, ensuring the required reliability and safety of products under static and dynamic loads. Contents: Basic hypotheses and assumptions of the resistance of materials - axial tension and compression, geometric characteristics of flat sections, transverse bending, shear,	5		v								

				torsion and complex types of deformations, stress state at a point of a body, deformed state at a point of a body, stability of compressed rods. Fatigue strength of materials. Hit.													
	BD	EC	Engineering Mechanics	<p>Purpose: Formation of knowledge in the field of strength, rigidity and stability of structures that contribute to the reliable operation of buildings and structures and the development of practical skills in carrying out their calculations.</p> <p>Contents: basic principles of statics, the concept of a vector of forces, projection of forces on an axis, moment of a pair of forces. Laws of motion of rigid bodies - trajectory of the body, speed, acceleration. Differential equation of motion of a point, basic problems of dynamics. The main hypotheses and assumptions of the resistance of materials are axial tension and compression, transverse bending, shear, complex types of deformations, stress-strain state, stability of compressed structural elements and structures.</p>			v										
	BD	HsC	Fundamentals of Design and	<p>Purpose: Formation of a complex of knowledge, skills and research skills in the field of</p>	5		v										

			Machines' Components	analysis and calculations of machine parts and assemblies, design of machines and equipment in the industry. Contents: Classification and basic requirements for machine parts and assemblies. Principles and methods of design, development stages. Design and verification calculations. Multivariate and multicriteria design. Automated design. Stages of machine design and development of design documentation. Mechanical transmissions. Gearboxes. Shafts and axles. Sliding and rolling bearings. Couplings. Elastic elements. Case parts. Connections. Detachable and permanent connections.												
		BD	EC	Theory of Mechanisms and Machines	Purpose: Formation of knowledge about general methods of research and design of machines and devices, general principles of interaction of mechanisms in a machine, determined by their kinematic and dynamic properties, about the basics of structural, kinematic and dynamic analysis and synthesis of mechanisms. Contents: Basic elements of the structural diagram. Kinematic	5		v								

				<p>pairs and chains, their classification. Main types of mechanisms. The principle of formation of lever mechanisms. Assur structural groups and their classification. Main tasks and methods of kinematic and force analysis of mechanisms. Balancing mechanisms. Dynamic analysis of mechanisms. Synthesis of mechanisms and its methods. Manipulators, industrial robots.</p>													
		BD	EC	<p>Machine Mechanics</p>	<p>Purpose: Formation of knowledge about the properties of mechanical systems, about mechanical processes occurring in a machine, about program control systems in machines, optimal solutions that ensure the required quality of developed structures and research skills. Contents: Classification of kinematic pairs, chains and mechanisms. Analysis and synthesis of lever mechanisms. Kinematic diagram of the mechanism and its parameters. Assemblies, quality criteria for motion transmission. Classification of problems and synthesis methods. Accuracy of gear pairs and kinematic chains. Introduction to machine</p>		v										

					dynamics. Dynamics of machines with rigid and variable links. Structure, kinematics and dynamics of industrial robots.													
8	Fundamentals of Machine Engineering and Structural Materials Technology	BD	EC	Introduction to Specialty	<p>Purpose: Formation of knowledge about mechanical engineering production, types of products and methods of their processing, the importance of the role of engineering activities. Contents: Credit training system. The Bologna Process. History of the department, university. Planning and organization of the educational process. History of the development of mechanical engineering. The role and importance of the profession of mechanical engineer. The machine, its purpose and the system of quality indicators at the stages of the life cycle. Materials used in mechanical engineering. Technological processes of mechanical engineering production. Types of blanks, methods of their production. Types of materials used in mechanical engineering. Classification characteristics of metal-cutting machines. Methods for processing the surfaces of workpieces.</p>	3				v								
		BD	EC	Fundamen-	Purpose: Formation of the		v											

			tals of Academic Writing	communicative competence of a specialist capable of solving current communication problems in various areas of professional activity using the Kazakh language. Contents: Features of academic writing. General requirements for scientific work. Types of academic texts. Presentation style. Errors in written scientific papers. Fundamentals of academic writing (abstract, review, analytical review, scientific communication). Structure of the academic community: research centers, publishing houses, journals. Orientation in the modern academic space. Rules for compiling a bibliographic description. Domestic and foreign standards. Types of abstracts. Abstract structure. Volume of abstracts of various types, rules of formatting, Types of reviews, review structure.												
		BD	HsC	Educational Practice	Purpose: To consolidate the acquired theoretical knowledge, expand ideas about the future profession; to form professional adaptation and competencies in extracurricular activities. Contents: Introduction. History and structure of the university.	2		v	v		v					

				<p>participation Laboratory base of the university. Safety precautions. Initial training at the workplace. Basic provisions of statics. Laws of motion of rigid bodies - trajectory of the body, speed, acceleration. History of the development of mechanical engineering. The machine, its purpose and the system of quality indicators at the stages of the life cycle. Materials used in mechanical engineering. Technological processes of mechanical engineering production. Types of blanks, methods of their production. Classification characteristics of metal-cutting machines.</p>													
		BD	EC	<p>Structural Materials and Heat Treatment</p>	<p>Purpose: Formation of knowledge on the selection of materials, taking into account their composition, structure, heat treatment, operational properties necessary for the most effective use in the field of mechanical engineering; formation of research skills for solving practical problems. Contents: Structure and properties of metals and alloys. Theory of alloys. State diagram of iron-carbon alloys. Plastic deformation of metals. Carbon</p>	4							v				

				and alloy steels. Structural and instrumental materials. Theory and practice of thermal and chemical-thermal treatment of steels and alloys. Non-ferrous metals and alloys. Non-metallic and composite materials. Nanomaterials.													
		BD	EC	Technology of Structural Material and Materials Science	Purpose: To contribute to the acquisition of knowledge and skills about the shaping of workpieces and machine parts; about the connection between the composition, structure and properties of materials, about the principles of choosing structural materials and methods of their strengthening; instill materials research skills. Contents: Production of materials. Processing of materials by pressure. Foundry. Obtaining permanent connections. Metal cutting processing. Electrophysical and electrochemical processing. Structure and properties of metals. Fundamentals of the theory of alloys. Iron-based alloys. Alloy steels and alloys with special properties. Thermal and chemical-thermal treatment. Non-ferrous metals and alloys. Composite materials. Non-							v					

				metallic materials.															
		BD	EC	Technological Processes of Machine Engineering Production	<p>Purpose: Formation of knowledge about the production of metals, about methods of shaping blanks and machine parts from metallic and non-metallic materials; acquiring skills in choosing methods for obtaining blanks and products.</p> <p>Contents: Fundamentals of metallurgical production. Production of ferrous and non-ferrous metals. Powder metallurgy. Foundry technology. Technology of metal forming. Welding technology. Physical basis for obtaining welded joints. Physical foundations of metal cutting. Cutting processing methods. Electrophysical and electrochemical processing methods. Technology for the production of blanks and machine parts from non-metallic materials. Metrological support of machine-building production. Quality Management System.</p>	5													
		BD	EC	Welding Production and Technological Machinery	<p>Purpose: Formation of knowledge about welding production, theoretical and practical fundamentals of welding, cutting and technological equipment, power sources, types of electrodes and</p>														

				<p>other welding materials. Welding and its essence. Types of welding, their classification Arc welding. Electric arc and its properties. Welded joints, seams, materials. Filler materials. Electrodes, fluxes, protective gases. Welding transformers and rectifiers, converters and units, power supply devices. Automatic arc welding. Special types of welding and soldering and their technological equipment. Welding quality control.</p>														
		BD	EC	<p>Machine Engineering Technology</p>	<p>Purpose: obtaining skills in the design and development of technological processes for machining workpieces. Contents: Analysis of the manufacturability of the product design. Choosing a method for obtaining blanks. Development of technological processing route. Design of technological operations for machining parts on machine tools. Selection and justification of equipment. Factors influencing processing accuracy and surface quality of parts. Sequence of surface treatment. Calculations of allowances and operational dimensions. Design of</p>	5												

				technological processes for universal and special metal-cutting machines. Technological standardization of operations.														
	BD	EC	Student's Research Work	Purpose: formation of a comprehensive understanding of the specifics of research work; mastering research methods that are most relevant to the subject of research; acquisition of skills and abilities of independent research activities. Contents: Concept and principles of organizing student research work. Science as a type of activity. Concept and types of sources of scientific information. Purposes and methods of studying scientific literature. Methods of taking notes on scientific and educational literature. Types of research and development projects. Structure and content of the research work. Preparation of scientific work. Design of the main structural elements of scientific work.													v	v
	PD	EC	Processing Technology on Numerical Software-Controlled Machines	Purpose: to develop in students professional knowledge and skills in drawing up control programs and to study the features of processing parts in standard technological processes	5						v	v						

				on CNC machines. Contents: General information about control systems. International designation and types of CNC machines. Main parts and mechanisms of machine tools. Coordinate axes and motion structures of CNC machines. Peculiarities of assigning cutting modes for processing on CNC machines. Processing on CNC machines. Checking the quality of processed parts. Maintenance of machine tools. Meanings of letter addresses in control programs													
		PD	EC	Device Machines with Numerical Control	Purpose: to promote the development in students of the knowledge and skills necessary to operate devices, as well as tools of CNC machines for processing parts in engineering production. Contents: Characteristics of CNC equipment. Construction of CNC machines. Features of the drive device. Technological equipment of CNC machines. Machines for electrophysics and electrochemical processing. Processing modes on CNC machines. Auxiliary tool. Features of the development of technological processing					v							

					processes for CNC machines. Precision processing on CNC machines. Control system for CNC machines.												
9	Fundamentals of Machining and CAD Systems	BD	EC	Fundamentals of Cutting Theory and Metal-Cutting Tools	<p>Purpose: to create in students a general understanding of the physical and mechanical processes in the cutting zone, the formation of design skills, as well as the acquisition of knowledge about the requirements for cutting tools for metal-cutting machines, the design of tools, the shape of the surfaces of their cutting part, methods for calculating and designing tools . Contents: The essence of the cutting process and its laws. Cutting properties of metal-cutting tools; geometric parameters of the cutting part of the cutter and the cut layer; The main causes of wear, the external wear pattern of blades, cutting tools, Durability, strength and destruction of cutting tools. Kinematics of cutting; chip formation process, shape and size. Plastic deformation in the chip formation zone. Patterns of growth formation. Cutting force. Determination of cutting force. Measuring cutting force components using</p>	4						v	v				

				dynamometers.															
		BD	EC	Organization of Preparatory Section	<p>Purpose: Acquiring skills in assigning cutting modes on machine tools, processing techniques for various parts, and methods of operational control. Contents: Types of measuring instruments. Turning cutters. Cutter geometry. Sorting of metalworking machines. Fastening the workpiece and cutter to the TV-6 machine. External processing of cylindrical surfaces. Machining holes on a 1K62 lathe. Processing of flat parts on milling machines. Drilling metal on drilling machines Threading with a screw on the external and internal parts of the part. Control of a screw-cutting lathe. Metal forming. Electric arc welding technology.</p>														v
		PD	EC	CAD systems	<p>Purpose: Providing in-depth practical training for the design and technological design of technical objects, solving problems in the field of computer-aided design of objects related to professional activities. Contents: The state and prospects of automation of design and technological preparation of production and</p>	5					v	v							

				<p>technological processes in the engineering industry. Basic concepts and definitions. Composition and structure of CAD. CAD components and support. Classification of automated systems. Design stages: pre-design studies, technical design, preliminary design and detailed design. Automation systems for technological preparation of production. Selection, development and implementation of automated systems for the preparation and support of technological processes. Prototyping parts or templates.</p>													
		PD	EC	<p>Systems of the Computer Aided Design of Technological Processes</p>	<p>Purpose: formation of theoretical knowledge on the basics of developing computer-aided design systems for technological purposes and training in practical work with modern CAD systems. Contents: Computer-aided design methodology. The place of CAD in an automated system for technological preparation of production. Methods for computer-aided design of technological processes. Algorithmization of</p>						v					v	

				<p>technological design problems. Basic functions and purpose of CAD. CAD subsystems and means of supporting them. Stages of CAD development. CAD of technological processes of mechanical processing. Automation of design of technological operations. CAD of technological assembly processes. Automation of fixture design. CAD cutting tools.</p>													
		PD	HsC	<p>Industrial Practice I</p>	<p>Purpose: to consolidate knowledge by studying general professional and special disciplines of the educational program and gain skills in the field of technological processes of mechanical engineering production.</p> <p>Contents: Introduction. Safety precautions. Secondary training at the workplace. History and structure of the practice base. Main equipment in the technological process. Basic hypotheses and assumptions for the strength of materials. Fatigue strength of materials. Classification and basic requirements for machine parts and assemblies. Principles and methods of design, development stages. Fundamentals of</p>	4						v	v				

				metallurgical production. Foundry technology. Technology of metal forming. Welding technology. Cutting processing methods.													
		PD	EC	Computer Modeling in SolidWorks	Purpose: To develop in students a complex of knowledge and practical skills in using computer-aided design methods and tools when designing mechanical engineering products in the SolidWorks environment. Contents: SolidWorks Interface. Setting up the SolidWorks work environment. Coordinate systems. Management and shift. Graphic primitives. Entering commands. Types and sections. Surfaces. Editing edges. Principles of 3D construction. Dimensioning. 3D assembly modeling. Systems Analysis Engineering (CAE). Finite element method. SolidWorks Simulation structural analysis system. Material properties used in SolidWorks Simulation. Types of fastenings. Loads. Rules for preparing design documentation.	5				v	v						
		PD	EC	Calculation and Design of Machine Engineering	Purpose: Formation of student competencies in the field of design of mechanical engineering products and						v	v					

				Products	methods of engineering calculations. Contents: Manufacturability of product design. Types of products. Basic requirements for product design. The choice of materials for parts when designing products. Basic criteria for the performance and calculation of machine parts. Ensuring the reliability and durability of products during design. Calculation of quantitative indicators of reliability of non-repairable and repairable products. Calculations of strength and rigidity of structural elements during their design. Calculation of parts for strength under static loads and alternating stresses. Calculation of parts for vibration and shock loads.												
10	Modern Methods of Design and Production of Machine Engineering Products	PD	EC	Design and Production of Pumps and Valves	Purpose: to develop students' knowledge of the general characteristics and designs of pumps and shut-off valves; acquisition of skills in calculation and design of pumps and its components. Contents: Classification of pumps and fittings, main components and parts of pumps, their hydraulic characteristics. Types of design of pumps, basics of assembly	6								<b>v</b>			

				and features of calculation of the pump casing, pump covers, efficiency. Classification of fittings: blocking, adjustment, safety, control.													
	PD	EC	Production of Welded Constructions	Purpose: Acquiring knowledge about production technologies of various types of welded structures when solving specific problems. Contents: Principles of classification, types of welded structures and features of their work. Materials for the manufacture of welded structures. Manufacturing technology of welded structures. Heat treatment and inspection of welded joints. General issues of designing the manufacturing process of welded structures. Development of a technological process for assembling and welding welded structures. Fundamentals of designing workshops, sections, installation sites.							v						
	PD	HsC	Industrial Practice II	Purpose: To consolidate knowledge and in-depth study of the practical activities of engineering production enterprises/plants. Contents: Introduction. Safety precautions. History, structure of the practice base. Objects of	6					v	v				v		

				standardization, certification, metrology. SolidWorks interface. Setting up the SolidWorks work environment. Model kits. Structural and instrumental materials. Theory of thermal and chemical-thermal processing of steels and alloys. Properties of molding materials, mixtures, their preparation. Technological process for manufacturing castings. Technological method of cutting processing. The essence of the cutting process, patterns. Cutting properties of metal-cutting tools. Manufacturability of product design. Choosing a method for obtaining blanks. Development of technological processing route. Selection and justification of equipment.												
		BD	EC	Fundamentals of the Theory of Foundry and Equipment	Purpose: Forms theoretical knowledge of the fundamentals of foundry production and equipment used in foundries. Contents: Model kits. Properties of molding materials and mixtures, their preparation. Technological process for manufacturing castings. Fillet. Allowances in casting models. Rod signs. Non-stick paints, pastes. Methods of supplying	3						v	v			

				metal to the mold and design of gating systems. Buckets for filling molds, automatic filling and dosing devices. Cooling of castings and knocking them out of molds. Cutting, cleaning and heat treatment of castings. Final delivery of castings. Methods for correcting casting defects. Solidification and cooling of castings. Special types of casting.													
		BD	EC	Computer-Aided Design of Welding Production	Purpose: Formation of knowledge about the basics of design automation, technological processes and technical devices of automated design systems used in welding production. Contents: Fundamentals of computer-aided design of welding processes. CAD technical support. Mathematical and software analysis of design solutions for welding processes at the macro and micro levels. Mathematical and software analysis of design solutions for welding processes at the functional and logical level. Mathematical and software for welding production at the system level (organization of welding production, maintenance and repair of welding equipment).						v	v					

				Mathematical support for computer graphics and geometric modeling based on the AutoCAD system.														
		PD	EC	Technology of Material Processing on Machine Tools	Purpose: Formation of technical education in the field of technological process of processing materials on metal-cutting machines. Contents: Concepts about the technology of processing materials on machine tools. Machines, precision processing. Production and technological processes for manufacturing products. Generation of metal waste. Metalworking machines, purposes, devices, technological capabilities. Technological processes for manufacturing parts. Technical requirements and accuracy standards. Types and forms of organization of the production process. Feasibility study of the effectiveness of the designated type of material processing.	5												v
		PD	EC	Heat Engineering and Heating Devices	Purpose: To develop students' knowledge and skills in the field of heat transfer theory and practice in designing furnaces for various purposes. Contents: Classification of fuel. Chemical composition, calorific value and													v

				<p>methods for its determination. Artificial fuels. The concept of the combustion process. Combustion of solid, liquid and gaseous fuels. Mechanics of gases. Three types of heat transfer and their characteristics. Heat transfer by thermal conductivity. Fourier equation. Two cases: stationary and unsteady thermal state. Heat transfer by convection. Heat transfer by convection in free and forced movement, in laminar and turbulent regimes. Heating devices.</p>														
		PD	EC	<p>Designing of Production Pieces</p>	<p>Purpose: In the current state of development of mechanical engineering, to teach the choice of methods for manufacturing workpieces in various types of production that place high demands on the precision characteristics of machined parts and identifying errors in the manufacture of machine parts. Contents: Basic methods of obtaining blanks. Procurement operations, methods of their implementation. Technological process of forged blanks. The influence of hot stamping on the mechanical properties and structure of metal. Clutch and its</p>	5												<b>v</b>

					technological process. Production of roll blanks. Receiving blanks by pouring into sand-clay molds. Casting design methods. Production of blanks from some other types of casting. Obtaining blanks using waste-free, material-saving production processes.												
		PD	EC	Control Systems and Organization of Welding Production	Purpose: Mastering technical education in control systems and organization of welding production. Contents: Technological preparation of production. Manufacturing program. Methods and techniques of labor organization. Planning and organization of assembly and welding areas, procurement work and calculation of welding modes. Design of workshops and areas, work of an intermediate warehouse and picking department. Qualification form of division of labor, Rationing of welding work and cost of products. Economic analysis and technical and economic indicators of the workshop.												v
11	Workshop Design and	PD	EC	Quality Management Systems in Machine	Purpose: Formation of theoretical knowledge and practical skills in monitoring the specified quality of mechanical	6						v		v			

	Production Equipment		Engineering	engineering products, assessing the causes of identified non-conformities and preparing proposals to improve product quality and save resources. Contents: The concepts of “quality assurance” and “quality management”. The role of quality management in the modern management system. Optimization of product quality requirements. Assigning tolerances to products taking into account the quality loss function. Standardization of dimensional accuracy of machine parts. Tasks and types of product quality forecasting, initial data. Methods for predicting product quality. Basic principles for the development of technical regulations and standards.												
	PD	EC	Theory of Founding	Purpose: To study the main physical and chemical phenomena during melting and cooling of castings, the causes of various defects in castings, rational ways to improve the quality of castings. Contents: Production of blanks using casting methods. Classification of methods for manufacturing casting molds. Hydraulic						v						

				<p>processes. The process of filling a mold with metal, calculating the time to fill the mold. Melt flow in the casting space of thin-walled ingots, filling of molds. Movement and removal of non-metallic particles in an alloy flow. Casting properties of alloys. Fluid retention. Solidification processes of alloys. Crystallization processes. Kinetics of bulk crystallization processes. Features of crystallization processes in steel ingots. Formation of graphite derivatives in solution.</p>													
		PD	EC	<p>Basics of Designing Mechanical Assembly Shops</p>	<p>Purpose: development of theoretical and practical knowledge and skills in the design of mechanical assembly shops, technological processes, calculation and selection of technological equipment and transport systems. Development of production system layout. Contents: Introduction. Workshop design sequence. Patterns of technological processes. Determination of the composition of the workshop. Determination of the need, quantity and range of main and auxiliary equipment. Metrological support tools.</p>	5										v	

					<p>Labor protection systems.  Calculation of composition and quantity of equipment.  Calculation of the number of employees. Principles of arrangement of technological equipment and organization of the workplace. Composition of auxiliary systems. Lifting and transport equipment.  Development of production system layout.</p>													
		PD	EC	<p>Designing and Organization of Assembly and Welding Complexes</p>	<p>Purpose: to develop theoretical and practical knowledge among students about the basic principles of designing factories and welding production areas, the ability to carry out calculations of individual subsystems of assembly and welding structures and complexes using modern tools.  Contents: Introduction. The role of technological design in organizing the production process of welded structures  Manufacturing of beam, frame and lattice structures.  Manufacturing of oversized sheet structures and pressure vessels. Manufacturing of hull transport structures. Main directions of optimization of production design processes.</p>							v					v	

					Specialization and cooperation in the production of welded structures. Spatial arrangement of the production process. Features of the design of auxiliary departments and services of the machine-building complex. Quality control in welding production.												
		PD	EC	Design of Technological Equipment	Purpose: building theoretical knowledge and practical skills in calculation and selection of technological equipment, classification and technical and economic indicators. Contents: Introduction. Technological equipment and its classification. Operability, efficiency, reliability and types of failures of machine tools. Occupational safety when working on the machine. Principles of installing blanks on devices. Fastening workpieces. Machine clamping devices. Methods for calculating clamping forces. Device batteries. Devices that coordinate the position of the cutting tool. Devices for drilling, turning, milling, etc. machines.	5					v	v					
		PD	EC	Quality Management Systems for Welding	Purpose: Formation of knowledge and skills in the field of control systems and technological processes of						v						

				Production	welding production, production of various types of welded structures in the conditions of single small-scale, large-scale and mass production. Contents: Measures to improve production operations to introduce new advanced technology. Technical control of product quality compliance with established standards. Qualimetric assessment of welded joints, development of measures to prevent defects in welded structures and selection of the optimal technology for their elimination. Justification for the choice of methods, equipment, apparatus and devices for testing metals and welded joints. Preparation of documentation for welding quality control.												
		PD	EC	Device and Purpose of Metal-Cutting Machines	Purpose: students obtain knowledge about the design, technological adjustment and operation of metal-cutting machines, to know the methodology for calculating typical units and mechanisms of metal-cutting machines. Contents: Classification, marking, general structure of metal-cutting machines. Kinematic diagrams, typical	6					v	v					

					gears and their gear ratios. Main components and mechanisms of the machine. Lathes. Purpose, classification and design features of CNC machines. Drilling and boring group machines. Milling machines. Grinding machines. Gear processing machines. Aggregate machines. Multi-purpose machines. Machine tools for electrophysical and electrochemical processing methods. Robotic technological complexes. Organization of the machine operator's workplace. Means ensuring labor safety.												
		PD	EC	Technological Equipment of Machine-Building Production	Purpose: to give students knowledge on the equipment of modern machine-building industries, on making a rational choice of technological equipment for performing a technological process, to instill skills in choosing equipment for implementing technological processes. Contents: General information about metal-cutting machines. Equipment for metal cutting. Equipment for processing body parts. Equipment for electrophysical and electrochemical processing. Equipment for procurement production. Equipment for						v	v					

				welding production. Pressure processing equipment. Equipment for laser processing. Load-lifting machines. Cargo moving machines. Industrial robots and manipulators. Designs and equipment of automatic lines.														
		PD	EC	Design of Actuators in Machine Engineering	<p>Purpose: Formation of a body of knowledge on the basics of calculation and design of machine and mechanism drives, using the acquired knowledge in the development of new equipment in the field of mechanical engineering.</p> <p>Contents: Design of components, structure and characteristics of various drives, areas of application. Algorithm for designing machine and mechanism drives. Comparative characteristics of various types of drives. Operating principle, basic concepts, characteristics and classification of volumetric drives. Block diagrams and components of the drive. Energy calculation of the drive and choice of displacement motor. Calculation of basic parameters and selection of standard sizes of hydraulic machines and hydraulic devices.</p>	5												



13	Module of Final Certification	PD	HsC	Pre-degree or Industrial practice	<p>Purpose: students receive an in-depth study of mechanical engineering production, organization of the technological process of manufacturing parts and components for machines and equipment.</p> <p>Contents: Introduction. Safety precautions. General information about control systems. International designation and types of CNC machines. Main parts and mechanisms of machine tools. The state and prospects of automation of design and technological preparation of production and technological processes in the engineering industry. General provisions and features of the design process of mechanical assembly shops. The principle of organizing mechanical production. Design of components, structure and characteristics of various drives, areas of application.</p>	10									v	v	v	
				Writing and Defending a Thesis, a Graduate Work, or Preparing and Passing a	Analyzes existing technologies, develops new technologies for processing a given object. Justifies the technical and economic indicators of the project. Forms knowledge of the use of modern literature. Applies new and information technologies at	8									v	v	v	

				Comprehensive Exam	machine-building enterprises. Gives an idea of the graphic part of the project, illustrating new design elements in equipment, fixtures, and tools.												
					<b>Total</b>	<b>240</b>											

## 5. SUMMARY TABLE ON THE VOLUME OF DISBURSED CREDITS IN THE CONTEXT OF EP MODULES

Course of study	Semester	Number of modules to be mastered	Number of subjects studied			Number of credits KZ					Total in hours	Total credits KZ	Quantity	
			OC	HsC	EC	Theoretical training	Physical training	Educational practice	Industrial practice	Final certification			Exam	D. cr.
1	1	4	5	1	1	28	2				900	30	5	2
	2	5	3	2	2	27	2	1			900	30	5	2
2	3	5	2	3	3	28	2				900	30	6	2
	4	6	3	1	2	24	2		4		900	30	5	1
3	5	4		1	5	30					900	30	6	
	6	3			6	24			6		900	30	6	
4	7	2			4	21					630	21	4	
	8	3			4	21					630	21	4	
	9								10	8	540	18		
Total						203	8	1	20	8	7200	240	40	8

## 6. STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION

<p><b>Learning Strategies</b></p>	<p>Student-centered learning: the learner is the center of teaching/learning and an active participant in the learning and decision-making process.</p> <p>Practice-oriented learning: focus on the development of practical skills.</p>
<p><b>Teaching methods</b></p>	<p>Conducting lectures, seminars, various types of practices with:</p> <ul style="list-style-type: none"> <li>• application of innovative technologies;</li> <li>• problem learning;</li> <li>• case study;</li> <li>• work in a group;</li> <li>• discussions and dialogues, quizzes;</li> <li>• presentations;</li> <li>• lectures with analysis of specific situations;</li> <li>• visualization lectures;</li> <li>• lectures-consultations;</li> <li>• round table;</li> <li>• situational analysis;</li> <li>• analysis of production documentation;</li> <li>• solution of situational problems.</li> </ul> <p>rational and creative use of information sources:</p> <ul style="list-style-type: none"> <li>• multimedia educational programs;</li> <li>• electronic textbooks;</li> <li>• digital resources.</li> </ul> <p>Organization of independent work of students, individual consultations.</p>

<p><b>Monitoring and assessing the achievability of learning outcomes</b></p>	<p>Current control on each topic of the discipline, control of knowledge in classroom and extracurricular activities (according to the syllabus). Assessment forms:</p> <ul style="list-style-type: none"> <li>• survey in the classroom;</li> <li>• testing on the topics of the academic discipline;</li> <li>• test papers;</li> <li>• protection of independent works;</li> <li>• discussions;</li> <li>• colloquia;</li> <li>• essays, etc.</li> </ul> <p>Midterm control at least two times during one academic period within the same academic discipline.</p> <p>Intermediate certification is carried out in accordance with the working curriculum, academic calendar. Формы проведения:</p> <ul style="list-style-type: none"> <li>• exam in the form of testing;</li> <li>• oral exam;</li> <li>• a written exam;</li> <li>• defense of term papers (projects);</li> <li>• protection of practice reports;</li> <li>• differentiated credit.</li> </ul> <p>Final state certification.</p>
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## 7. EDUCATIONAL AND RESOURCE SUPPORT OF THE EP

<p><b>Information resource center</b></p>	<p>There are 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC) in the structure of the OIC. The network infrastructure of the JIC is based on 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4.3 format scanners. JIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system.</p> <p>The library fund is reflected in the electronic catalog available to users on the site <a href="http://lib.ukgu.kz">http://lib.ukgu.kz</a> on-line 24 hours 7 days a week.</p> <p>Thematic databases of their own generation have been created: "Almamater", "Proceedings of scientists of the South Kazakhstan State University", "Electronic archive". Online access from any device 24/7 via the external link <a href="http://articles.ukgu.kz/ru/ppp">http://articles.ukgu.kz/ru/ppp</a>.</p> <p>Working with catalogs in electronic form. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKSU in Print", "Readers", "SKR".</p> <p>The JIC provides its users with 3 options for accessing its own electronic information resources: from the "Electronic Catalog" terminals in the catalog hall in the JIC subdivisions; through the information network of the university for faculties and departments; remotely on the library website <a href="http://lib.ukgu.kz">http://lib.ukgu.kz</a>.</p> <p>Access to international and republican resources is open: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in open access, "Zan", "RMEB", "Adebiet", Digital library "Aknurpress", "Smart-kitap", "Kiap.kz", etc.</p> <p>For persons with special needs and disabilities, the CRC has adapted the library website for the work of visually impaired users.</p>
<p><b>Material and technical base</b></p>	<ul style="list-style-type: none"> <li>• academician A.I.Ainabekov Educational and Research Laboratory of Mechanical Testing;</li> <li>• Specialized Laboratories:</li> <li>• Information and communication technologies;</li> <li>• Physics;</li> <li>• Laboratory "Module of electrical machines";</li> <li>• Laboratory "Module of electrical engineering and fundamentals of electronics";</li> <li>• Engineering computer graphics;</li> <li>• Standardization, certification and metrology;</li> </ul>

	<ul style="list-style-type: none"> <li>• Test center "SAPA";</li> <li>• Testing regional laboratory of engineering profile "Structural and biochemical materials" (IRLIP);</li> <li>• Educational laboratory "Theory of mechanisms and machines";</li> <li>• Educational laboratory "Materials science and foundry processes";</li> <li>• Educational laboratory "Technology of mechanical engineering";</li> <li>• Educational laboratory "Fundamentals of design and machine parts";</li> <li>• Educational and scientific workshop of mechanical engineering technology;</li> </ul> <p><b>UNPK base:</b></p> <ul style="list-style-type: none"> <li>• KARLSKRONA LC AB LLP;</li> <li>• KAZMEDPRIBOR Holding LLP;</li> </ul> <p><b>Practice bases:</b></p> <ul style="list-style-type: none"> <li>• JSC "Kardanval";</li> <li>• KAZMEDPRIBOR Holding LLP</li> <li>• Shymkent Plant Etalon LLP</li> <li>• KazTermoplast LLP</li> <li>• Electroapparat Plant LLP</li> <li>• JSC "Lenger machine-building plant"</li> <li>• Sona Sroy LLP</li> <li>• NPO Kazgeomash LLP</li> <li>• Asia Trafo LLP</li> <li>• KazBuildPartner LLP</li> <li>• KazFerroGroup LLP</li> <li>• Shymkent Temir LLP</li> <li>• DanaTrade LLP</li> <li>• MedComfort LLP</li> <li>• MEDICAL DEVICES LLP</li> <li>• Kentau Transformer Plant LLP</li> </ul>
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## APPROVAL SHEET

For the EP «6B07120 – Machine Engineering»

Director of AID \_\_\_\_\_ A.Naukenova

Director of ASD \_\_\_\_\_ U.Nazarbek

Director of DEC \_\_\_\_\_ T.Bazhirov

## **REVIEW**

of the educational program 6B07120 "Machine Engineering"  
drafted at the M.Auezov SKU, Shymkent

### **1. Brief description of the company and the profile of its activities**

LLP «KARLSKRONA LC AB» is a manufacturer of pumping, electrical, non-standard equipment and shut-off and control valves used in the field of water supply, water treatment, heating, sewerage, the company also cooperates and supplies equipment to organizations of subsurface users and other industries.

LLP «KARLSKRONA LC AB» pays great attention to the development of its Service Service, expanding the range of services provided and improving the skills of employees. The plant is equipped with advanced technologies and modern engineering equipment, including metalworking machines and machining centers. LLP «KARLSKRONA LC AB» is an authorized service partner of the world's largest equipment manufacturers.

### **2. Relevance and importance of the EP**

As a result of the adoption of the State Program of Industrial and Innovative Development of Mechanical engineering of the Republic of Kazakhstan, six branches of mechanical engineering were declared priority. It was decided to provide these industries with benefits as a priority and create conditions for their development. According to industry experts, two groups of problems have the greatest impact on the development of mechanical engineering: personnel and technical equipment of enterprises.

The demand for specialists of the EP 6B07120 "Machine Engineering" is related to the needs of the Southern region and the Republic of Kazakhstan as a whole in highly qualified managerial, scientific and pedagogical personnel in the field of technological processes of machine-building industries, with in-depth theoretical and practical training in the field of mechanical engineering, with a high level of professional culture, including the culture of professional communication, with a civil position, able to formulate and practically solve modern problems of the development of mechanical engineering, carry out production, management, scientific and pedagogical activities. Within the framework of this educational program, highly qualified specialists are trained who are able to come up with a new product or technical idea, carry out all design and technological work on its implementation, and introduce what has turned out into production.

In the near future, specialists who have the skills to work with modern machine-building equipment, control programs and the ability to work in conditions of uncertainty and risks in the market of machine-building products will be in demand. In connection with the above circumstances, we believe that the EP 6B07120 "Machine Engineering" is relevant, and graduates will be in demand and easily find a job at modern machine-building enterprises.

### **3. Learning outcomes and competencies, their relationship to the demands of the labor market**

Learning outcomes are presented in all modules and components of the EP and are aimed at obtaining general and professional competencies by students. The

competencies of the graduate in the EP "Machine Engineering" meet the expectations and requirements of modern machine-building industries. I would especially like to mention such key competencies as:

- perform mathematical modeling of processes and objects based on standard computer-aided design and research packages;
- use the organizational and legal basis of management and business activities;
- study the research of problems in the field of management and marketing and use the results to improve the methods of enterprise management.

The modern enterprise, just, first of all, has to solve precisely the problems of automation of production processes and commercial activities. Therefore, the results of training and the competencies of the graduates of the EP are also very relevant.

#### **4. Availability of components that develop practical skills**

A number of components of the EP modules are aimed at acquiring students' practical skills in the specialty. These are disciplines related to the design of technological processes, automation of the design and design of mechanical engineering products. As a result of completing course projects and mastering disciplines, students gain practical skills in developing advanced technological processes and optimal production modes for simple types of products or its elements.

Practical training after each course of theoretical training, as well as pre-graduate practice, allows you to consolidate your knowledge and acquire practical skills in the workplace. As the bases of the proposed production practice, modern machine-building enterprises are presented, the profile of which fully corresponds to the direction of training in the educational program.

#### **5. Content of the educational program (modules, disciplines)**

The EP "Machine Engineering" is developed on the basis of a modular approach to the construction of a training program for the EP. It contains general, interdisciplinary specialty modules and additional modules that go beyond the qualification. Each group of modules is aimed at obtaining the relevant competencies presented in the corresponding tables "Content of modules". As a result of mastering each module, students acquire certain competencies. The disciplines are organized into modules in order to obtain certain professional competencies. The modules of the specialty include disciplines that meet the modern requirements of machine-building enterprises. It is particularly necessary to note such important areas as automation of production and technological processes of design and production of engineering products, as well as issues of economics and business commercialization.

#### **6. Quality of the modular reference guide**

The module guide contains a description of the modules, the amount of credits and the weekly load of students. The content of the modules and the results of training aimed at obtaining professional and universal competencies of students are presented in detail. The relevant literature is indicated. Textbooks and manuals are recommended in the updated edition for the last 10 years, as well as textbooks and modern periodicals on casting and injection molding technology in English. The modules are designed taking into account the logical connection and sequence of studying disciplines, which allows you to gradually increase the level of acquired competencies.

## **7. Conclusion on the EP**

The educational program "Machine Engineering", developed at the M.Auezov SKU fully corresponds to this specialty, meets the requirements of the state standard of higher education (bachelor's degree), as well as the requirements of modern machine-building enterprises of the Republic of Kazakhstan and international standards of machine-building enterprises. The modular principle of building the EP and the competence-based approach allow students to gain in-depth professional knowledge, skills and abilities necessary for the rapid adaptation of a specialist in the conditions of modern production.

CEO  
«KARLSKRONA LC AB» LLP

U.Akhmetov

## **REVIEW**

of the educational program 6B07120 "Machine Engineering»

### **1. Brief description of the company and the profile of its activities**

"Kazakhstan plant of metal structures KazBuildPartner" has been operating since 2007, has a state license for the construction of civil, industrial and fire hazardous objects of the 2nd category. During its activity, KazBuildPartner has gained experience in the construction of various facilities. Such objects include: residential buildings, schools, recreation area facilities, gas stations, manufacturing of light and complex metal structures, gas stations, etc.

Company products:

- Welded I-Beams
- C-profile
- Beam cranes
- Overhead and gantry cranes
- Tanks and reservoirs rgs and rvs up to 20 000 m<sup>3</sup>
- Non-standard equipment

Company Services:

- Development of KM and KMD drawings
- Sheet bender
- Guillotine
- Plasma cutting of metal with 3D support
- Construction and installation works

### **2. Relevance and importance of the EP**

Modern trends in the development of production in the southern region of the Republic of Kazakhstan are defined in a number of successive programs of industrial and innovative development of our state. One of the important priority areas is the development of domestic engineering. The level of development of the machine-building industry is one of the most important indicators of the state economy. As you know, mechanical engineering includes a number of sub-sectors, including such important ones for our region as metallurgical, chemical, energy, lifting and transport, railway, tractor, agricultural, aviation engineering, electrical, electronic and radio industries, as well as the automotive industry, which has received a powerful impetus. Therefore, the problem of training personnel for modern machine-building enterprises is very relevant.

The demand for the EP 6B07120 "Machine Engineering", which covers all branches of the national economy, is determined by the need of modern enterprises for specialists in the organization and management of machine-building workshops and factories, as well as specialists directly working on modern machine tools and automated complexes. The level of development of the machine tool industry has determined the need to train highly qualified specialists who are able to work on multi-purpose equipment with software control. Graduates of the EP 6B07120 "Machine Engineering" are subject to high requirements both in terms of general

engineering training, and in the field of design and technological preparation of production, development of technological processes for mechanical processing of parts, as well as assembly processes, bench tests and running-in of machines. Due to the focus of the EP on obtaining relevant competencies for graduates, it will be in demand, especially in the coming years.

### **3. Learning outcomes and competencies, their relationship with the needs of the labor market**

The results of training are presented in all modules and components of the EP and are aimed at obtaining general and professional competencies of students. The competence of the graduate of the EP 6B07120 "Machine Engineering" corresponds to the expectations and requirements of modern production facilities of the machine-building profile. It is necessary to emphasize the results of training and key competencies:

- solving problems in professional activities in the field of metalworking machines, conducting a qualitative analysis; fundamentals of designing technological equipment, methods of placing workpieces, applying knowledge in the field of application of universal Composite devices, providing basic schemes of operation of the main equipment, tools, equipment, design features of structures made of composite materials;

- information and computational literacy, the ability to generalize, analyze and perceive information, set Purposes and choose ways to achieve them;

- the ability to reliably and critically use modern information and digital technologies for work, leisure and communication, acquire the skills of using, restoring, evaluating, storing, producing, presenting and exchanging information through a computer, communicating and participating in communication networks using the Internet in the field of professional activity.

- development of a methodology for mastering new products and technologies; use of packages of modern application programs to solve practical tasks related to the selection of test products; mastering methods of taking into account technological factors that cause errors in the preparation of products, reducing the impact of technological factors that cause errors in the preparation of products;

- monitoring the quality of work, making the necessary adjustments to the methods and methods of adjustment; identification and detection of defects in the connection and operation of the electrical part of metal cutting machines using electrical measuring devices and devices.

A modern enterprise, in conditions of fierce competition, must first of all solve the problems of automation of the production process and commercial activities. Therefore, the educational results and competencies of graduates of the EP are very relevant.

### **4. Availability of components that develop practical skills**

A number of components of the EP modules are aimed at acquiring students' practical skills in the specialty. These are disciplines related to the design of technological processes, automation of the design and design of tools and products of mechanical engineering. As a result of completing course projects and mastering

disciplines, students gain practical skills in developing advanced technological processes and optimal production modes for simple types of products or its elements.

Passing the practical training after each course of theoretical training, as well as pre-graduate practice, allows you to consolidate the acquired knowledge and acquire practical skills in the workplace. As the bases of the proposed production practice, modern machine-building enterprises are presented, the profile of which fully corresponds to the direction of training in the educational program.

### **5. Content of the educational program (modules, disciplines)**

The EP 6B07120 "Machine Engineering" is developed on the basis of a modular approach to the construction of a training program in the specialty of Machine engineering. It contains general, interdisciplinary, specialty modules and additional modules that go beyond the qualification. Each group of modules is aimed at obtaining the relevant competencies presented in the corresponding tables "Content of modules". As a result of mastering each module, students acquire certain competencies. The disciplines are coordinated with the specialists of JSC "Kardanval" and are aimed at acquiring certain professional competencies. The modules of the specialty include disciplines that meet the modern requirements of machine-building enterprises. It is especially necessary to note such important areas as automation of production and technological processes of design and production of machine-building products, as well as issues of economics and business commercialization.

### **6. Quality of the modular reference guide**

The module reference book contains a description of modules, disciplines, the amount of credits and the workload of students in hours. The modules are designed taking into account the logical connection and sequence of studying disciplines, which allows you to gradually increase the level of acquired competencies.

### **7. Conclusion on the EP**

The EP 6B07120 "Machine Engineering", developed at the M.Auezov SKU, meets the requirements of the state standard of higher education (bachelor's degree), the Professional Standard "Mechanical Engineering", the Industry qualification framework for the industry "Mechanical Engineering", as well as the requirements of modern machine-building enterprises of the Republic of Kazakhstan and international standards of machine-building enterprises.

The educational program 6B07120 "Machine Engineering" is aimed at training modern specialists who, in accordance with the Atlas of Future Professions and Competencies of the Republic of Kazakhstan, will be in demand in the near future.

## **REVIEW**

### **for the educational program 6B07120 «Machine Engineering»**

#### **1. Brief description of the enterprise and the profile of its activities**

LLP «KAZMEDPRIBOR HOLDING», which started its activity from a small workshop for the production of medical furniture, today is the largest plant of medical equipment in Kazakhstan.

The medical equipment plant produces more than 300 types of products: from simple items of medical furniture to high-tech modern equipment

The production of «KAZMEDPRIBOR HOLDING», LLP complies with international standards. The company has certificates ST RK ISO 9001: 2016, as well as the international certificate ISO 13485: 2016 «Production of medical furniture, equipment, medical equipment and medical products», which allows exporting products to the CIS countries and the European Union.

#### **2. The relevance and importance of the EP**

The educational program 6B07120 «Machine Engineering» is in demand in the Republic of Kazakhstan, involving the development of the engineering industry in the South Kazakhstan region.

The development of the economy focused on the Kazakhstani market, the need to move it to a new industrial level is one of the primary tasks of the education system and the provision of the engineering industry with qualified personnel with a high level of professional competence, capable of independently formulating purposes, setting tasks and organizing their high-quality solution.

Of course, under the current conditions, the machine-building industry of Kazakhstan has a high need for specialists of various levels, ensuring the growth and development of enterprises and the country's economy as a whole.

During the development of high technologies in the machine-building industry, a mechanical engineer is required not only to fulfill production, design, and research tasks, but also organizational, managerial and economic activities aimed at manufacturing competitive machine-building products based on the use of modern design methods. Only with high-quality economic and managerial training of bachelors of mechanical engineering, who will be competent in the field of economics and management, it is possible to effectively manage modern engineering enterprises.

The production process and the management process have a financial and economic component. Only economically competent calculations of design and production activities will create a prospect for the development of an enterprise. It is the economic and managerial training of bachelors in mechanical engineering that will be the main factor in the formation of universal competence, which is so necessary for future engineers.

#### **3. Learning outcomes and competencies, their relationship with the demands of the labor market**

The educational program contains learning outcomes and competencies, namely:

- to develop technical specifications for the design of special equipment, tools and devices provided by the technology, technical specifications for the production of non-standard equipment, automation and mechanization; is able to determine the order of performance of work and the operational route of processing parts and assembling products;

- to apply deep natural science, mathematical and engineering knowledge in the creation of new competitive technologies for the manufacture of parts and assembly of machines;

- to carry out and justify engineering projects for the creation of complex competitive mechanical engineering products and technologies for their production, including using modern CAD / CAM / CAE products; develop and implement control programs for parts processing

- to provide modeling of technical objects and technological processes using standard packages and computer-aided design tools, to carry out experiments according to specified methods with the processing and analysis of results.

- to set and solve innovative engineering problems using system analysis and modeling of objects and processes of mechanical engineering;

- analyze and process technical and economic data, carry out production and technical and economic calculations, estimate production and non-production costs, be able to solve problems with the creation and reorganization of production sites, plan the work of personnel and the wages fund;

Competencies include knowledge and understanding (theoretical knowledge of the academic area, the ability to know and understand), knowledge of how to act (practical and operational application of knowledge and skills to specific situations) and knowledge of how to be (value aspect as an integral part of living with others in a social context). Types of professional practices, these are included in the corresponding modules of the educational program, depending on the relationship and unity of Purposes with academic disciplines. Moreover, each type of professional practice can refer to different modules.

#### **4. The presence of components that develop practical skills**

The main educational program for the training of an engineer is developed on the basis of this state educational standard for a graduate and includes a curriculum, curriculum of academic disciplines, programs of educational and industrial practices. All student practices are aimed at consolidating the theoretical knowledge gained in the learning process, acquiring practical skills and competencies, as well as mastering advanced experience.

The EP includes components that form professional competencies that develop practical skills - Technological processes of machine-building production, Systems of the Computer Aided Design of Technological Processes, Computer Modeling in SolidWorks, Designing of Production Pieces, Fundamentals of Design of Mechanical Assembly Plants, Fundamentals of the Theory of Cutting and Cutting Tolls, Fundamentals of cutting theory and metal-cutting tools, Structure and Purpose Metallgehäuse Machines Design and Production of Pumps and Valves.

## **5. Content of the educational program (modules, disciplines)**

The content of the educational program for the compulsory component of the curriculum corresponds to the State Educational Standard of the Republic of Kazakhstan and includes modules of the compulsory component. The basic profile module is aimed at forming fundamental knowledge of the specialty for the future bachelor. The individual trajectory module defines a list of special competencies in relation to the professional activity of a mechanical engineer.

Students receive in-depth knowledge depending on the chosen training profile, which makes them prepared for solving problems that are urgent for modern mechanical engineering and in demand in the field of modern equipment and technology of engineering and welding production, the latest processing technologies and the production of new materials, including nanostructured ones.

Disciplines are agreed with the specialists of «KAZMEDPRIBOR HOLDING» LLP and are aimed at acquiring certain professional competencies

## **6. The quality of the modular guide**

The modular reference book of the educational program contains forms for describing each module, allowing students to familiarize themselves with its content, learning outcomes, the number of credits with the allocation of hours for the specified types of classes (lectures, practical, laboratory, IWS), prerequisites, postrequisites responsible for the module.

## **7. Opinion on EP**

In general, the educational program of higher education in the field of training 6B07120 «Machine Engineering» (bachelor's level) has an integrated and targeted approach to training a qualified specialist with certain professional skills and competencies necessary for further professional activity in the relevant field of training.

CEO of  
«KAZMEDPRIBOR HOLDING» LLP

K.Kanatbekuly

## **REVIEW**

### **for the educational program 6B07120 «Machine Engineering»**

#### **1. Brief description of the enterprise and the profile of its activities**

«Asia Trafo» LLP is the largest transformer plant in Central Asia, capable of producing 120 high-power transformers per year.

The main products of the plant are oil-immersed power transformers and autotransformers of voltage class 110, 220, 500, 750 kV with power up to 500 MVA, as well as reactors. The products of the enterprise are manufactured according to their own unique patented technologies.

Sales markets: Kazakhstan, Russia, Iran, Uzbekistan, Kyrgyzstan, as well as other CIS countries.

#### **2. The relevance and relevance of the EP**

Mechanical engineering is the most important branch of the economy of any industrially developed state. Manufacturing all kinds of equipment, machines, machine tools, devices, as well as goods for the population, mechanical engineering ensures the stability of the agro-industrial complex, energy and metallurgical sectors, transport and other key sectors of the economy. Sustainable development and reliable operation of mechanical engineering largely determine the energy and material consumption of the economy, labor productivity, the level of environmental safety of industrial production and, ultimately, the economic security of the country. Today in Kazakhstan's mechanical engineering there are systemic problems associated with an insufficient level of investment attractiveness of the industry, a low level of competitiveness of products in the domestic and foreign markets, and a shortage of qualified personnel.

Students of this specialty receive powerful basic training of a specialist of the future, based on a harmonious combination of humanitarian, natural science and professional components of higher professional education. This ensures the possibility of high-quality performance of the following types of professional activities: research; design and engineering; production and technological; organizational and managerial.

The volume and depth of the study of issues, the acquisition of practical engineering skills allow graduates of the specialty to quickly show themselves in the profession, thereby providing an opportunity for career growth. Competent language training and participation in international competitions of student work allows the graduate to expand the geography of his interests, to focus in the learning process not only on the domestic, but also on foreign labor markets.

#### **3. Learning outcomes and competencies, their relationship with the demands of the labor market**

The competencies of the graduate in EP 6B07120 «Machine Engineering» meet the expectations and requirements of modern engineering industries. As a result of studying the discipline, the student must have the following competencies:

- choose a method for obtaining blanks and their basing schemes, draw up routes for the manufacture of parts and design technological operations;

- to choose the main and auxiliary materials and methods for the implementation of the main technological processes and apply progressive methods of operating technological equipment in the manufacture of mechanical engineering products;
- use modern information technologies (Compass, Autocad, Solidworks, etc.) in the design of mechanical engineering products, production;
- to develop and apply design automation tools, introduce progressive technological processes, types of equipment and technological equipment, automation and mechanization means, optimal production modes for products and all types of work of various complexity, ensuring the production of competitive products and reducing material and labor costs for its manufacture ;
- participate in the development of programs and methods for monitoring and testing machine-building products, technological equipment, diagnostics, automation and control, carry out metrological verification of measuring instruments for the main indicators of the quality of manufactured products, in assessing its marriage and analyzing the causes of its occurrence, developing measures to prevent it and elimination.

#### **4. Availability of components that develop practical skills**

The educational program is provided with educational and methodological documentation and materials for all training courses, disciplines of the main educational program.

There are specialized auditoriums, laboratories, contracts with enterprises on the employment of students for the duration of the internship for conducting educational and industrial practices, as well as research and development work for students.

In the implementation of educational activities in the EP, it is envisaged to conduct educational, industrial and pre-diploma practices:

- educational practice for obtaining primary professional skills and abilities, including primary skills and abilities of research activities;
- industrial practice to obtain professional skills and professional experience;
- pre-diploma practice is carried out to perform the final qualifying work and is mandatory.

In order to improve the level of preparation of a bachelor of mechanical engineering for practical activities, a new methodological support of the discipline has been carried out, which ensures teamwork, project activities, and business planning of students.

#### **5. Content of the educational program (modules, disciplines)**

The content of the educational program is determined by the regulatory requirements of the Ministry of Education and Science of the Republic of Kazakhstan and the internal regulations of the university.

The content of the educational program 6B07120 «Machine Engineering» a complete list of basic and specialized disciplines; the necessary integrity of the educational program is provided, combining the fundamentality of training with the interdisciplinary nature of the specialist's professional activity; the relationship between the classroom load and the independent work of a bachelor has been determined; a reasonable relationship has been established between the theoretical and practical components of the content of education; the most effective types of

training sessions, educational technologies from the point of view of achieving the set Purposes are determined.

Disciplines are coordinated with the specialists of «Asia Trafo» LLP and are aimed at acquiring certain professional competencies.

#### **6.The quality of the modular guide**

The modular reference book is a necessary component of credit technology of education, which ensures the eligibility of the teacher and the learning path. The modular reference contains data about the teacher, the distribution of credits, types of classes, the level of the module, the number of credits, the form of training, prerequisites and post-requisites of the module, the content of the module, learning outcomes, and the form of final control.

#### **7.Opinion on OP**

6B07120 «Machine Engineering» educational program provides high-quality, advanced, multi-level education for all students and prepares future engineers.

Graduates of the program can possess deep professional knowledge, objectively assess the technical condition of technological equipment, including a wide range of machine tool systems and complexes.

As a result, the introduction of new educational and information technologies in the educational process and the formation of a single virtual educational space are currently the priority trends in the framework of the state program «Digital Kazakhstan».

CEO «Asia Trafo» LLP

O.Assanov

## **REVIEW**

of the educational program 6B07120 "Machine Engineering»  
of M.Auezov South Kazakhstan University

### **1. Brief description of the company and the profile of its activities**

Medcomfort Limited Liability Partnership was founded in 2016. The main activity of the company is the production of medical furniture, as well as the sale of medical equipment.

High quality products, strict adherence to deadlines and attention to the needs of customers have made it possible for us to create an extensive base of regular customers throughout the country.

Selling our products, we focus primarily on the request sent to us by the market. Therefore, all our products are of high quality and affordable. We use only modern machines and reliable and durable materials in the production process. At the same time, we are constantly introducing new technologies.

Today, we can offer our customers both economy-class medical furniture and more comfortable furniture for patients, which has a number of additional features and capabilities.

The main direction of our activity is the production of medical functional beds, gynecological chairs and operating tables, bactericidal irradiators. A wide price and functional range of our products will allow each customer to choose models that perfectly suit his needs and financial possibilities: from economical options to options with electric drives.

The company is also engaged in the production of medical furniture for massage rooms, treatment and dressing rooms, cosmetology rooms and furniture for sports medicine.

Since 2016, Medcomfort LLP has been successfully participating in public procurement conducted on electronic platforms. All contracts concluded in this way were fulfilled by the company with high quality and on time.

### **2. Relevance and importance of the EP**

The relevance of the EP is related to the need to train qualified bachelors in the field of mechanical engineering to perform strategically important tasks for the industrial development of the Republic of Kazakhstan. An optimally formed curriculum, including a combination of disciplines and practices, an in-depth scientific approach to the subjects studied, and the possibility of mastering foreign languages, positively characterizes the EP under consideration. The quality of the content component of the curriculum is beyond doubt. The composition of the disciplines provides not only the disclosure of the essence of the current industry problems of the machine-building complex, but also forms research approaches to their solution. The structure of the curriculum is logical and consistent. The demand for EP is conditioned by the increase in the competitiveness of bachelors in the specialty of mechanical engineering, who are in demand in the labor market, who possess all the knowledge and skills that are necessary in practice. These trends dictate the need for EP for the training of such specialists in higher educational institutions of the country.

### **3. Learning outcomes and competencies, their relationship to the demands of the labor market**

The educational program contains the results of training and competencies, namely:

- to solve problems in professional activities in the field of metalworking machines;
- apply knowledge in the field of the basics of designing technological equipment, methods of basing workpieces, the use of universal prefabricated devices;
- present the basic diagrams of the main equipment, tools, equipment, design features of structures made of composite materials;
- design mechanical assembly shops;
- master the terminology, basic concepts and definitions, solutions to the drawings of the main metric and positional problems and layout solutions.

### **4. Availability of components that develop practical skills**

A number of components of the modules of the educational program are aimed at acquiring students' practical skills in the specialty. The EP includes components that form professional competencies that develop practical skills – The design of technological equipment, Mechanical engineering technology, the device and purpose of metal-cutting machines, the Basics of interchangeability, the Production of welded structures, the Theory of welding processes, Structural materials and heat treatment.

Practice strengthens the knowledge and skills acquired by students as a result of mastering theoretical courses, develops practical skills and contributes to the comprehensive formation of general cultural and professional competencies of students. During the practice, the student acquires both universal (socio-personal and instrumental) competencies, as well as general professional and professionally specialized competencies necessary for the practical work of a bachelor in the educational program 6B07120 "Machine Engineering".

The EP provides for conducting all types of practice on the basis of concluded contracts with practice bases. The Purposes and objectives of the practice at different stages of training students differ from each other, but they are organically linked with other forms and methods of training. The practice is included in the training module with the disciplines, the theoretical knowledge of which it is intended to consolidate.

### **5. Content of the educational program (modules, disciplines)**

The EP "Machine Engineering" is developed on the basis of a modular approach to the construction of a training program for the EP. It contains general, interdisciplinary specialty modules and additional modules that go beyond the qualification. Each group of modules is aimed at obtaining the relevant competencies presented in the corresponding tables "Content of modules". As a result of mastering each module, students acquire certain competencies. The modules of the specialty include disciplines that meet the modern requirements of machine-building enterprises. It is especially necessary to note such important areas as automation of production and technological processes of design and production of machine-building products, as well as issues of development of technological processes of tool processing and calculation of welded parts of machines operating under dynamic loading conditions.

## **6. Quality of the modular reference guide**

The modular reference book of the educational program contains forms for describing each module, allowing students to get acquainted with its content, learning outcomes, the number of credits with the distribution of hours for the provided types of classes (lectures, practical, laboratory, SIW), prerequisites, post-prerequisites, responsible for the module. Each module is detailed with a form describing the components (disciplines) included in it, allowing students to get more in-depth acquainted with the annotation of the component, the list of topics of practical/seminar/laboratory classes, the number of credits, the conditions for obtaining them, prerequisites, post-prerequisites, the duration of the component, the list of necessary literature, the form of the final control.

## **7. Conclusion on the EP**

The EP 6B07120 "Machine Engineering", developed at the M.Auezov SKU, meets the requirements of the state standard of higher education (bachelor's degree), the Professional Standard "Mechanical Engineering", the Industry qualification framework for the industry "Mechanical Engineering", as well as the requirements of modern machine-building enterprises of the Republic of Kazakhstan and international standards of machine-building enterprises.

The EP 6B07120 "Machine Engineering" is built logically, which describes the disciplines that are necessary in the practical activities of the graduate and meet the current requirements of the labor market, when selecting for the position. In the context of the presented form, the educational program contains the learning outcomes that reveal the essence of each module.

Director, LLP «Medcomfort»

D.Katashov

**APPENDIX 2**  
**Expert opinion**  
**for the educational program 6B07120 "Mechanical Engineering"**

1. **The relevance of the EP** is due to the development of industrial and innovative production in our state. One of the directions is the development of domestic engineering. The level of development of the machine-building industry is one of the important indicators of the state economy. As you know, mechanical engineering includes a number of industries, including such important ones for our region as metallurgical, chemical, energy, hoisting and transport, railway, tractor, agricultural, aircraft engineering, electrical, electronic and radio industries, as well as received a powerful impetus - automotive industry. Therefore, the problem of training personnel for modern machine-building enterprises is very relevant.

2. **Compliance of the EP with the formulated Purposes, consistent with the mission of the university, the requests of employers and students**

The EP corresponds to the Purposes formulated in it and is consistent with the mission of the M.Auezov SKU on training specialists in the field of mechanical engineering based on the use of the achievements of science and technology, dynamism and advanced development of the national economy of Kazakhstan.

The presented Purposes of the EP are formulated and concretized in the context of students' requests, as they are formed on the basis of Dublin descriptors and are expressed through competencies: in the field of native language, foreign language, fundamental mathematical, natural science, technical, computer, educational, social (interpersonal, intercultural, civil), entrepreneurial, economic, cultural training, scientific research, additional and professional competencies in the field of mechanical engineering.

Employers' requests are specified in order to reflect the EP's ability to provide students with a solid training in mechanical engineering that will enable them to compete successfully in the labor market. Employers took an active part in the development of the educational program, with whom an employment contract was concluded on the passage of all types of practices.

1. **Compliance with the National Qualification Framework of the Republic of Kazakhstan.**

The National Qualifications Framework contains eight qualification levels, which corresponds to the European Qualifications Framework and the levels of education defined by the Law of the Republic of Kazakhstan "On Education". The educational program corresponds to the sixth level of qualifications of the NQF of the Republic of Kazakhstan and is necessarily agreed with potential employers and students.

2. **Reflection in the EP of learning outcomes and competencies based on the Dublin descriptors laid down in professional standards / industry frameworks.**

The educational program contains learning outcomes and competencies based on the Dublin descriptors, namely:

- A. knowledge and understanding;
- B. putting into practice the knowledge and ability to understand;

- C. ability to make judgments and formulate conclusions;
- D. communication skills;
- E. skills in the field of study, taking into account the three levels of training (bachelor's, master's and doctoral studies), as provided for in the terminology of the Bologna process.

The sectoral qualifications framework for standardization (draft) is undergoing the procedure of coordination and approval, from which the recommended titles of graduates in the EP of standardization and certification are included in the EP.

Thus, the EP was developed in accordance with the regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan, including standard curricula and standard programs of disciplines, in accordance with the rules of modular structuring, a competency-based approach, and taking into account the results of mastering the modules and the entire modular curriculum in credits of the Republic of Kazakhstan and ECTS.

Standard curricula are based on the principles of continuity, succession and adaptability, contain a list of disciplines, the number of credits, semester breakdown, types of classes and forms of control. All disciplines of the curriculum involve studying in semesters, taking into account the logical sequence based on prerequisites and postrequisites. In the structure of the curriculum there are 3 cycles of disciplines distributed between the compulsory and elective components. Along with this, the volume of loans, the terms of professional practice and the completion of term papers (projects) are reflected.

### **3. The structure and content of the EP, the application of the modular principle of their content**

The educational program has a modular training system. It contributes to solving the problems of systematization of knowledge, their best assimilation and consists in splitting information into certain doses - modules that determine the necessary controllability, flexibility and dynamism of the learning process. The module is not only a section of the educational program, but also a system based on the interaction of various methods and methods of educational activities that ensure the entry of this module into an integral learning system.

### **4. The presence in the EP of components for preparing for professional activities that develop key competencies, intellectual and academic skills, reflecting the changing demands of society, including the implementation of the presidential program for mastering three languages: Kazakh, Russian and English**

The EP is aimed at obtaining professional and general educational competencies, such as: general education, socio-ethical, economic and organizational and managerial, special and professional competencies, develops students' readiness to change social, economic, professional roles, geographical and social mobility in the face of increasing dynamism change and uncertainty.

The EP contains elements of the implementation of the presidential program for mastering three languages: Kazakh, Russian and English. The number of disciplines in English is 20%, in Kazakh - 50%, and in Russian - 30%.

## **5. The logical sequence of disciplines and the reflection of the main requirements in the curricula and training programs**

The sequence of modules/disciplines in the EP is logically justified, the principles of ensuring continuity, succession, accessibility and consistency of the content of education in curricula and training programs are implemented.

## **6. Reflection in the EP of the system for accounting for the workload of students and teachers in credits, its compliance with the parameters of the credit system of education**

The EP reflects the system for accounting for the workload of students and teachers in credits, through the formation of a summary table that reflects the amount of disbursed credits in the context of modules of the educational program and in a form that describes the structure of the module, including the number of credits for its development.

## **7. The presence in the programs of industrial practice to consolidate the theoretical material, expressed in the teaching load in credits**

The EP has a section on providing professional practices: their types, main typical places of organization and conduct, evaluation of results "which reflects the Purposes, objectives and results of professional practices for students of the EP, the workload in credits is given in a summary table reflecting the amount of mastered practice credits in section of the modules of the educational program.

## **8. Information about the teaching staff involved in the implementation of the EP**

Information about the teaching staff involved in the implementation of the EP is reflected in the module form, which describes each component of the module.

### **9. Qualification obtained as a result of mastering the EP**

The qualification obtained as a result of mastering the EP is a bachelor of engineering and technology in EP 6B07120 "Mechanical Engineering".

Recommendations:

1. For students studying "excellent", it is necessary to provide for the second production practice at innovative enterprises of the engineering industry abroad.
2. In order to involve students in the discussion of the EP, place the EP on the website of the department and take into account reasonable suggestions.

Chairman of the expert committee,

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Abzalova D.A.

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