Institute _____ **Energy and Mechanical engineering** _____

Department __ **Mechanical engineering** _____

EDUCATIONAL PROGRAM

6B07220 - Machines and technologies for processing new materials

the name of educational program

Code and name field of education:
6B07-Engineering, manufacturing and civil engineering
Code and classification direction of personnel training:
6B072- Manufacturing and processing
Group of educational programs:
B069 Production of materials (glass, paper, plastic, tree)
EP purpose: 6
EP type: 6
Period of study: 4 years
Volume of the credits: 240

Almaty 2023

Educational program 6B07220 - Machines and technologies for
(the name of educational program)
processing new materials was approved at the meeting of K.I. Satbayev KazNRTU Academic Council
Minutes 5 dated « 24 » November 2022.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council
Minutes 3 dated « 17 » November 2022.

Educational program 6B07220 - Machines and technologies for
(the name of educational program)
processing new materials code and name of the educational program developed by the academic committee in the direction «6B072- Manufacturing and processing»

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
Nugman E.Z.	Doctor PhD	Head of the Department of "Mechanical Engineering"	NAO KazNRTU named after K.I. Satpayev, Institute of Energy and Mechanical Engineering	
Teaching staff:				
Kerimzhanova M.F.	Candidate of Technical Sciences, Associate Professor	Professor	Department of Mechanical Engineering	
Uderbayeva A.E.	Doctor PhD	Assoc. Professor	Department of Mechanical Engineering	
Employers:				
Dyusembayev I.M.		Chief Engineer	Almaty plant "Electroshield"	
Students				
Akan A.		4th year student	Department of "Mechanical Engineering"	

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List of abbreviations and designate

ECTS European Credit Transfer and Accumulation System
BD Basic disciplines
HEI higher education institution
SOSE State obligatory standard of education
KazNTU Kazakh national research Technical University named after K.I. Satpaeva
MOP Modular educational program
NSC Non-profit joint stock company
GED General education disciplines
ED Educational program
MD Major disciplines
WC Working Curriculum
SIW Student's independent work
EMC Educational and Methodological Council
AC Academic Council

1 Description of educational program

EP 6B07220 - "Machines and technologies for processing new materials" is focused on the result of training, which forms professional competencies in accordance with the requirements of the labor market.

The objects of professional activity of the bachelor according to EP 6B07220 are machine-building plants, repair and mechanical bases of power systems, metallurgical enterprises, transport and automobile facilities, mining and processing industries, research organizations, design and technology organizations, design organizations, marketing and transport and operational services, service stations.

Bachelor in EP 6B07220 - "Machines and processing of new materials" can perform the following professional activities:

1. Design and technological development, implementation and operation of systemic, resource-saving technologies; development and implementation of technological processes for processing and assembling products; automation of machine-building production; creation of continuous flow production processes, automated complexes, flexible automated production; introduction of highly efficient means of technological equipment, ensuring the environmental friendliness of machine-building production.

2. Organizational and managerial: organization of the production process, organization of the work of performers; setting a goal and forming a management task related to the implementation of professional functions; organization of production service; management of the production process, taking into account technical, financial and human factors; development of control algorithms; accounting and reporting planning, development of a business plan for an enterprise, planning to improve production efficiency;

3. Experimental - research: the use of modern experimental methods for the study of processes occurring in machine-building production; research of new directions in the technology of modern mechanical engineering; study of types of processing in mechanical engineering; research of objects of automation in the field of mechanical engineering; scientific substantiation of methods for ensuring the quality of manufactured products and increasing labor productivity;

4. Design and engineering: development of advanced designs; optimization of design solutions, taking into account environmental and energy-saving technologies; examination of design and technological developments; development of draft, technical and working designs of complex products using computer-aided design tools and best practices in the development of competitive products; carrying out technical calculations for projects, technical, economic and functional cost analysis of the effectiveness of designed products and structures; assessment of innovative potentials of projects; assessment of innovative risks of commercialization of projects.

Based on the theoretical and practical knowledge gained, the bachelor of technical sciences in the educational program forms professional competencies and must:

have an idea:

- about scientific, philosophical and religious pictures of the universe; about the essence, purpose and meaning of human life; variety of forms of human knowledge; spiritual values in creative and everyday life;
- about the processes and phenomena occurring in animate and inanimate nature; the possibilities of modern scientific methods of cognition of nature for solving natural science and professional problems;
- about the essence and social significance of his future profession, the importance of the disciplines that determine the specific area of his activity, their relationship in an integral system of knowledge;
- about the role of science in the development of civilization, the relationship between science and technology and related modern social and ethical problems, the value of scientific rationality;
- about the main directions, trends, problems and achievements in the field of pressure treatment of materials of different nature;
- about the features of plastic deformation and shaping of materials on a metal and non-metal base;
- about progressive technologies of processing materials by pressure;
- about the problems of environmental protection, ecology and life safety;

know:

- theoretical bases of initiation of plastic deformation, influence, influence of thermomechanical and structural factors on technological and operational properties of products and semi-finished products (material products);
- on the relationship between the composition of raw materials, technological stages and technical and economic indicators of processes;
- methods for predicting, calculating and evaluating plastic and strength properties in the development of rational modes of shaping and deformation;
- basic principles of modeling of technological processes under different schemes of stress state and loading stiffness;
- methods for calculating the parameters of technological processes and the main characteristics of technological operations of the OMD;
- the main methods of building a CAD for the processing of materials and the choice of control parameters of the technological cycle for obtaining high-quality products.
- fundamentals of economic theory, industry economics;
- issues of labor protection and safety, environmental legislation;

be able to:

- use normative and legal documents related to professional activity;
- to conduct a conversation-dialogue in the state and foreign languages, using the rules of speech etiquette, to read literature in the specialty without a dictionary in order to search for information, to translate texts with a dictionary, to make annotations, abstracts and business letters in a foreign language;
- analyze the possibilities of shaping and plastic deformation of materials of different nature when changing the temperature-velocity, deformation-geometric and structural-phase parameters of the impact;

- formulate technical and economic requirements for the organization and management of technological processes for processing materials by pressure;

- assess the quality of products, identify and eliminate the causes of defects, develop measures to prevent them;

- analyze the production and economic activities of your unit and / or the entire enterprise, including using modern software products;

- exercise control over technological and labor disciplines;

- use information technology to collect information and application software packages in solving design and production problems.

have skills:

- knowledge of the state language and the language of interethnic communication; lexical and grammatical minimum of one of the foreign languages;

- on the basics of industrial relations and management principles, taking into account technical, financial, psychological and human factors;

- work with software products, modern information technologies for searching, collecting, processing, analyzing and storing scientific and technical information;

- possession of special and scientific terminology in the field of processing materials by pressure;

- design and production of equipment and tools for OMD operations, organization of workshops for the processing of materials;

- selection of the necessary equipment, compilation of technological (route) maps, calculation of technical and economic indicators of production efficiency and reduction of wasteful costs;

- mathematical modeling of MMD processes and rationalization of the modes of preliminary preparation of materials, methods of their thermal and deformation processing.

be competent:

- in matters of technological and environmental safety, protection of human life, legal norms, international standards, technical means and methods of information technology used abroad.

The graduate of the educational program must:

1. Possess broad fundamental knowledge, be proactive, have the ability to adapt to changing requirements of the labor market and technology, be able to work in a team (general educational competencies);

2. Know the ethical and legal norms that regulate the relationship of a person to a person, society, the environment, be able to take them into account when developing environmental and social projects (socio-ethical competencies);

3. Be able to master the commercial, financial, administrative functions of management; skills of situational analysis, market analysis, economic methods of management (commercial calculation, financial policy formation, program-target methods of organization management), methods of modeling economic processes, evaluation of economic projects, a professional approach to studying the main problems in the field of economic and production management (economic and organizational and managerial competencies);

4. To be able to build and use models to describe and predict various phenomena, to carry out their qualitative and quantitative analysis (professional competencies);

2 The purpose and objectives of additional educational program

EP purpose:

Training of highly qualified and competitive specialists for the successful solution of scientific and engineering problems, capable of designing and implementing advanced technological processes of materials processing by pressure.

EP tasks:

- formation of knowledge of modern information technologies;
- acquisition of theoretical and practical knowledge of computer design of blank production products;
- possession of methods and methods of mathematical and 3D modeling;
- acquisition of professional competencies in accordance with the requirements of industry professional standards;
- acquisition of knowledge of the basics of technological processes of stamping, forging, rolling and design of technological processes for obtaining blanks;
- acquisition of knowledge of new materials, nanomaterials, nanopowders and technologies for their production;
- formation of knowledge about the main trends in the development of technologies for processing new materials, the introduction of innovative digital technologies.

3 Requirements for evaluating the learning outcomes of an educational program

Description of mandatory standard requirements for graduating from a university and conferring an academic bachelor's degree: mastering at least 240 academic credits of theoretical training and final thesis

4 Passport of the educational program

4.1 General information

№	Field name	Note
1	Code and name field of education	6B07- Engineering, manufacturing and civil engineering
2	Code and classification direction of personnel training	6B072 - Manufacturing and processing
3	Group of educational programs	6B069- Production of materials (glass, paper, plastic, tree)
4	Name of the educational program	6B07220 Machines and technologies for processing new materials
5	Short description of the educational program	The educational program "Machines and technologies for processing new materials" lays the foundations of technology for processing materials by pressure and procurement, students will learn in-

		depth knowledge of special courses for processing composite and polymer materials (additive technologies, CAD/CAM/CAE/PLM/PDM) modeling skills and research of various processing processes They will acquire skills in designing production and industrial systems, creating machines for pressure treatment, and operating modern equipment., controlled by computers, including additive technologies. Primary attention is paid to the skills of developing technological routes for manufacturing parts and designing technological operations, developing and implementing control programs, developing and using structural documentation for designing processes for the preparation of parts.
6	EP purpose	Training of highly qualified and competitive specialists for the successful solution of scientific and engineering problems, capable of designing and implementing advanced technological processes of materials processing by pressure.
7	EP type	New EP
8	Level on NQF	6
9	Level on SQF	6
10	EP distinctive features	No
11	List of competencies of the educational program:	- Ability to apply general engineering knowledge, methods of mathematical analysis and modeling in professional activities; - Ability to analyze and evaluate production and technological processes; - Willingness to use modern information technologies in modeling technological processes, processing materials by pressure; - Willingness to apply advanced methods for calculating die equipment and tools in blank production; - Willingness to apply new materials, technologies for their production, additive technologies.
12	Learning outcomes of the educational program:	ON1 Applies basic knowledge of fundamental disciplines of mathematics, physics, chemistry, digital technologies in production processes of materials processing by pressure. ON2 Demonstrates commitment to ethical values, has socio-cultural and business communication skills, is able to independently find the right solutions in non-standard situations; applies knowledge of economic laws, life safety, ecology; culture of academic integrity. ON3 Substantiates the application of advanced methods of computer-aided design and construction in the production processes of forging and stamping production. ON4 Searches, analyzes and evaluates information necessary for setting and solving professional tasks using information technologies in the field of

		procurement.. ON5 Evaluates additive technologies as a promising direction for improving the technology of processing composite materials, restoring machine components and parts. ON6 Develops design and technological documentation on the use, operation, maintenance of technological equipment, tooling and tools, in the production of blanks and finished parts. ON7 Participates in the design of forging, stamping, pressing equipment, tooling and tools in accordance with technical specifications using computer-aided design software. ON8 Applies progressive methods of research on the patterns of changes in the deformation properties of various materials, the influence of various technological factors on the quality of products. ON9 Applies promising methods, methods and means of obtaining, storing, processing information to solve communication problems; modern information technologies. ON10 Demonstrates readiness to use effective methods and methods of automation of technological processes of pressure treatment; advanced software for solving engineering and technological problems in the field of pressure treatment of materials.
13	Form of training	daytime
14	Period of study	4 years
15	Volume of the credits	240
16	Language of education	russian, kazakh
17	The awarded academic degree	Bachelor of Engineering and Technology
18	Developer(s) and authors:	The EP was developed by the academic committee in the direction "6B072-Production and manufacturing industries"

4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of discipline	Short description of discipline	Number of credits	The formed educational outcomes (codes)									
				ON1	ON 2	ON 3	ON 4	ON 5	ON 6	ON 7	ON 8	ON 9	ON10
Cycle of general education disciplines Required Component													
1	Foreign language	English is a compulsary subject. According to the results of placement test or IELTS score, students are placed into groups and disciplines. The name of the discipline corresponds to the level of English. When passing from level to level, prerequisites and postrequisites are respected.	10	v									
2	Kazakh (Russian) language	In this course author considers socio-political, socio-cultural spheres of communication and functional styles of the modern kazakh (russian) language. The course covers the specifics of the scientific style to develop and activate professional communication skills and abilities of students. Also it allows students to leavn the basics of scientific style practically and develop the ability of production structural and semantic text analysis.	10	v									
3	History of Kazakhstan	The purpose of the discipline is to provide objective historical knowledge about the main stages of the history of Kazakhstan from ancient times to the present day; introduce students to the problems of the formation and development of statehood and historical and cultural processes; contribute to the formation of humanistic values and patriotic feelings in the student; teach the student to use the acquired historical knowledge in educational, professional and everyday life; evaluate the role of Kazakhstan in world history.	5		v								
4	Philosophy	The purpose of the discipline is to teach students the theoretical foundations of philosophy as a way of knowing and spiritually mastering the world; developing their interest in fundamental knowledge, stimulating the need for philosophical assessments of historical events and facts of reality, assimilating the idea of the unity of the world historical and cultural process while recognizing the diversity of their skills in applying philosophical and general scientific methods in professional activities.	5		v								
5	Module of socio-political knowledge	The objectives of the disciplines are to provide students with explanations on the sociological analysis of society, about social communities and personality, factors and patterns of social development, forms of interaction, types and directions of social	3		v								

	(sociology, political science)	processes, forms of regulation of social behavior, as well as primary political knowledge that will serve as a theoretical basis for understanding social -political processes, for the formation of political culture, development of a personal position and a clearer understanding of the extent of one's responsibility; help to master the political, legal, moral, ethical and socio-cultural norms necessary to act in the interests of society, form personal responsibility and achieve personal success.										
6	Module of socio-political knowledge (cultural studies, psychology)	Module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, on their understanding and assimilation of the basic forms and universal laws of the formation and development of culture, on the development of their aspirations and skills to independently comprehend the entire wealth of values of world culture for self-improvement and professional growth. During the course of cultural studies, the student will consider the general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of the formation and development of culture, the main historical stages of the formation and development of Kazakhstani culture, its most important achievements. In the course of studying the course, students acquire theoretical knowledge, practical skills and abilities, forming their professional orientation from the standpoint of psychological aspects.	5		v							
7	Information and communication technologies (in english)	Required component. The aim of the course is to gain theoretical knowledge in information processing, the latest information technologies, local and global networks, the methods of information protection; Getting the right use of text editor editors and tabulators; creation of base and different categories of applications.	5	v								
Cycle of general education disciplines Component of choice													
8	Fundamentals of anti-corruption culture and law	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various spheres. The purpose of studying the discipline «Fundamentals of anti-corruption culture and law» is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in everyday practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption.	5		v							

9	Fundamentals of economics and entrepreneurship	Discipline studies the foundations of economics and entrepreneurial activity from the point of view of science and law; features, problematic aspects and development prospects; the theory and practice of entrepreneurship as a system of economic and organizational relations of business structures; The readiness of entrepreneurs for innovative susceptibility. The discipline reveals the content of entrepreneurial activity, the stages of career, qualities, competencies and responsibility of the entrepreneur, theoretical and practical business planning and economic examination of business ideas, as well as the analysis of the risks of innovative development, the introduction of new technologies and technological solutions.	5		v								
10	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity. Monitoring of the environment and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5		v								
11	Fundamentals of scientific research methods	The purpose of the discipline is to form the skills of organizing and planning scientific research, methods of conducting experimental research, methods of information processing. The discipline introduces students to the goals, objectives and stages of scientific research. The terms and concepts, the methodology of the experiment, mathematical methods of processing research results are considered. The concept of engineering, laboratory and industrial experiment, bench research. The discipline introduces the basics of the theory of solving inventive problems, algorithmic methods of finding technical solutions and their optimization. Highlights the main mathematical methods of optimization, the use of artificial intelligence capabilities to solve optimization problems; issues of search, accumulation and processing of scientific information.	5				v					v	
Cycle of basic disciplines University component													
12	General Chemistry	The purpose of the discipline is to study the basic concepts and laws of chemistry; fundamental laws of chemical thermodynamics and kinetics; quantum mechanical theory of atomic structure and chemical bond. Solutions and their types, redox processes, coordination compounds: formation, stability and properties. The structure of matter and the chemistry of the elements.	4	v									
13	Physics I	Objectives: to study the basic physical phenomena and laws of classical, modern physics; methods of physical research; the relationship of physics with other sciences. The following topics are considered: mechanics, dynamics of rotational motion of a solid body, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, transport phenomena, continuum	5	v									

		mechanics, electrostatics, direct current, magnetic field, Maxwell equations.											
14	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to study elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course sections include the differential calculus of functions of one variable, the derivative and differentials, the study of the behavior of functions, complex numbers, and polynomials. Indefinite integrals, their properties and methods of calculation. Certain integrals and their applications. Improper integrals.	5	v									
15	Physics II	The course studies the laws of physics and their practical application in professional activity. Solving theoretical and experimental-practical educational problems of physics for the formation of the foundations in solving professional problems. Assessment of the degree of accuracy of the results of experimental or theoretical research methods, modeling of physical condition using a computer, study of modern measuring equipment, development of skills for conducting test studies and processing their results, distribution of the physical content of applied tasks of the future specialty.	5	v							v		
16	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and self-adjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the plane and in space are included.	5	v							v		
17	Introduction to engineering design	General provisions of the methodology of engineering design. Stages of creating cars. Design procedures. Principles of engineering design. Engineering design methods. Manufacturability of machine designs.	5									v	
18	The theoretical mechanics	Statics: reactions of communications; the theory of the moments; conditions of balance of flat and spatial systems of forces; the centre of grav-ity of a body. Kinematics: kinematics of a point; the elementary movements of a firm body; plane-parallel movement of a firm body; free movement of a firm body; complex movement of a point and a firm body. Dynamics: dynamics of a material point in inertial and not inertial systems of readout; mechanical system and its characteristics; the general theorems of dynam-ics of a material point and system; analytical dynamics; the theory of impact.	5	v			v						
19	Strength of materials	Stretching and compression. Stresses in cross sections and deformations of a straight rod. Mechanical properties of materials under tension and compression. Calculation of strength and stiffness in tension-compression. Geometric characteristics of flat sections. Shear and torsion. Calculation of strength and torsional stiffness.	5	v			v						

		Bend. Normal and tangential bending stresses. Calculation of bending strength. Theory of stressed and deformed states. The limit state hypothesis. Complex resistance. Stability of the equilibrium of deformable systems. Dynamic load.											
20	Electrical and Electronic Engineering	The purpose of the discipline is to acquire theoretical and practical knowledge on the basics of electrical engineering and electronics. The basic laws of the processes occurring in electromagnetic and electronic circuits and methods for determining the electrical quantities characterizing these processes are studied. Methods of calculation of DC electric circuits are studied; analysis and calculation of linear AC circuits; analysis and calculation of magnetic circuits. Electromagnetic devices and electrical machines. Fundamentals of electronics and electrical measurements. The element base of modern electronic devices. Fundamentals of digital and microelectronics, microprocessor tools.	5	v								v	
21	Theory of mechanisms and machine parts	The purpose of the study of the discipline is to gain knowledge of the general methods of studying and designing the schemes of mechanisms necessary for the creation of machines, devices, automatic devices and complexes that meet modern requirements for efficiency, accuracy, reliability and economy. The main task of the discipline is to give knowledge about the kinematic and dynamic characteristics of mechanisms with rigid and elastic links and controlled kinematic chains, about methods for determining the parameters of mechanisms according to the required conditions, methods of vibration protection of a person and a machine, about controlling the movement of mechanisms and machines.	5	v					v				
22	Economics of a machine-building enterprise	The purpose of the discipline is to acquire theoretical knowledge and practical skills of economic assessment of the company's activities. The discipline studies the structure of a machine-building enterprise, fixed and current assets, production capacity of the enterprise, material and technical support of production, personnel, financial resources of production. The issues of forecasting and planning of production, calculation of production costs, production costs, economic efficiency, analysis and evaluation of the economic activity of the enterprise are studied.	5		v							v	
23	Qualimetry	The purpose of studying the discipline is to form students' scientific ideas about the nature and properties of probabilistic processes, random variables, distribution functions and statistical methods, mastering practical skills of working with random variables and methods of their search and evaluation. The subject of probability theory, probability definitions, elements of combinatorics, random variables and the laws of their distribution are considered. The basics of mathematical statistics are studied - samples, types of samples, point and interval estimates.	5									v	

24	Forging and hot stamping technology	The main purpose of the discipline is to study the methods of manufacturing forgings, the operations of technological processes, the principles of designing forgings and die tooling. Production of workpieces and parts by forging and hot stamping selection and calculation of the stamping force, temperature regime, tools for processing metals and alloys. Study of the structure, mechanical properties of forgings and finished products after the forging and hot stamping process. Study of the structure, mechanical properties of forgings and finished products after the forging and hot stamping process.	6				v						
25	Probabilistic models in industrial engineering	The purpose of the discipline is to acquire theoretical and practical knowledge of the reliability of technical systems (machines). The fundamentals of probability theory and the application of the laws of probability theory to the analysis of technological and technical systems, including in mechanical engineering, in procurement production, are studied. With the help of probabilistic and statistical models, the problems of designing, manufacturing and controlling products are solved. The use of such models in the calculations and research of the accuracy of equipment and technological processes, in the development and selection of statistical methods for quality control of machine-building products.	5	v							v		
26	Construction materials and heat treatments	The purpose of the discipline is to provide theoretical and practical knowledge of the basic properties of structural materials used in mechanical engineering, methods of their heat treatment. The discipline considers: classification of engineering materials, properties and characteristics of materials, methods of studying the structure and composition of materials, the diagram of iron-cementite. The production of cast iron and steel, non-ferrous metal alloys is being studied. The types of heat treatment, modes and recommendations for their use are considered; promising engineering materials.	5								v		
27	Standardization, interchangeability and technical measurements	The purpose of studying the discipline is to form students' knowledge of the basics of standardization, interchangeability and practical skills in performing technical measurements. The discipline studies the basic principles of standardization, types of interchangeability, uniform principles of building tolerance and fit systems for standard joints. Accuracy standards of smooth cylindrical, keyway, spline, threaded connections, cylindrical gears. Tolerances and fits of rolling bearings. Methods of measurement, measuring instruments and methods of processing multiple technical measurements are studied.	5	v							v		
28	Heating and heating devices	The purpose of the discipline is to provide knowledge of: modern methods of heating workpieces for subsequent pressure treatment; designs of heating installations used for these purposes; solving problems related to the design, search and selection of furnace designs and heating installations. The basic principles of the theory of heat transfer, the mechanics of gases, the principles of calculation	4							v			

		and selection of fuel, the basics of calculation of technological processes of metal heating are considered. Basic principles of design, selection of heating devices; design of heating devices, their application in the design of forging and stamping shops, sites.											
29	Automated design of PMP processes	The purpose of the discipline is to acquire theoretical and practical knowledge in the field of computer-aided design of technological processes for processing materials by pressure. The discipline outlines the basic principles of modeling and CAD development of OMD processes. Aspects of constructing algorithms for calculating specific CAD tasks are considered. Examples of the use of various CAD systems for tool design are presented OMD - QForm technological process modeling program.	6			v	v						
Cycle of basic disciplines Elective component													
30	Hydraulics and hydraulic pneumatic drive	The purpose of the discipline is the formation of knowledge in the field of hydraulics, hydraulic and pneumatic machines for processing, feeding and moving liquids and gases. The discipline deals with the issues of hydrostatics: basic physical properties of liquids and gases; hydrodynamics: motion of liquids and gases, Euler and Bernoulli equations, modeling of hydrodynamic phenomena; hydraulic machines and hydraulic drives. Fundamentals of pneumatic actuators, pneumatic motors, equipment of pneumatic systems. The basics of operation of combined hydraulic pneumatic actuators are studied.	5				v		v				
31	Mechanics of liquid and gas	The course "Mechanics of liquid and gas" examines the models and physical properties of liquids and gases; the forces acting in the fluid, hydrostatic pressure and its properties; basic equations and laws of equilibrium and motion of liquids and gases; flow regimes and methods for calculating applied problems	5				v		v				
32	Forging and stamping equipment	The purpose of the discipline is to acquire theoretical and practical knowledge on the creation, operation and improvement of forging and stamping equipment. The discipline examines the composition and structure of forging and stamping equipment (FSE), the principles of design and analysis of FSE; structure, kinematic and force analysis of crank machines; stamping and forging hammers, hydraulic forging and stamping machines. Forging and stamping machines for special purposes are studied: horizontal forging machines, bending and sheet-stamping presses, rotary forging machines, principles of their operation, issues of improving the reliability of operation.	5			v							
33	Pressing equipment	The purpose of teaching this discipline is to expand the theoretical knowledge of students in the field of technological equipment for sheet-stamping production, means of loading pressing equipment with blanks of various types, acquiring practical skills in designing units and mechanisms of the main and auxiliary equipment for sheet stamping. The objectives of the discipline are the study of the main	5			v							

		units and mechanisms of technological equipment for sheet-stamping production, the study of schematic diagrams and designs of devices for automatic loading of presses with blanks from a strip, sheet and piece blanks of universal presses.											
34	Design of forging and stamping equipment	The purpose of the discipline is to acquire knowledge on the design of forging and stamping equipment in procurement production. Basic concepts about the production technology of standard parts of forging and stamping equipment. Processing of bab, shabots, guides and shtampovyh plates. Technological processes of assembly of forging and pressing machines. Features and technological processes of production of the main parts of forging and stamping equipment, assembly processes of forging and stamping equipment used for the manufacture of forging and stamping equipment, stamps and die tooling.	5			v			v				
35	Design of forging and stamping equipment	The purpose of the discipline is to acquire knowledge and skills in calculating and designing die tools, principles of creating automated stamp design systems. The discipline considers design features, issues of durability and types of wear of die tools for hot and cold deformation of metals and alloys. The stages of stamp design, design development, sequence of design and design drawings are studied. Stages and principles of computer modeling of stamps.	5			v			v				
36	Theory of materials processing by pressure	In the process of study of discipline students get skills of global analysis of technology and equipment for the special methods of OMD. Group methods of the cold stamping. Stamping by rubber, operations, by the выполняемы method of stamping by rubber. Rigging for stamping rubber. Gidroshtampovka. Rigging and equipment at гидроштамповке. Магнито-импульсная treatment. Electro-hydraulic stamping. Stamping by an explosion. Rolling and rolling. Cold deformation of rolling of circular purveyances and wares a method. Rigging and equipment for rotary deformation.	5						v	v			
37	Physical bases of plastic deformation	The purpose of the discipline is the formation of skills and research skills of plastic shaping of metals in the development of technological processes of pressure treatment. The discipline examines the physical foundations of strength and plasticity: the structure of crystalline solids, the strength of an ideal crystal, crystal lattice defects, plastic deformation and hardening, dislocations in the theory of plastic deformation, classification of types of destruction. The elements of continuum mechanics, the phenomenology of metal destruction during plastic deformation, the criteria of strength and plasticity of materials are studied. Linear fracture mechanics, viscous fracture mechanics, brittle and viscous fracture resistance characteristics	5						v	v			
Cycle of profile disciplines University component													

38	Processes of machine-building production	The purpose of the discipline is to acquire knowledge of technological methods for obtaining and processing blanks and machine parts. The discipline studies the general characteristics of metals and alloys used in mechanical engineering, the technological foundations of metallurgical production, the technology of metal processing by pressure, the technology of foundry production, the technology of welding production. The technology of production of blanks and machine parts from non-metallic materials is considered; features of welding of various metals and alloys.	5	v						v			
39	Labour safety	The purpose of the discipline is to form knowledge of legislative acts and norms aimed at ensuring occupational safety. In the discipline, students study legal and regulatory documents on labor protection (LP), occupational hygiene and industrial sanitation. Dangerous and harmful production factors, safety measures during installation and operation of technological equipment, emergency situations and elimination of their consequences are considered. In the discipline, they study the basics of LP management, rationing, methods of assessing and forecasting LP, methods of monitoring and auditing LP.	5		v				v				
40	Cold stamping technology	The purpose of the discipline is to study the technological foundations of cold stamping. As a result of studying the discipline, the future specialist must master the methods of developing the technological process of cold stamping, know the rules for designing technological equipment and equipment selection. The discipline studies the technological processes of cold stamping, reveals the content and features of the process of developing and calculating the processes of stamping and die tooling, their layout and structure, characteristics, requirements, design evaluation criteria.	5			v				v			
41	Computer-aided design systems of machine structures	The purpose of the course is to familiarize students with various automatic design systems and acquire the necessary knowledge and skills to develop various technical documentation and perform calculations using a personal computer. The task of the discipline: to give the necessary knowledge on various kinds of automatic design systems of technical and design documentation, to teach how to use the knowledge gained.	4	v		v							
Cycle of profile disciplines Component of choice													
42	Automation of material processing processes by pressure	The goals are to increase the basics of knowledge in general issues of automation of production processes in PMP. The discipline complements the knowledge about the automation of the processes of tool support, product quality control, warehousing, personnel labor protection, transportation, maintenance, management and production preparation. The task of studying the discipline is to determine the level and degree of automation for the formation of the structure of	5			v	v						

		the production process in PMP and its components, the design and calculation of flexible automatic assembly systems.											
43	Composite materials processing technology	The purpose of the discipline is to study and analyze the use of composite materials for the manufacture of high-quality machine parts and economic indicators of manufacturing. The discipline studies the structure and properties of composite materials, the properties of matrix materials. The development of special equipment, the creation of the required energy state of the processed material, the use of combined energy effects that ensure high economic performance of products made of composite materials are studied.	5					v			v		
44	Computer-aided design systems for materials processing	The purpose of the discipline is to gain knowledge on the use of CAD in the design of technological processes for processing materials by pressure. The discipline considers methods of mathematical and graphical modeling, methods and principles of calculations and drawings of die tooling for metal processing by pressure using CAD. For the design development of technological process models in OMD, volumetric design systems (Pro/Engineer, SolidEdge, SolidWorks, Compass 3D, AutoCAD) are considered.	4			v	v						
45	Production design	The purpose of the discipline is to prepare the student to solve problems related to the design of workshops, the ability to find and choose progressive design and technological solutions. The composition of the machine-building plant. Determination of the quantity and loading of equipment. Selection of the type and calculation of heating devices. Calculation of the number of workers. Determination of the areas of departments within the workshop. The layout of the main and auxiliary sections, the transport system of the workshop. Design methods. Classification and structure of the main workshops. Construction design. Automation of design of workshops of machine-building plants	4	v			v						
46	Welding equipment and tools	The purpose of studying the discipline is to familiarize students with the technological processes used in modern welding production in the manufacture of various welded structures. The objectives of studying the discipline are to acquire sufficient knowledge on the production of welded structures; to develop an engineering idea of the feasibility of using certain technical means, techniques and methods that provide conditions for the flow of welding processes in the established modes.structures.	6				v		v				
47	Properties and processing of engineering materials	Mechanical properties and structural strength of materials. Technological and operational properties of materials. Atomic-crystalline structure of metals and alloys. Deformation and destruction of materials. Theory of alloys. Iron and iron alloys. Technology of heat treatment of steel. Chemical heat treatment of surface hardening of parts. Alloy steels and alloys. General purpose structural steels. Tool alloys. Special alloys. Non-ferrous metals and	6					v			v		

		alloys. Non-metallic materials. Powder materials. Composite materials.											
48	Organization and planning of forging and stamping production	Objectives of the discipline: obtaining knowledge on the organization, methods of designing factories, workshops of forging and stamping production, the basics and principles of designing workshops of forging and stamping production, taking into account the generally accepted provisions of calculation and construction of technological processes for manufacturing parts, devices, principles of processing and assembly. Principles of designing workshops of forging and stamping production, taking into account the generally accepted provisions of calculation and construction of technological processes for the manufacture of parts, devices, principles of processing and assembly of forging and stamping equipment.	6	v			v						
49	Basics of designing machines for pressure processing	The construction and working conditions of rolling shop equipment, advantages and disadvantages of certain types of equipment, typical modern designs of rolling machine machines and mechanisms, prospects and directions for improving rolling production equipment, technical and economic indicators of rolling shop equipment are studied.The device and working conditions of equipment of rolling shops, advantages and disadvantages of certain types of equipment, typical modern designs of machines and mechanisms of the rolling machine, prospects and directions of improvement of equipment of rolling production, technical and economic indicators of equipment of rolling shops are studied.	6			v	v						
50	Advanced materials processing technologies	The purpose of studying the discipline is the formation of knowledge, skills and abilities in the field of advanced technologies for processing machine-building materials and surfaces of machine parts. The discipline presents the types of surface treatment of workpieces by ultrasonic, electrophysical and electrochemical methods, laser treatment. Technologies of heat treatment and surface alloying of metals using plasma, electron beam, waterjet and electroerosion methods. Methods of hardening treatment, methods of coating are considered.	5					v			v		
51	Tool and mold design	The purpose of the discipline is to master the necessary techniques for designing and calculating stamps for cold sheet stamping and molds for the manufacture of parts from press materials. Objectives of the discipline: the student must learn how to develop working drawings of parts made by cold stamping from sheet material and pressing from a press material; learn how to design stamps for various technological operations of cold stamping, as well as molds for compression pressing of plastic parts.	5					v			v		
52	CAM(Solidworks, Inventor)	The purpose of teaching the discipline is to form the skills of the profession as a constructor using the Solid Works program. The purpose of the discipline is to form students ' basic concepts of modeling(structure, classification,application of models, requirements for models), to introduce students to the theoretical	5							v			

		foundations and ways of optimization of modeling processes in Mechanical Engineering, processing and obtaining information from various sources, to analyze the structure of the model, to know its application ,to know the methods of constructing models, to use modern applied programs in the design of machine mechanisms and nodes.Machines, drives, and systems being studied, development of physical and mathematical models of phenomena and objects											
53	Additive Manufacturing	The concept of additive manufacturing. The history of the emergence and development of additive technologies. 3D modeling as the basis of additive technologies. Type of print FDM. Type of print SLA. Type of printing DLP. Print Type SLS / SLM. Type of printing 3DP. Type of printing LOM. Types of printing MJM, EBM. Optimization of additive manufacturing. Preparation of 3D models for printing. Engineering calculations in additive manufacturing. Accounting for the characteristics of materials in additive manufacturing. The concept of slicers. Variations and correlation of print parameters. Defects and their classification. Post processing. Mechanical processing of products. Heat treatment. Chemical treatment. Optimization of the print taking into account post-processing.	5					v					
54	Theory and practice of project management	The purpose of mastering the discipline is to expand and deepen knowledge about modern project management technology and study the principles of using project management in practical tasks. Mastering the discipline involves an introduction to the problems of project management and the study of project management methodology, familiarization with the tools and methods of project management at all stages of the project life cycle, starting with initialization project, planning its work, organizing their use and control, and ending with completion.	5			v							v	
55	Capstone Project	The purpose of the discipline is the formation of a complex of theoretical knowledge and practical skills in management, maintenance and support of technical preparation of production. Practical possibilities are considered and professional skills of students to work in a team are formed. Students solve real engineering and technical problems of production, formation and implementation of the life cycle of machine-building products based on the collection of information, critical assessment of the feasibility of the project, in-depth analysis and execution of the project report.	5										v	

5 Curriculum of the educational program

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATBAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of KazNRTU named after K.Satpayev
_____ M.M. Begentaev
"12" _____ 2023 y.

CURRICULUM

of Educational Program on enrollment for 2023-2024 academic year

Educational program 6B07220- "Machines and technologies for processing new materials"
Group of Educational programs B069 - "Production of materials (glass, paper, plastic, wood)"

Form of study: full-time Duration of study: 4 years Academic degree: Bachelor of Engineering and Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	classroom volume of lek/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
								I course		II course		III course		IV course	
								1 semester	2 semester	3 semester	4 semester	5semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Module of language training															
LNG 108	English language	GED, RC	10	300	0/0/6	210	E	5	5						
LNG 104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	E	5	5						
M-2. Module of physical training															
KFK 101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Difcredit	2	2	2	2				
M-3. Module of information technology															
CSE 677	Information and communication technologies (in English)	GED, RC	5	150	2/1/0	105	E				5				
M-4. Module of socio-cultural development															
HUM 137	History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE		5						
HUM 132	Philosophy	GED, RC	5	150	1/0/2	105	E				5				
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	E				3				
HUM 134	Socio-political knowledge module (culturology, psychology)		5	150	2/0/1	150	E			5					
M-5. Module of anti-corruption culture, ecology and life safety base															
HUM 136	Fundamentals of Anti-corruption Culture and Law	GED, CCH	5	150	2/0/1	150	E			5					
MNG 489	Fundamentals of Economics and Entrepreneurship														
MSM500	Fundamentals of scientific research methods														
CHE 656	Ecology and life safety														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5							
PHY 111	Physics I	BD, UC	5	150	1/1/1	105	E	5							
MAT 102	Mathematics II	BD, UC	5	150	1/0/2	105	E		5						
PHY 112	Physics II	BD, UC	5	150	1/1/1	105	E		5						
M-7. General technical training module															
MSM132	Introduction to engineering design	BD, UC	5	150	1/2/0	105	E	5							
CHE815	General chemistry	BD, UC	4	120	1/1/1	75	E	4							
MCH532	Standardization, interchangeability and technical measurements	BD, UC	5	150	1/1/1	105	E			5					
GEN408	Resistance of materials	BD, UC	5	150	1/1/1	105	E				5				
MSM106	Probabilistic models in industrial engineering	BD, UC	5	150	1/1/1	105	E					5			
MAT402	Theoretical mechanics	BD, UC	5	150	1/0/2	105	E			5					
MCH505	Modern consrtuction materials	BD, UC	5	150	1/2/0	105	E			5					
GEN 125	Design basics and machine parts	BD, UC	5	150	1/1/1	105	E					5			
ELC101	Electrical and Electronics engineering	BD, UC	5	150	1/1/1	105	E			5					
MCH531	Qualimetry	BD, UC	5	150	2/0/1	105	E					5			
MCH416	Forging and hot stamping technology	BD, UC	5	150	1/2/0	105	E					5			
MSM136	Economics of a machine-building enterprise	BD, UC	5	150	1/0/2	105	E							5	
MSM420	Heating and heating devices	BD, UC	4	120	1/0/2	75	E				4				
MSM414	Automated design of PMP processes	BD, UC	6	180	2/0/2	120	E							6	
MSM149	Hydraulics and hydropneumatic drive	BD, CCH	5	150	1/0/2	105	E					5			
3201	Elective	BD, CCH	5	150	1/0/2	105	E						5		
3202	Elective	BD, CCH	5	150	2/0/1	105	E						5		
3203	Elective	BD, CCH	5	150	1/0/2	105	E						5		
AAP196	Educational practice	BD, UC	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Module of production and technological preparation															

HYD482	Labor protection and industrial safety (by industry)	BD, UC	5	150	2/0/1	105	E							5	
MCH158	Cold stamping technology	PD, UC	5	150	1/1/1	105	E							5	
MSM129	Technological processes of machine-building production	PD, UC	5	150	2/1/0	105	E						5		
MSM411	Computer-aided design systems of machine structures	PD, UC	4	120	1/2/0	75	E								4
4301	Elective	PD, CCH	5	150	2/0/1	105	E								5
3302	Elective	PD, CCH	4	120	2/1/0	75	E						4		
4303	Elective	PD, CCH	6	180	2/0/2	120	E							6	
4304	Elective	PD, CCH	6	180	2/0/2	120	E							6	
3305	Elective	PD, CCH	5	150	1/2/0	105	E					5			
4306	Elective	PD, CCH	5	150	2/0/1	105	E								5
AAP197	Production Practice I	PD, UC	4								4				
AAP198	Production Practice II	PD, UC	6										6		
M-9. Management training module															
4307	Elective R&D	PD, CCH	5	150	2/1/0	105	E								5
M-10. Module of final attestation															
ECA108	Final examination	FE	8												8
M-11. Module of additional types of training															
AAP500	Military affairs	ATT	0					31	29	32	28	30	30	33	27
Total based on UNIVERSITY:								60		60		60		60	

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		required component (RC)	university component (UC)	component of choice (CCH)	Total
GED	Cycle of general education disciplines	51		5	56
BD	Cycle of basic disciplines		96	15	111
PD	Cycle of profile disciplines		29	36	65
	Total for theoretical training:	*51*	*125*	*56*	*232*
FA	Final attestation	8			8
	TOTAL:	59	125	56	240

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 5 от "24" 11 2022 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 3 от "17" 11 2022 y.

Decision of the Academic Council of the Institute_ E&ME__. Protocol № 4 от "11" 10 2022 y.

Vice-Rector for Academic Affairs _____ B. A. Zhautikov

E&ME Institute Director _____ K.Yelemessov

ME Department Head _____ E.Nugman

Specialty Council representative from employers _____ I. Dyusebaev

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV

SATBAYEV UNIVERSITY

APPROVED
Director of the Institute E&ME
K.Telemessov
"12" 12 2023y.

MAJOR ELECTIVE DISCIPLINES educational program for the 2023-2024 academic year admission
Educational program 6B07220 - "Machines and technologies for processing new materials"
Group of Educational programs B069 - "Production of materials (glass, paper, plastic, wood)"

Full-time study Study duration : 4 years Academic degree: Bachelor of Engineering and Technology

Year of study	Code of elective	Code of discipline	Name of discipline	Semestr	Cycle	Credits	Total hours	lec/lab/pr	SIW (including SIWT) in
	General technical training module								
3	3201	MSM163	Theory of materials processing by pressure	6	BD CCH	5	150	1/0/2	105
		MSM164	Physical foundations of plastic deformation						
	3202	MSM167	Forging and stamping equipment	6	BD CCH	5	150	2/0/1	105
		MSM168	Pressing equipment						
	3203	MSM461	Design of forging and stamping equipment	6	BD CCH	5	150	2/1/0	105
		MSM462	Die tool design						
	3302	MSM415	Computer-aided design systems for pressure treatment of materials	6	PD CCH	4	120	1/2/0	75
		MSM454	Automation of material processing processes by pressure						
	3305	MSM412	Composite materials processing technology	5	PD CCH	5	150	1/2/0	105
		MSM128	Properties and processing of engineering materials					1/1/1	
	Module of production and technological preparation								
4	4301	MCH159	Fundamentals of designing machines for pressure treatment	8	PD CCH	5	150	2/0/1	105
		MSM416	Welding equipment and tools						
	4303	MSM455	Organization and planning of forging and stamping production	7	PD CCH	6	180	2/0/2	120
		MSM421	Production design						
	4304	MSM453	Tool and mold design	7	PD CCH	6	180	2/0/2	120
		MSM413	Advanced materials processing technologies						
	4306	MCH149	CAM(Solidworks, Inventor)	8	PD CCH	5	150	1/2/0	105
		MSM119	Additive manufacturing					2/0/1	
	Management training module								
4	4307	MNG481	Theory and practice of project management	8	PD CCH	5	150	2/0/1	105
		MSM418	Capstone Project					1/2/0	

Credits numbers of elective disciplines over the entire period of study	
Cycle of disciplines	Credits
Cycle of basic disciplines (B)	15
Cycle of special disciplines (S)	36
Overall:	51

Decision of the Academic Council of the Institute_ E&ME__, Protocol №2 от "11" 10 2023.

ME Department Head _____ E.Nugman

Specialty Council representative from employers _____ I. Dyusebaev