A. Burkitbayev Institute of Power and Mechanical Engineering

Department of «Mechanical engineering»

EDUCATIONAL PROGRAM

6B07220 - Machines and technologies for processing new materials

(code and name of educational program)

Code and classification of the field of education:
6B07-Engineering, manufacturing and construction industries
Code and classification of training directions:
6B072- Industrial and manufacturing branches
Group of educational programs:
B069 Production of materials (glass, paper, plastic, tree)
Level based on NQF: 6
Level based on IQF: 6
Study period: 4 years
Amount of credits: 240

Almaty 2025

Educational program 6B07220 – Machines and technologies for
(code and name of educational program)

processing new materials was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes 10 dated «06» 03 2025.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes 3 dated « 20 » 12 2024.

Educational program 6B07220 – Machines and technologies for
(code and name of educational program)
processing new materials

was developed by Academic committee on direction "6B072- Industrial and manufacturing branches"

Full name	Academic degree/ academic title	Position	Workplace	Signature
Teaching staff:				
Nugman E.Z.	Doctor PhD, Associate Professor	Head of the Department of "Mechanical Engineering"	Institute of Energy and Mechanical Engineering named after A.Burkitbaev	
Kerimzhanova M.F.	Candidate of Technical Sciences, Docent	Professor	Department of Mechanical Engineering	
Uderbayeva A.E.	Doctor PhD	Assoc. Professor	Department of Mechanical Engineering	
Employers:				
Andreev V.I.		General Director	Kazecotech STE LLP	
Students				
Myrzakhan A.		1st year doctoral 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
SMSE	State mandatory standard of education
KazNRTU	K. I. Satpayev Kazakh National Research Technical University
MEP	Modular educational program
NJSC	Non-profit joint stock Company
GED	General education disciplines
EP	Educational program
PD	Profile disciplines
WC	Working curriculum
IWS	Independent work of a student
EMC	Educational and Methodological Council
AC	Academic council
SDGs	Sustainable development goals

1 Description of the 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 Purpose and objectives of additional educational program

Purpose of EP:

Training of highly qualified and competitive specialists to successfully solve scientific and engineering problems, capable of solving scientific and engineering problems in the field of materials processing, taking into account development control. The program focuses on the design and implementation of progressive, resource-saving and environmentally sound technological processes, the development of innovative employment, as well as ensuring high-quality, accessibility and practice-oriented training in order to implement the SDGs.

Tasks of EP:

- 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 educational program learning outcomes

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	Comments
1	Code and classification of the field of education	6B07- Engineering, manufacturing and construction industries
2	Code and classification of training directions	6B072 - Industrial and manufacturing branches
3	Educational program group	B069- Production of materials (glass, paper, plastic, tree)
4	Educational program name	6B07220 Machines and technologies for processing new materials

5	Short description of 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	Purpose of EP	Training of highly qualified and competitive specialists to successfully solve scientific and engineering problems, capable of solving scientific and engineering problems in the field of materials processing, taking into account development control. The program focuses on the design and implementation of progressive, resource-saving and environmentally sound technological processes, the development of innovative employment, as well as ensuring high-quality, accessibility and practice-oriented training in order to implement the SDGs.
7	Type of EP	New
8	The level based on NQF	6
9	The level based on IQF	6
10	Distinctive features of EP	No
11	List of competencies of 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 educational program	LO1 Demonstrate commitment to ethical values; socio-cultural and business communication skills, a culture of academic integrity, apply knowledge of economic laws, life safety and ecology,

		elements of artificial intelligence, multicultural skills, inclusive education skills. LO 2 Apply basic knowledge in the fundamental disciplines of mathematics, physics, chemistry, electrical engineering, intellectual property, research methods, principles of interchangeability and rationing in the manufacture of equipment. LO 3 Apply knowledge of designing machine structural elements using modern materials and methods for calculating their strength, rigidity and stability. LO 4 Choose innovative technologies for processing machine parts, modern engineering materials, methods for automating the life cycle of products, digital technologies. LO 5 Development and implementation of engineering solutions in compliance with international quality standards, design of engineering systems Taking into account their economic efficiency and innovativeness. LO 6 To use process modeling methods, software products and computer-aided design technologies to solve engineering problems in the field of pressure treatment of materials. LO 7 Apply knowledge of hydraulics and hydraulic pneumatic drives, theory of material processing by pressure, forging and stamping in the development of tools and technological equipment. LO 8 Choose resource-saving methods and technologies for processing materials in forging, stamping and pressing industries; information, energy-efficient and environmentally friendly technologies. LO 9 Apply the principles and methods of engineering economics, environmental safety, organization and planning of sustainable forging and stamping production while minimizing harm to the environment. LO 10 Apply modern innovative technologies that promote the development of industrialization and improve the quality of work.
13	Education form	full-time
14	Period of training	4 years
15	Amount of credits	240
16	Languages of instruction	russian, kazakh
17	Academic degree awarded	Bachelor of Engineering and Technology
18	Developer(s) and authors	The educational program was developed by Academic committee on direction "6B072 - Industrial and manufacturing branches"

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning 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 Component of choice													
1	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	v								
2	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									
3	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	5	v						v			

		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												
4	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									
5	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5	v										
Cycle of basic disciplines University component														
6	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 mechanics, electrostatics, direct current, magnetic field, Maxwell equations.	5		v									
7	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	5		v									

		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.											
8	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					
9	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					
10	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					v				
11	Production workshops	The purpose of the discipline is to form knowledge about the technological processes of manufacturing machine parts and practical knowledge of metalworking. The workshops study the locksmith's workplace, locksmith and cutting tools, tool materials, work on universal metal-cutting machines (turning, drilling, milling and grinding). Familiarity with the purpose and classification of machines. Machining of workpieces on sheet bending machines, laser machine with numerical control, milling machining center.	5	v					v				
12	Standardization, interchangeability	The purpose of studying the discipline is to form students' knowledge of the basics of standardization,	5		v			v					

	and technical measurements	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.											
13	Classic mechanics	The purpose of the discipline is to form the foundations of engineering thinking among students by studying the basics of mechanics and mastering the basic principles and laws of theoretical mechanics The content of the discipline: the basic laws of mechanical motion and mechanical interaction of material bodies; the basic concepts of the law of mechanics, methods for studying the equilibria of motion of a material point, a solid and a mechanical system	5					v	v				
14	Equipment for machine-building production	The purpose of the discipline is to provide students with professional knowledge of equipment used in mechanical engineering. To give an idea of the basic kinematic characteristics of the equipment, to teach how to read diagrams. To develop the ability to analyze and make informed decisions when designing stamping equipment using innovative and controlled systems, safe and ergonomic equipment, and waste management. Designing equipment with minimal resources, using energy- and resource-saving technologies in mechanical engineering	5					v					v
15	Materials Science and Structural materials	The purpose of the discipline is to acquire theoretical and practical knowledge in the field of materials science, technology for the production and processing of structural materials. The basics of materials science are studied: classification of materials; interrelation of structure, properties and processing technology. Metal and polymer materials, composite polymer and composite materials are studied. The problems of corrosion and methods of corrosion protection, surface and anticorrosive coatings are considered. Students acquire knowledge and skills for the effective selection, processing and application of structural materials in engineering practice.	5			v	v						
16	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	5	v	v								

		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.											
17	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. 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.	5		v	v							
18	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 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.	4					v			v		
19	Bases of designing and details of cars	Purpose: to acquire knowledge of calculations and design of machine parts and assemblies, taking into account the criteria of strength, reliability and stability.Contents_ general principles of design and construction, construction of models and calculation algorithms for standard machine parts taking into account performance criteria, fundamentals of theory and methodology for calculating standard machine parts, computer technologies for designing assemblies and machine parts. Basic requirements for machine parts and assemblies_	5		v	v							
20	Test and Measurement,	The purpose of the discipline is to master the principles, methods and means of measurement, as well as the skills of statistical processing of results. Students gain knowledge about metrological fundamentals, quality control methods, and data analysis. They	5		v						v		

	Measurements and Statistics	study control and measuring devices, methods and measuring instruments. Principles of operation of measuring instruments, calibration and verification of instruments. Quality control and process management, methods of statistical quality control, optimization and use of control maps and rationing. They acquire practical skills in the use of control and measuring instruments, quality analysis and measurement process management.											
21	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.	5					v		v			
22	Machine-building equipment drives	The purpose of the discipline is to study the components and mechanisms of metal-cutting machines, drives of metal-cutting machines and machine-building equipment, electric motors, transmission mechanisms, reversing, transformation of movement in machines. Classification and terminology of drives of machine-building equipment are studied, structures, principles of operation and methods of calculation of basic parameters of elements and devices of drives, methods of creation of models of drives for study of their dynamic characteristics using modern application programs, drives of machines with numerical program control (CNC) are considered.	5							v	v		
23	3D Scanning techniques and technologies	The purpose of the discipline is the formation of knowledge about the methods and technologies of three-dimensional scanning of objects of machine-building production, optimization of the parameters of 3D scanners for high-quality measurements. The principles of 3D scanning, the structure of scanners, and the creation of a single model of the object to be scanned based on the results obtained are studied. Classification of 3D scanners, technologies and methods of 3D scanning: laser and optical, contact or contactless digitization. With different types of 3D scanners, practical skills are acquired to create three-dimensional models of real machine-building objects.	5						v				v
24	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	6			v		v	v				

		CAD systems for tool design are presented OMD - QForm technological process modeling program.											
25	Occupational health and industrial safety (by industry)	Purpose: formation of knowledge, skills and abilities of students on the occupational health and safety management system at enterprises, taking into account industry specifics. Contents: regulatory and legal framework for occupational safety; harmful production factors; accidents and occupational diseases at work; industrial sanitation and occupational health; regulatory and technical regulation in the field of industrial safety; measures to protect employees at the enterprise	5	v							v		v
Cycle of basic disciplines Elective component													
26	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				
27	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5	v				v					
28	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	5					v	v				

		forging machines, principles of their operation, issues of improving the reliability of operation.											
29	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5	v								v	
30	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			
31	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	5	v								v	
Cycle of profile disciplines University component													
32	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	5					v		v			v

		structure, characteristics, requirements, design evaluation criteria.											
33	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		
34	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
35	Lean manufacturing	The purpose of the discipline is to develop students' competencies in the field of 3D scanning as an innovative tool for digitalization, improving the accuracy of production design, production and modern industrial activities in accordance with the objectives of SDG 9. Basic 3D scanning methods: principles and opportunities for industry. 3D scanning in the development of sustainable employment and engineering. Analysis of the economic efficiency of the introduction of 3D scanning in the enterprise. Understanding the connection of 3D scanning with the tasks of sustainable industrialization and labor development.	5								v	v	
36	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	6					v			v		v

		technological processes for the manufacture of parts, devices, principles of processing and assembly of forging and stamping equipment.											
37	Engineering Product Lifecycle Management	The purpose of the discipline is to generate knowledge in the field of automation of industrial product life cycle management, basic methods and technologies of life cycle management systems. Practical skills are acquired in automated systems of technical preparation of production and management, automated systems of enterprise management (PDM- product data management, PLM-Product Lifecycle Management), their individual subsystems, optimization of management according to the criterion of economic efficiency and high competitiveness of products, organization of a single information space about the product.	5								v	v	
Cycle of profile disciplines Component of choice													
38	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.	6					v		v			
39	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.	6						v		v		
40	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	5						v	v			

		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.											
41	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.	5						v	v			
42	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 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	5					v	v				
43	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	5				v						v

		products. Heat treatment. Chemical treatment. Optimization of the print taking into account post-processing.												
44	Project management in mechanical engineering	The purpose of the discipline is to acquire knowledge of methodology and project management in mechanical engineering, organization, enterprise design and product development. The discipline studies the basics of project management, Scrum Factory tools and methods, Scrum Factory implementation in organizations; methods of analysis and planning of machine-building production indicators based on a qualimetric approach, evaluating the effectiveness of projects and personnel management, planning team work for the future.	5					v				v	v
45	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	v	v

5 Curriculum of the educational program

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year: 2025-2026 (Autumn, Spring)
Group of educational programs: B069 - "Production of materials (glass, paper, plastic, tree)"
Educational program: 6B07220 - "Machines and technologies for processing new materials"
The awarded academic degree: Bachelor of engineering and technology
Form and duration of study: full time - 4 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites
									1 course		2 course		3 course		4 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M1 Module of language training																	
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5								
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5							
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5							
M2 Module of physical training																	
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2								
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2							
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2					
M3 Module of information technology																	
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E				5					
M4 Module of socio-cultural development																	
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE	5								
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E			5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E			3						
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E				5					
M5 Module fundamentals of anti-corruption culture, ecology and life safety																	
MSM500	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E			5						
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E			5						
HUM136	Fundamentals of anti-corruption culture and law	1	GED, CCH	5	150	30/0/15	105	E			5						
CHE656	Ecology and life safety	1	GED, CCH	5	150	30/0/15	105	E			5						
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E			5						
CYCLE OF BASIC DISCIPLINES (BD)																	
M6 Module of physical and mathematical training																	
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5								
PHY111	Physics I		BD, UC	5	150	15/15/15	105	E	5								

Additional type of training (ATT)																				
AAP500	Military training																			
Total based on UNIVERSITY:									32	28	30	30	30	30	32	28				
									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	0	5	56
BD	Cycle of basic disciplines	0	101	15	116
PD	Cycle of profile disciplines	0	39	21	60
Total for theoretical training:		51	140	41	232
FA	Final attestation				8
TOTAL:					240

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 19.12.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs — Uskenbayeva R. K.

Approved:

Vice Provost on academic development — Kalpeyeva Z. B.

Head of Department - Department of Educational Program Management and Academic-Methodological Work — Zhumagaliyeva A. S.

Director of the Institute - A.Burkitbaev Institute of Energy and Mechanical Engineering — Yelemesov K. .

Department Chair - Mechanical Engineering — Nugman E. .

Representative of the Academic Committee from Employers ___Acknowledged___ — Andreev V. I.