Institute of Energy and Mechanical Engineering named after A. Burkitbayev
Department of "Technological machines and equipment"

EDUCATIONAL PROGRAM
6B07107 "Operational and Service Engineering"

Code and classification of the field of education	6B07 « Engineering, manufacturing and civil engineering»
Code and classification of training directions	6B071 «Engineering and engineering trades»
Group of educational programs	B064 «Mechanics and metal working»
Level based on NQF	6
Level based on IQF	6
Study period	4 years
Amount of credits	240

Almaty 2024

Educational program 6B07107 "Operational and Service Engineering" was approved at the meeting of K.I. Satbayev KazNRTU Academic Council
Minutes # 12 dated «22» April 2024

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council
Minutes # 6 dated «19» April 2024

Educational program 6B07107 "Operational and Service Engineering" was developed by Academic committee based on direction 6B071 «Engineering and engineering trades»

Full name	Academic degree / academic title	Position	Place of work	Signature
Chairperson of Academic Committee:				
Yelemessov Kassym	Candidate of Technical Sciences, Professor	Director of the Institute of Energy and Mechanical Engineering	KazNRTU named after K.I. Satbayev	
Teaching staff:				
Kaliev Bakytzhan	Candidate of Technical Sciences, Associate Professor	Head of the department "Technological machines and equipment"	KazNRTU named after K.I. Satbayev	
Bortebayev Saiyn	Candidate of Technical Sciences,	Associate Professor	KazNRTU named after K.I. Satbayev	
Employers:				
Stvaev Nurzhan		Chairman of the Management Board of Alageum Group	Alageum Group LLP	
Students				
Moshanov Kanat		2nd year doctoral student	KazNRTU named after K.I. Satbayev	

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List of abbreviations and designations

NCJS KazNRTU named after K. I. Satbayev– NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATBAYEV»;
SOSE – State obligatory standard of education of the Republic of Kazakhstan;
EP – educational program;
IWS – independent work of a student (student, undergraduate, doctoral student);
IWST – independent work of a student with a teacher (independent work of a student (undergraduate, doctoral student) with a teacher);
WC – working curriculum;
UC – university component;
CC – component of choice;
NQF – National Qualifications Framework; S
QF – Sectoral Qualifications Framework;
LO – learning outcomes;
KC – key competencies

1. Description of educational program

The educational program "Operational and Service Engineering" covers the specialty "Technological Machines and Equipment" in the following fields:

- Metallurgical machines and equipment;
- Mining machines and equipment;
- machines and equipment of the oil and gas industry.

This document meets the requirements of the following legislative acts of the Republic of Kazakhstan and regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan:

• The Law of the Republic of Kazakhstan “On Education” with amendments and additions within the framework of legislative changes to increase the independence and autonomy of universities dated 04.07.18 № 171-VI.

• The Law of the Republic of Kazakhstan “On Amendments and Additions to Certain Legislative Acts of the Republic of Kazakhstan on the Expansion of the Academic and Management Independence of Higher Education Institutions” dated 04.07.18 №171-VI.

• Order of the Minister of Education and Science of the Republic of Kazakhstan dated 30.10.18, №595 “On approval of the Model Rules for the activities of educational organizations of the corresponding types”.

• The state compulsory standard of higher education (Appendix 7 to the order of the Minister of Education and Science of the Republic of Kazakhstan dated 31.10.18. №604.

• Decree of the Government of the Republic of Kazakhstan dated 19.01.12, №111 “On approval of the Model Rules for admission to study at educational organizations implementing educational programs of higher education” with amendments and additions from 14.07.16 № 405.

• ‘National Qualifications Framework”, approved by the protocol of March 16, 2016 by the Republican tripartite commission on social partnership and regulation of social and labor relations.

• industry qualification framework in the field of "mechanical engineering". Order No. 446 of the acting Minister of industry and new technologies of the Republic of Kazakhstan dated December 27, 2013.

The purpose of the educational program of the specialty "Operational and Service Engineering" is to provide comprehensive and high quality training of competitive, highly qualified specialists who are ready to solve practical and theoretical problems of professional activity in modern conditions on the basis of the development of skills and abilities necessary for the future specialist.

The field of professional activity of the bachelor of the educational program "Operational and Service Engineering" includes:

- sections of science and technology containing a set of tools, techniques, methods and methods of human activity aimed at creating competitive engineering

products and based on the use of modern methods and tools for designing, calculating, mathematical, physical and computer modeling;

- organization and execution of works on the creation, installation, commissioning, maintenance, operation, diagnostics and repair of technological machines and equipment, on the development of technological processes for the production of parts and components.

The objects of professional activity of the bachelor are:

- technological machines and equipment of various complexes;
- technological equipment and means of mechanization and automation of technological processes;
- production processes, their development and development of new technologies;
- installation and repair of technological machines and equipment;
- means of information, metrological, diagnostic and management support of technological systems to achieve the quality of the products;
- means of testing and quality control of technological machines and equipment;
- regulatory and technical documentation, standardization and certification systems, methods and means of testing and quality control of products.

Types of professional activity are:

- experimentalresearch;
- settlementdesignandanalytical;
- productionandtechnology;
- serviceandoperational;
- installation and commissioning; - organizational and managerial.

Subjects of professional activity of the bachelor is:

- technological machines and equipment; power equipment; welding equipment; drive systems; traffic control systems; operator life support systems;
- constructionandmaintenancematerials;
- equipment for the manufacture, testing and disposal of technological machines;
- equipment for maintenance and repair of technological machines;
- instrumentation for the manufacture and operation of machines; - equipment for automation of working processes of machines; - equipment for the design of machines.

2. Purpose and objectives of educational program

Purpose of EP: "Operational and service engineering" is to provide comprehensive and high-quality training of competitive, highly qualified specialists ready to solve practical and theoretical problems of professional activity in modern conditions based on the development of skills and abilities necessary for a future specialist.

The content of the OP "Operational and Service Engineering" based on the development of a multi-level system of personnel training, the fundamentality and quality of training, continuity and continuity of education and science, the unity of

training, education, research and innovation activities aimed at maximizing customer satisfaction should ensure:

- obtaining a full-fledged and high-quality professional education in the field of mining, metallurgy, oil and gas production, welding production, confirmed by the level of knowledge and skills, skills and competencies on the basis of established State educational standards and criteria, their assessment, both in content and in volume;
- ensuring the preparation of bachelors for industries that know the methods and principles of research, design, production and operation of materials and products;
- training of professional and competitive specialists in the field of mining metallurgical and oil-gas production machinery and equipment, and production management
- to formulate the main technical and economic requirements for equipment, methods and modes of preparation of the source material, the definition of technological parameters of the process in order to obtain the required properties and product quality;
- the ability to use the methods, skills and modern technical means necessary in engineering practice;
- the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks;
- to form students' teamwork skills, production and ethical responsibility, the ability to understand the problem and, from working with various specialists, find solutions, the need to improve their knowledge and skills;
- the ability to position oneself in solving and formulating technical tasks within a single information space of a metallurgical enterprise;

the ability to work in a team on interdisciplinary topics, at the same time to show individuality, and if necessary, to solve problems independently

Tasks of EP:

- study of a cycle of general education disciplines to provide social and humanitarian education based on the laws of socio-economic development of society, history, modern information technologies, the state language, foreign and Russian languages;
- study of the cycle of basic disciplines to provide knowledge of natural science, general technical and economic disciplines as the foundation of professional education;
- the cycle of profile disciplines is focused on the study of key theoretical aspects of technological machines in general, theoretical and practical techniques, methods and methods of human activity aimed at creating competitive technological machines and based on the use of modern methods and means of design, mathematical, physical and computer modeling of technological processes and equipment;
- study of disciplines that form knowledge, skills and abilities of planning and organizing research, designing technologies and devices;
- familiarization with the technologies and equipment of enterprises during the period of various types of practices.

- acquisition of skills and abilities of laboratory research, technological calculations, equipment selection and design using modern computer technologies and programs.

3. Requirements for evaluating the educational program learning outcomes

Admission of persons entering KazNRTU is carried out by placing a state educational order (educational grants), as well as paying for training at the expense of citizens' own funds and other sources.

Admission is carried out according to the applications of an applicant who has completed full secondary, secondary special education on a competitive basis in accordance with the points of the certificate issued by the results of the unified national testing (hereinafter – UNT) or complex testing. To participate in the competition, it is required to gain at least 65 points when entering a national University.

Special requirements for admission to the program if available, including for graduates of 12-year schools, colleges of applied bachelor's programs, etc.

Admission to the university of individuals who have technical and professional or post-secondary education with the qualification of "mid-level specialist" or "applied bachelor" in related areas of training of higher education personnel, providing for shorter training periods, is carried out according to the results of the UNT. (Model rules for admission to education organizations that implement educational programs of higher and postgraduate education dated October 31, 2018 № 600).

Descriptors of the level and scope of knowledge, skills, skills and competencies

A – knowledge and understanding:

A1 - The ability to logically represent the acquired knowledge and understanding of systemic relationships within disciplines, as well as interdisciplinary relations in modern science.

A2 - Knowledge of approaches and methods of critical analysis, the ability to use them practically in relation to various forms and processes of production.

A3 - to carry out basic calculations of the main parameters of technological machines, to justify their choice depending on production levels.

C – application of knowledge and understanding

B1 - Independent development and promotion of various options for solving professional tasks using theoretical and practical knowledge

B2 - to put forward hypotheses for the acquisition of new knowledge necessary for daily professional activity and continuing education

B3 - based on basic knowledge, be able to adequately navigate in various situations

C – formation of judgments

C1 - on the basis of knowledge about economic laws, the formation of hypotheses, forecasting and planning of economic activity of the enterprise.

C2 - be able to work in a team, correctly defend your point of view, and offer new solutions.

C3 - skills of daily acquisition of new knowledge necessary for professional activity.

D – personal abilities

D1 - compliance with the norms of business ethics, possession of ethical and moral standards of behavior.

D2 - the ability to find a compromise, correlate your opinion with the opinion of the team

D3 - to know social and ethical values based on public opinion, traditions, customs, social norms and be able to navigate them in their professional activities.

Competencies upon completion of training

General cultural competencies (GCC)	
GCC 1	Ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction
GCC 2	Understanding and practical use of healthy lifestyle norms, including prevention issues, the ability to use physical culture to optimize performance
GCC 3	The ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position
GCC 4	The ability to use the basics of philosophical knowledge to form a worldview position
GCC 5	The ability to critically use the methods of modern science in practice
GCC 6	Awareness of the need and acquisition of the ability to independently study and improve their qualifications throughout their working life
GCC 7	Knowledge and understanding of professional ethical standards, proficiency in professional communication techniques
GCC 8	Ability to work in a team, tolerantly perceiving social, ethnic, confessional and cultural differences
GCC 9	The ability to use the basics of economic knowledge in various fields of activity
General professional competencies (GPC)	
GPC-1	The ability to acquire new knowledge with a high degree of independence using modern educational and information technologies
GPC-2	Possession of computer skills sufficient for professional activity with basic programming
GPC-3	Knowledge of the basic methods, methods and means of obtaining, storing, processing information, the ability to use modern technical means and information technologies using traditional information carriers, distributed knowledge bases, as well as information in global computer networks to solve communication problems
GPC-4	Understanding the essence and significance of information in the development of modern society, the ability to receive and process information from various sources, the willingness to interpret, structure and formalize information in a form accessible to others

GPC-5	Ability to solve standard tasks of professional activity on the basis of information and bibliographic culture with the use of information and communication technologies and taking into account the basic requirements of information security
Professional competencies (PC)	
PC1	The ability to systematically study scientific and technical information, domestic and foreign experience in the relevant training profile
PC 2	The ability to take part in the preparation of scientific reports on the completed task and implement the results of research and development in the field of technological machines and equipment
PC 3	Ability to participate in work on innovative projects using basic research methods
PC 4	Ability to model technical objects and technological processes using standard packages and computer-aided design tools, willingness to conduct experiments according to specified methods with processing and analysis of results
PC 5	Knowledge of approaches and methods of critical analysis, the ability to use them practically in relation to various forms and processes of technological processes
PC 6	The ability to independently master new equipment, technological and technical documentation, make adjustments to it in relation to operating conditions
PC 7	The ability to take part in the calculation and design of parts and assemblies of technological machines in accordance with the technical specifications and the use of standard design automation tools
PC 8	The ability to conduct patent research in order to ensure the patent purity of new design solutions and their patentability with the determination of indicators of the technical level of the designed products
PC 9	The ability to investigate and optimize the operating modes of technological machines during their operation
PC 10	The ability to conduct a preliminary feasibility study of design solutions
PC 11	The ability to design the technical equipment of workplaces with the placement of technological equipment, the ability to master the equipment being introduced
PC 12	The ability to participate in the work on fine-tuning and mastering of technological processes during the preparation of production of new products, to check the quality of installation and commissioning during testing and commissioning of new samples of products, assemblies and parts of manufactured products
PC 13	Ability to check the technical condition and residual life of technological equipment, organize preventive inspection and maintenance of technological machines and equipment
PC 14	The ability to carry out measures for the prevention of occupational injuries and occupational diseases, to monitor compliance with the environmental safety of the work carried out
PC 15	Ability to choose basic and auxiliary materials, methods of implementation of technological processes, to apply progressive methods of operation of technological equipment
PC 16	Master the basic methods of calculating the parameters of technological equipment, the methodology of their selection according to reference books and catalogs.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	6B07 «Engineering, manufacturing and civil engineering»
2	Code and classification of training directions	6B071 «Engineering and engineering trades»
3	Educational program group	B064 "Mechanics and metal working"
4	Educational program name	"Operational and Service Engineering"
5	Short description of educational program	The educational program "Operational and service engineering" covers the specialty "Technological machines and equipment" in the following areas: - metallurgical machines and equipment; - mining machines and equipment; - machinery and equipment for the oil and gas industry;
6	Purpose of EP	The purpose of the educational program is to train highly qualified and competitive specialists competent in the field of monitoring, operation and maintenance of technological equipment of mining and oil and gas industries. Development of students ' personal qualities, the formation of General cultural and professional competence.
7	Type of EP	updated
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	QC 1. Communication QC 2. Basic literacy in the natural sciences QC 3. General engineering competencies QC 4. Professional competencies QC 5. Engineering and computer competencies QC 6. Engineering and working competencies QC 7. Socio-economic competencies QC 8. Special professional competencies
12	Learning outcomes of educational program	**LO1**: Develop technical documentation, proposals and measures for the implementation of technological processes of operation, repair and maintenance of technological machines for various purposes. Use welding technologies and equipment in repair production. **LO2**: Demonstrate theoretical knowledge and practical skills in the field of operational reliability and technical diagnostics of machines and equipment. Choose robotic systems and manipulators for production processes **LO3**: Demonstrate knowledge of the branches of mathematics, physics and other natural sciences and apply them to solve engineering problems in

		the field of maintenance of machinery and equipment **LO4**: Apply innovative methods of installation and assembly of technological equipment units. Evaluate the technical condition and residual life of the equipment, organize preventive inspection and maintenance of equipment using diagnostic devices, process the results of measurements **LO5**: To use the principles of formulation and algorithms for solving research tasks in order to systematically develop knowledge about project management. To evaluate the technical and economic performance of industrial enterprises. Apply in practice methods of calculating parts and evaluate the strength of materials **LO6**: Apply modern methods for the development of low-waste, energy-saving technologies that ensure the safety of human life and their protection from the possible consequences of accidents, catastrophes and natural disasters, methods of rational use of raw materials, energy and other types of resources **LO7**: To study the basic tribological patterns for solving specific design, technological and operational problems related to friction, wear and lubrication in machines and mechanisms **LO8**: Perform standardization work, technical preparation for certification of technical means and equipment, organize metrological support of technological processes using standard quality control methods **LO9**: Apply modern design methods and computer graphics software in the design of machines and equipment. Choose materials when designing machines **LO10**: To choose the main methods and means of obtaining, storing, processing information, to solve communication problems to use modern technical means and information technologies using traditional media, as well as information in global computer networks **LO11**: Apply the basic laws and forms of regulation of social behavior, human and civil rights and freedoms in the development of social projects, demonstrating respect for people, tolerance to another culture, readiness to maintain partnerships **LO12**: Apply knowledge of economic laws, labor protection and environmental standards, rules of moral development, culture of academic integrity at a professional level

		LO13: Solve engineering problems using the basic laws of mechanics, electrical engineering, hydraulics, thermodynamics and heat and mass transfer **LO14** Apply theoretical and experimental methods for calculating machine parameters and applied software for design and verification calculations
13	Education form	full
14	Period of training	4 years
15	Amount of credits	240
16	Languages of instruction	Kazakh/Russian
17	Academic degree awarded	Bachelor of Engineering and Technology
18	Developer(s) and authors:	Academic Affairs Committee

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

№	Name of the discipline	Short description of the discipline	Number of credits	Generated learning outcomes (codes)													
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14
Cycle of general education disciplines Required component																	
1	English language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. During the transition from level to level, the prerequisites and post-prerequisites of the discipline are observed	5			v											
2	Kazakh (Russian) language	The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of scientific style in order to develop and activate	5			v											

		professional and communicative skills and abilities of students, allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text																
3	Information and communication technologies (in English)	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using text editors and tabular processors; to create databases and various categories of application programs	5			v												
4	History of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol	5			v												

		conquest (XIII century), medieval states in the XIV-XV centuries. The epoch of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, during the formation of independence and at the present stage															
5	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self-esteem, awareness of the value of human existence. It teaches you to think and act correctly, develops practical and cognitive skills, helps you to search and find ways and ways of living in harmony with yourself, society, and the world around you	5			**v**											

6	Module of socio-political knowledge (sociology, political science)	The study of the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary to understand political processes, to form a political culture, to develop a personal position and a clearer understanding of the measure of one's responsibility	3			**v**												
7	Module of socio-political knowledge (cultural studies, psychology)	The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation and development of culture. During the course of cultural	5			**v**												

		studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture are considered. The regularities of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, the regularities of the development and functioning of the psyche as a special form of vital activity are also studied															
Cycle of general education disciplines Component of choice																	
8	Fundamentals of anti-corruption culture	_to form an informed understanding of the problem of corruption in society, to develop anti-corruption skills, as well as to educate civic responsibility and ethical principles. Contents_ basic theoretical and practical knowledge about corruption, analysis of corruption phenomena, strategies and	5												**v**	**v**		

		methods of combating them, formation of adequate behavior and values aimed at creating an honest and open society															
9	Fundamentals of economics and entrepreneurship	The purpose of studying the discipline is to familiarize students with the basic principles of economic theory and entrepreneurial activity. The course includes the study of basic economic concepts, market mechanisms, management tools and key aspects of entrepreneurship, such as starting and managing a business, analyzing the market environment, financial planning, assessing risks and developing development strategies.	5					v							v		
10	Ecology and life safety	The purpose of the discipline: to acquaint students with the tasks of ecology as a science, its sections and conclusions that find application in various fields of practical activity. Brief description: ecological terms, laws of functioning of	5						v						v		

		natural systems are considered; environmental monitoring and management in the field of its security; sources of air, water, soil pollution and ways to solve environmental problems; emergency situations of natural and man-made nature.															
11	Fundamentals of scientific research methods	Purpose: to form a systematic understanding of the methodology of scientific cognition among students; to develop scientific thinking skills; to form experience in organizing and conducting scientific research; to develop a competence-based approach to the use of methods and rules for conducting research in the field of mechanical engineering, related processes and their technologies. Contents: stages of scientific research, terms and concepts, methods of conducting an experiment, mathematical methods of processing research results. Concepts of engineering, laboratory and	5						**v**								**v**

		industrial experiment, bench research.																
12	Basics of Financial Literacy	Purpose: acquiring knowledge and skills in the field of personal finance management, including budget planning, use of financial instruments, taxation and investments to ensure effective management and increase of own funds. Contents: as part of the course, students will master the basics of financial management, learn how to create a budget, use various financial products, plan and pay taxes. They will also gain practical skills in analyzing financial information and choosing investment strategies.	5					v										
Cycle of basic disciplines University component																		
13	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline.	5			v												

		Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.															
14	Physics	Purpose:To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents_ physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.	5			v										v	
15	Mathematics II	Purpose: To teach students integration methods. To teach	5			v											

		you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations															
16	Engineering and computer graphics	Purpose: formation of knowledge of drawing construction, skills to read and develop graphic documentation. The student must apply the achievements of modern computer technology in all areas of the transport industry. Contents_ ESCD standards. Graphic primitives. Methods and properties of orthogonal	5									v					

		projection. The Monge plot. GOST 2.305-68. Incisions. Axonometric projections. Types of connections. Polyhedra. Sketches of details. Detailing. Ways to transform a drawing. Creating a 3M complex solid-state object in the AutoCAD system,															
17	The basics of plumbing	Purpose of study: To promote the formation of students ' technical thinking, ability to apply this knowledge in a production environment. To familiarize students with the operational topics, to master the techniques and methods of mechanical works, to learn to perform all basic types of mechanical works. To create conditions for the development of social-professional competence The result of the development of the discipline the student should be able to: apply techniques and methods of basic types of locksmith work; use the most common tools and instruments	4	v							v						

18	Introduction to the specialty	The course is designed to familiarize students in the field of operational and service technologies of technological machines and equipment in the oil and gas, mining and metallurgical industries with the necessary theoretical and practical knowledge that allows the student to form an idea of the industries and the place of a specialist in the production sector and science in its broad representation. The content of the course determines the practical activity of the bachelor at all stages of the life cycle of technological machines	5											**v**	**v**			
19	Theoretical and applied mechanics	To involve students in the development and solution of tasks that help bridge the gap between scientific theory and engineering practice.Contents_ Theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of	5														**v**	**v**

		material bodies and the mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied															
20	Hydraulics and hydraulic drive of technological machines	Application of knowledge in the field of technical fluid mechanics (hydraulics), for the calculation of hydraulic pressure systems, hydraulic machines, hydraulic and pneumatic actuators, widely used in the oil industry. Full hydraulic calculation of various hydraulic systems, hydraulic and pneumatic equipment drives. Getting the basics of knowledge in the field of hydraulics - theoretical fluid mechanics in the field of hydraulic and pneumatic actuators.	6							v						v	
21	Interchangeability, standardization and technical measurements	Studying the basic laws and concepts of standardization and interchangeability, methods	5								v						

		and means of controlling deviations of the shape, roughness and waviness of the surfaces of parts, the role of standardization in improving the quality of machines Interchangeability binds in a single whole design, production technology and control products. Standardization and unification of parts and elements contribute to the acceleration and cheapening of the design and manufacture of products.															
22	The branch Materials and Structural Materials Technology	The course provides for the study of requirements for basic engineering materials. Methods of obtaining metallic and non-metallic materials used in various branches of technology are considered. Objective regularities and dependences of their properties on the chemical composition, structure, processing methods and operating conditions, as well as methods of forming blanks, parts and products from these	5									**v**					

		materials. Attention is paid to lubricants and composite materials, metal corrosion and coatings															
23	Strength of materials	_to independently calculate structural elements, mechanisms and machine parts. Contents_ Stretching and compression. Stresses in cross sections and deformations of a straight rod. Mechanical properties of materials under tension and compression. Calculation of tensile and compressive strength and stiffness. Geometric characteristics of flat sections. Shear and torsion. Calculation of strength and torsional stiffness. The bend. Normal and tangential bending stresses_	5													v	v
24	Basics of thermodynamics and heat engineering installations	The study of discipline is, the formation of students' knowledge of thermal engineering terminology, the laws of obtaining and transforming thermal energy,	5													v	

		methods of analyzing the efficiency of using heat; principles of operation, designs, applications and potential capabilities of the main heat-power equipment.															
25	Industrial economics	Purpose: To provide students with an understanding of the basic principles and factors affecting industrial economics, including the organization of production, the competitiveness of enterprises, and the impact of government policy. Content: study the structure and dynamics of industrial production, analyze the main factors affecting the efficiency of enterprises, including technological innovation, factors of production and competition. Examination of the role of public policy in industrial development and industrial safety issues.	5					v								v		
26	Bases of designing and details of car	Purpose: to acquire knowledge of calculations and design of	5							v		v						

		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.															
27	Electrotechnics and Microelectronics	Electrical and magnetic circuits. Basic definitions, parameters and methods of calculation of DC electrical circuits. Analysis and calculation of linear AC circuits. Analysis and calculation of electrical circuits with nonlinear elements. Analysis and calculation of magnetic circuits.	5			v										v	

		Electromagnetic devices and electrical machines. Fundamentals of electronics and electrical measurements. The element base of modern electronic devices. Semiconductor elements. Electronic equipment power supply devices. Amplifiers of electrical signals. Electronic amplifiers and generators. Elements of pulse technology. Pulse and auto-generator devices. Fundamentals of digital and microelectronics. Microprocessor tools															
28	Fundamentals of Artificial Intelligence	The purpose of the course is to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. As a result of studying this course, students will gain an understanding of the basic principles of artificial intelligence systems and their role in the modern world. The	5										v				

		purpose of this course is to provide an introduction to the basic concepts, methods, and technologies of artificial intelligence, such as machine learning, computer vision, natural language processing, and others. Students will acquire knowledge of the key principles, algorithms and practical applications that underlie the development and use of artificial intelligence in various fields. Upon completion of the course, students achieve the following learning outcomes: Know basic machine learning techniques, including supervised, unsupervised and reinforcement learning; be able to apply machine learning methods to solve various problems; have skills in working with various artificial intelligence tools and technologies.																

29	Structural strength of parts and assemblies of technological machines	The course is designed to study the basic methods of calculating the strength of parts and assemblies of technological machines and equipment. The main strength models are considered in detail, in particular, methods of finite element modeling, methods for constructing stiffness matrices, displacements and deformations. A special place is occupied by the basics of calculating stresses and deformations when assessing strength, using various strength theories and methods of calculating the strength of simple and complex structures with the determination of internal forces during static calculation and the output to determine geometric parameters	4		v												v	v
30	Fundamentals of the theory of reliability of machines and mechanisms	Basic concepts of the theory of reliability. The operating conditions of machinery and equipment. The concept of	5		v													

		maintainability of machinery and equipment parts. Regulatory and technical documentation on the issues of reliability and the development of a system for maintenance and repair of equipment. The nature of loading, operation and wear of friction units of oil and gas equipment, reliability of parts.																
Cycle of basic disciplines Component of choice																		
31	Equipment maintenance system	Mastering the principle of operation, design, selection and operation of electromechanical equipment of mine stationary installations. Principles of operation and design of machines designed for ventilation of mine workings, mine drainage and compressed air production. Machines for the preparation of laying mixtures and mechanisms for the construction of shotcrete supports. Ensuring the safe and efficient operation of stationary installations, the ability to	5	**v**			**v**											

		design such installations, the choice of equipment, the definition of rational modes of their operation and technical and economic indicators.															
32	Legal regulation of intellectual property	Purpose: the goal is to form a 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. Contents: 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		
33	Fundamentals of the theory of wear of machinery and equipment	The course studies the basics of the theory of friction and wear, the mechanisms of friction and wear, types of wear. The stages of wear of the friction unit and methods of	5		v					v								

		lubrication are considered. To gain practical skills, familiarization with equipment and equipment for determining the wear and characteristics of lubricants is provided. Attention is paid to the physico-chemical processes occurring in tribo-conjugations. Methods of mathematical modeling of complex processes of friction and wear are considered															
34	Internal combustion engines	Thermodynamic cycles internal combustion engines. The designs of internal combustion engines used in the oil and gas industry, the theory of working processes, the principles of their work, the basic concepts and definitions, technical and economic indicators, designs of engine systems, the rules of their technical operation, maintenance and repair. The processes of compression, combustion and expansion. Calculation of parameters of	5			v										v	

		the working mixture in these processes.															
35	Gas-pumping units	The main features and current state of pipeline transportation of natural gas. Modes and performance of gas pumping units at compressor stations. Features of the properties and aerodynamics of currents in gas pumping units. Used in the gas industry types of centrifugal feeders. Designs and characteristics of the Central Natural Gas Center. Methods for determining the technical condition and power consumption Gas pumping units with power transmission.	5						v							v	
36	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.	5					v	v								

		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.																
37	Gas turbine plants	Modes and performance indicators of gas pipelines of compressor stations, design schemes and principles of operation of various types of GTI and their characteristics, purpose, methods of technical diagnostics of GTI under operating conditions, energy-saving technologies for operation of GTI in the oil and gas industry. Natural gas centrifugal blowers of their design and characteristics; concepts and cycles of gas turbines	5						v								v	

38	Pumps, fans, compressors	The device is technologically important and large energy consumers in the industry: pumps, fans and compressors of various types, parameters, effective modes of their operation. Practically mastered the methods of design and installation of pumping stations, fan installations of the main ventilation. Piping networks, their device and installation, auxiliary equipment, ensuring efficient and safe operation of pumping, fan and compressor units are being studied.	5							v						v	
39	Drives of technological machines	Structural diagrams of drives of working bodies, typical solutions. Mechanical and speed characteristics of the drives. Hydraulic drives and control systems. Types and features of hydraulic motors used in machine drives. Types and features of the guide and regulating hydraulic equipment used in machine drives. Typical schemes of variable	5													v	v

		speed drives with proportional electro-hydraulic control. Pneumatic drives and machine control systems.															
40	Fundamentals of designing technological machines and machine graphics	The course is designed to study the designs, type and performance criteria of the components of all technological machines – parts, assemblies, aggregates; study the basics of the theory of work and methods of calculating machine parts in collaboration; acquisition of design and construction skills, development of creative design abilities; mastering modern computer technology and machine graphics in the design; mastering the basic methods of image spatial forms on the plane and execution of drawings	6							v		v					
40	Computer technologies in operational and service engineering	The course examines the basics of system and automated modeling and design of technical objects; technical characteristics and capabilities	6									v	v				

		of various computer-aided design systems and database management systems. To obtain practical skills, it is planned to use modern computer technologies as a tool for solving scientific and practical problems in operational and service engineering at a high professional level, to improve the basics of knowledge, skills and skills in designing and modern methods of calculating parts, assemblies and mechanisms for strength																
Cycle of profile disciplines University component																		
41	Technology of repair and operation of technological machines	Reliability and durability of their work depend on correct installation and operation of technological machines and the equipment. In the given discipline rules of installation of equipment and technology of his(its) realization are studied. Questions of starting-up and adjustment works, diagnostics of a condition of	5	**v**			**v**											

		technological machines are considered(examined). Systems and technology of operation of technological machines, their maintenance service are studied. Trainees get skills and skills of drawing up of technological cards(maps) of maintenance service of machines, the equipment and their electric drive															
42	Instrumentation and automation of technological machines	Formation of the future specialist knowledge of the design of devices, their purpose and principles of operation. As well as special training of engineering and technical personnel with scientific and practical knowledge in the field of operation, as it solves relevant engineering and scientific problems in the field of quality, performance properties and rational use of fuels, oils, lubricants and technical fluids.	5			v					v						

43	Installation and assembly production of technological machines	The course is designed to study the main aspects of technologies used in the assembly production of technological machines. The forms of organization and assembly methods are considered in depth, attention is paid to documentary support, tool management and features of the assembly technology of standardized assemblies and connections: threaded, tensioned, gears, rolling and sliding bearings, pipeline systems. Installation technologies are presented in accordance with the stages of the work production project: acceptance of the construction part, methods of installation and alignment of equipment on the foundation, fastening, balancing and centering, stages of commissioning and commissioning on the example of overhead cranes and conveyor belts	6	v			v										

44	Technical diagnostics of technological equipment	The course is aimed at studying the theoretical foundations of technical diagnostics and obtaining practical skills in the use of non-destructive testing methods to assess the technical condition of technological machines and equipment; to familiarize students with the basics of the theory of technical diagnostics, types of technical condition, controlled parameters, technical diagnostics systems; to study the physical foundations of non-destructive testing methods for detecting and diagnosing malfunctions of technological equipment; familiarization with equipment for non-destructive testing, test methods, acquisition of practical skills	4	v	v													
45	Metal welding and cutting	The course studies the physical foundations of the metal welding process; energy sources during welding; electric arc. Classification of		v		v												

		welding arcs and their characteristics; dynamic characteristics of power sources; transformers with increased and normal scattering; welding rectifiers; aggregates and converters; multi-post power sources of the welding arc; auxiliary devices of power sources; specialized power sources for electroslag and plasma welding; safety during operation of welding power sources. General information about welding materials. Classification of welding materials.																
Cycle of profile disciplines Component of choice																		
46	Mining and transport machines	As part of the course, students study the principles of operation and design of mining and transport machines; classification and purpose of machines for mining and transportation of minerals; schematic diagrams, design features, applications and basic	5	**v**														**v**

		design characteristics of various machines for breaking, loading, transportation, fastening and other auxiliary operations; methods for determining the main structural and operational parameters of mining and transport machines, their productivity and efficiency in mining production															
47	Equipment for metallurgical plants	General characteristics of the mechanical equipment of an iron and steel industry. Classification of the equipment on a fuctioning of drives in a cycle of working hours. The crushing equipment. The common data on process of crushing. Types of crushing ma-chines. Calculation of crushers. Chopper the equipment. The common data and classification of mills. Calculation of key parameters. The equip¬ment of a uniform feed of technological machines. Types, the device, calculation of key parameters.	5	v													v

		The equipment for enrichment. The necessary mechanical equipment. Calculation of key parameters. The equipment for drying concentrates																
48	Machinery and equipment for drilling oil and gas wells	In the discipline, modern designs of equipment for drilling wells are studied, with the purpose of oil and gas production on land, the device and the main directions of further development of drilling machines and complexes in accordance with the trends of world technical progress; Technological and normative-technical requirements for drilling machines and installations for the rules of their installation and dismantling, operation and maintenance on land. Questions of an estimation of efficiency of cars and the equipment for a choice of a rational way of their operation are considered.	5	v														v

49	Tribonika and Tribotechnics	The discipline provides students with knowledge in the field of tribology (friction, wear and lubrication), develops skills in calculation, design, testing and operation of friction units. In the course of training, students become familiar with the friction process, with the basic methods of tribotechnical testing and methods of modeling tribotechnical processes; they receive the necessary information about tribotechnical materials and rational technologies for obtaining wear-resistant, antifriction and friction coatings and modified surface layers on various elements of friction units	6							v							
50	Fuels, oils and special liquids	The course is aimed at the formation of students' knowledge in the field of operation of technological equipment of industrial complexes, taking into account the rational use and storage of	6							v							

		lubricants and special liquids, as well as the organization of lubricants, collection, regeneration of oils and their storage at enterprises. The objectives of the discipline are: to provide information on the nomenclature of liquid mineral and synthetic oils, plastic, solid, sealing, preservative lubricants; to provide information about the methods and systems of lubrication of machines, issues of organization of the lubrication economy, collection, regeneration of oils and their storage at enterprises; to master the existing methods of assessing the quality of lubricants and special liquids.																
51	Technology maintenance and repair of compressor units and hydraulic machines	The study of the discipline forms students' ideas about the basics of installation of compressor units and hydraulic machines, about the organization of the operation system, factors affecting operating conditions, as well as	5	v			v											

		about modern technologies to improve operational reliability. When studying the discipline, the following are considered: general methods of installation of compressor stations; installation of technological equipment of a gas turbine shop; installation of equipment of gas engine shops; installation of auxiliary technological equipment															
52	Welding technologies in repair and service production	The course provides for the study of technology and modern technology, as well as welding materials for electric arc welding, flame welding and various types of thermal cutting of metals, which are an integral part of the repair and maintenance work in production. The course involves the formation of students' knowledge and skills that provide a creative approach to solving problems of effective use of modern technologies during welding	5	v													

53	Machines and equipment of pumping and compressor stations	Purpose and classification of equipment of pumping and compressor stations. Equipment of pumping stations for transportation of oil and oil products. The equipment of compressor stations for transportation of natural gases. Shutoff and regulating valves and equipment of oil pipelines. Shutoff and regulating valves and equipment of gas pipelines. Technological scheme of piping equipment pumping and compressor stations. Automation and control of pumping and compressor stations equipment.	5														v	v
54	Theory and practice of project management	Purpose: for students to master the basic principles and methods of project management, as well as develop the necessary skills for the successful implementation of projects in various fields of activity. Contents: Students learn the theoretical foundations of project management, including the	5					v										

		concepts, principles, methods of planning, organizing, controlling, and completing projects.															
55	Operation and maintenance of drainage and pneumatic installations	The device is technologically important and large energy consumers in the mining industry: pumps, fans and compressors of various types, the main parameters and scope of these installations. Methods of design and installation of pumping stations, fan installations for main ventilation. Pipeline networks, their device and installation, auxiliary equipment, ensuring efficient and safe operation of pumping, fan and compressor units	5	v			v										
56	Operation and maintenance of dust and gas cleaning equipment and recycled water supply	The course provides for the study of modern systems of dust and gas purification and circulating water supply at industrial enterprises, rules of operation and maintenance, highly efficient cleaning of process and waste gases in	5	v			v										

		industry. Modern electromechanical, chemical and biological technologies and solutions for gas purification, the latest designs of electric filters, bag filters, scrubbers, cyclones, vortex dust collectors, air purification systems, ventilation and air conditioning, modern technical and filter materials, etc. are also considered.															
57	Equipment and technology of well repair and maintenance	To get acquainted with promising innovative technologies and techniques in technological engineering. Awareness of the need for professional development during their working life. The ability to formulate problems and use heuristic methods to solve them. The ability to critically use the methods of modern science in practice. The ability to assess the quality of advanced technologies and equipment in an expert manner. Ability to make a technical and economic	5	v			v										

		comparison of various modifications of technological machines and equipment															
58	Industrial safety in the oil and gas industry	The complex of scientifically grounded constructive, technological, organizational measures aimed at minimizing the anthropogenic impact of oil and gas facilities on environmental components. Prediction, assessment of the effects of man-made effects on the components of the environment in the construction and operation of oil and gas facilities. Classification, composition, sources of technogenic impact of objects of the oil and gas industry. Technology for restoring and optimizing the state of environmental components	5						v						v		
59	Industrial safety in an industrial cluster	A complex of scientifically-based constructive, technological, organizational measures aimed at minimizing the man-made impact of	5						v						v		

		industrial cluster facilities on environmental components. Forecasting, assessment of the consequences of man-made impacts on the components of the natural environment during the construction and operation of facilities. Classification, composition, sources of technogenic impact of objects. Technology of restoration and optimization of the state of components of the natural environment															
60	Fundamentals of energy saving in repair and service production	To form an idea of the general principles of developing an energy survey strategy, the modern regulatory framework for energy efficiency, methods for determining regulatory and prospective indicators of energy efficiency, methods for confirming energy efficiency indicators and compliance with their regulatory values, modern and promising science-based technologies for energy conservation, control and improvement of energy	5	**v**					**v**								

		quality, including the use of renewable energy sources																
61	Robotic complexes in metallurgical production	The development of the discipline is the study by students of industrial robots and manipulators of technological equipment, features of the design and calculation of modern structures of robotic complexes, their layout and structures, characteristics and requirements, conditions for the use of various types of manipulators in production..	5		v													
62	Energy-saving technologies in repair and service production in the oil and gas industry	Basic terms and definitions of energy saving. Energy saving in the oil and gas industry. The main uses of SER. Prospects for the development of unconventional energy sources. Energy-saving measures in the technology of the oil and gas industry. The use of heat pump installations in the gas and oil industry. Utilization and use of SER gas turbines at	5						v									

		compressor stations of main gas pipelines															
63	Experimental technique	Forms students' general ideas about the methodology for determining the measurement error, conducting regression and correlation analyses, hardware design of a full-scale tensometric experiment, instill students with the skills of independent analysis of experimental data. To give students the knowledge necessary for further production, design and research activities about the nature and methodology of scientific research.	4					v									v
64	Design of experiments bench and field tests	The course provides for the essence and methodology of scientific research, hardware design of a full-scale experiment. Familiarity with modern methods of planning experiments and estimating the measurement error of experimental results; mastering the types of experimental tests,	4					v									v

		methods of processing test results, modern methods of assessing reliability based on test results (resource, research, etc.). As a result of studying the discipline, methods of conducting experiments and types of tests are mastered to determine the resource and reliability of technological machines and equipment used in the industry															

5. Curriculum of educational program

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

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of Kaznu named after K.Satpayev
M.M. Begentaev
«__» _____ 2024.

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 6B07107 - "Operational and service engineering"
Group of educational programs B064 - "Mechanics and metal working"

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	5 semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Module of language training															
LNG 108	English language	GED, RC	5	150	0/0/3	105	E	5							
LNG 108	English language	GED, RC	5	150	0/0/3	105	E		5						
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/3	105	E	5							
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/3	105	E		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	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 133	Fundamentals of anti-corruption culture	GED, CCH	5	150	2/0/1	150	E			5					
MNG 488	Fundamentals of Entrepreneurship and Leadership														
MSM500	Fundamentals of scientific research methods														
CHE 656	Ecology and life safety														
MNG564	Basics of Financial Literacy														
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							
PHY468	Physics -	BD, UC	5	150	1/1/1	105	E	5							
MAT 102	Mathematics II	BD, UC	5	150	1/0/2	105	E		5						
M-7. Module of basic training															
General technical training module															
GEN 429	Engineering and computer graphics	BD, UC	5	150	1/1/1	105	E	5							
TEC564	The basics of plumbing	BD, UC	4	120	0/0/3	75	E		4						
TEC456	Introduction to the specialty	BD, UC	5	150	2/0/1	105	E	5							
GEN411	Theoretical and applied mechanics	BD, UC	5	150	2/1/0	105	E			5					
TEC554	Hydraulics and hydraulic drive of technological machines	BD, UC	6	180	2/0/2	120	E				6				
TEC463	Interchangeability, standardization and technical measurements	BD, UC	5	150	2/0/1	105	E			5					
PED104	The branch Materials and Structural Materials Technology	BD, UC	5	150	2/1/0	105	E			5					
GEN408	Strength of materials	BD, UC	5	150	1/1/1	105	E				5				
TEC164	Basics of thermodynamics and heat engineering installations	BD, UC	5	150	2/0/1	105	E					5			
NSE143	Industrial economics	BD, UC	5	150	2/0/1	105	E				5				
GEN125	Bases of designing and details of cars	BD, UC	5	150	1/1/1	105	E					5			
ELC103	Electrotechnics and Microelectronics	BD, UC	5	150	2/1/0	105	E					5			
CSE831	Fundamentals of Artificial	BD, UC	5	150	1/0/2	105	E					5			
TEC557	Structural strength of parts and assemblies of technological machines	BD, UC	4	120	2/0/1	75	E					4			
3218	Elective	BD, CCH	5	150	2/0/1	105	E					5			
PED446	Fundamentals of the theory of	BD, UC	5	150	2/0/1	105	E						5		
3220	Elective	BD, CCH	5	150	2/0/1	105	E						5		
3221	Elective	BD, CCH	5	150	2/0/1	105	E						5		
4222	Elective	BD, CCH	6	180	1/0/3	120	E							6	
AAP173	Educational practice	BD, UC	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Module of professional activity															
Technology and Operations Module															
TEC185	Technology of repair and operation of technological machines	PD, UC	5	150	2/0/1	105	E							5	

PED193	Instrumentation and automation of technological machines	PD, UC	5	150	2/0/1	105	E							5	
TEC560	Installation and assembly production of technological machines	PD, UC	6	180	2/0/2	120	E							6	
TEC570	Technical diagnostics of technological equipment	PD, UC	4	120	2/0/1	75	E						4		
TEC566	Metal welding and cutting	PD, UC	4	120	2/1/0	75	E								4
3302	Elective	PD, CCH	5	150	2/0/1	105	E						5		
3303	Elective	PD, CCH	4	120	2/0/1	75	E						4		
4307	Elective	PD, CCH	6	180	2/1/1	120	E							6	
4308	Elective	PD, CCH	5	150	2/0/1	105	E							5	
4309	Elective	PD, CCH	5	150	2/0/1	105	E								5
4310	Elective	PD, CCH	5	150	2/0/1	105	E								5
4311	Elective	PD, CCH	5	150	2/0/1	105	E								5
AAP102	Production practice I	PD, UC	2								2				
AAP183	Production practice II	PD, UC	3										3		
M-9. Module of final attestation															
ECA109	Final examination	FA	8												8
M-10. Module of additional types of training															
AAP500	Military affairs	ATT	0												
	Total based on UNIVERSITY:							32	28	27	33	29	31	33	27
								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		91	21	176
PD	Cycle of profile disciplines		29	34	
	Total for theoretical training:	*51*	*120*	*61*	*232*
FA	Final attestation	8			8
	TOTAL:	59	120	61	240

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 12 22. 04 **202** 4 **y.**

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 19. 04 **202** 4 **y.**

Decision of the Academic Council of the Institute of Energy and Mechanical Engineering. Protocol № 4 **"** 19 **"** 04 **20** 24 **y.**

Vice-Rector for Academic Affairs — **R.K. Uskenbayeva**

Director of Institute of E&ME — **K.K. Yelemessov**

Head of department TM&E — **K.K. Yelemessov**

Specialty Council representative from employers — **A.T. Shakenov**

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV

SATBAYEV UNIVERSITY

APPROVED
Director of the Institute of E&ME
K.K. Yelemessov
«25» 04 2024.

MAJOR ELECTIVE DISCIPLINES educational program for the 2024-2025 academic year admission
Educational program 6B07107 - Operational and service engineering
Group of Educational programs B064 - "Mechanics and metal working"

Full-time study Study duration : 4 years Academic degree: bachelor of natural sciences

Year of study	Code of elective	Code of discipline	Name of discipline	Semestr	Cycle	Credits	Total hours	lec/lab/pr	SIW (including SIWT) in hours
	M-7. Module of basic training								
	General technical training module								
3	3218	TEC411	Equipment maintenance system	5	BD	5	150	2/0/1	105
		MNG562	Legal regulation of intellectual property					2/0/1	
		TEC410	Fundamentals of the theory of wear of machinery and equipment					2/0/1	
	3220	TEC476	Internal combustion engines	6	BD	5	150	2/0/1	105
		TEC477	Gas-pumping units					2/0/1	
		MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan					2/0/1	
		TEC478	Gas turbine plants					2/0/1	
	3221	TEC469	Pumps, fans, compressors	6	BD	5	150	2/0/1	105
		TEC480	Drives of mining machines and stationary options					2/0/1	
		TEC457	Drives of technological machines					2/0/1	
4	4222	TEC553	Fundamentals of designing technological machines and machine graphics	7	BD	6	180	1/0/3	120
		TEC556	Computer technologies in operational and service engineering					1/0/3	
	M-8. Module of professional activity								
	Technology and Operations Module								
3	3302	TEC429	Mining and transport machines	6	PD	5	150	2/0/1	105
		PED149	Equipment for metallurgical plants					2/0/1	
		TEC430	Machinery and equipment for drilling oil and gas wells					2/0/1	
4	4307	TEC569	Tribonika and Tribotechnics	7	PD	6	180	2/1/1	120
		TEC568	Fuels, oils and special liquids					2/1/1	
	4308	PED130	Technology maintenance and repair of compressor units and hydraulic machines	7	PD	5	150	2/0/1	105
		TEC450	Welding technologies in repair and service production					2/0/1	
		TEC135	Machines and equipment of pumping and compressor stations					2/0/1	
		NSE185	Theory and practice of project management					2/0/1	
	4309	TEC441	Operation and maintenance of drainage and pneumatic installations	8	PD	5	150	2/0/1	105
		TEC442	Operation and maintenance of dust and gas cleaning equipment and recycled water supply					2/0/1	
		TEC443	Equipment and technology of well repair and maintenance					2/0/1	
	4310	PED457	Industrial safety in the oil and gas industry	8	PD	5	150	2/0/1	105
		TEC565	Industrial safety in an industrial cluster					2/0/1	
	4311	TEC500	Fundamentals of energy saving in repair and service production	8	PD	5	150	2/0/1	105
		TEC446	Robotic complexes in metallurgical production					2/0/1	
		TEC451	Energy-saving technologies in repair and service production in the oil and gas industry					2/0/1	
	Module"R&D"								
3	3303	TEC575	Experimental technique	6	PD	4	120	2/0/1	75
		TEC576	Design of experiments bench and field tests					2/0/1	

Credits numbers of elective disciplines over the entire period of study	
Cycle of disciplines	**Credits**
Cycle of basic disciplines (B)	21
Cycle of special disciplines (S)	35
Overall:	56

Decision of the Academic Council of the Institute E&ME. Protocol № 4 от "19" 04 2024 y.

Head of the department TM&T **K.K. Yelemessov**

Representative of the Council from employers **A.T. Shakenov**