



**Institute of Energy and Mechanical Engineering
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	Level 6 – higher education and practical experience
Level based on IQF	Level 6 - a wide range of special (theoretical and practical) knowledge (including innovative). Independent search, analysis and evaluation
Study period	4 years
Amount of credits	240

Almaty 2023

Educational program 6B07107 – "Operational and Service Engineering" was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 3 dated «27» 10 2022.

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

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Educational program **6B07107** – "**Operational and Service Engineering**" was developed by Academic committee based on direction «Engineering»

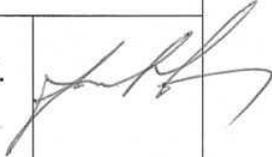
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List of abbreviations and designations

NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATBAYEV» – NCJS KazNRTU named after K. I. Satbayev;
SOSE – State obligatory standard of education of the Republic of Kazakhstan;
EP - educational program;
SRO - independent work of a student (student, undergraduate, doctoral student);
SROP - independent work of a student with a teacher (independent work of a student (undergraduate, doctoral student) with a teacher);
RUP - working curriculum;
QED - catalog of elective disciplines;
VK - university component;
KV - component of choice;
NQF - National Qualifications Framework;

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:

- experimental research;
- settlement design and analytical;
- production and technology;
- service and operational;
- 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;
- construction and maintenance materials;
- 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

№	Fieldname	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	training of highly qualified and competitive specialists who are able to realize their knowledge, skills, competencies in the field of monitoring, operation and maintenance of machinery and equipment
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	RE1: Apply the basic patterns and forms of regulation of social behavior, human and civil rights and freedoms in the development of social projects, demonstrating respect for people, tolerance for other cultures, readiness to maintain partnerships RE2: Demonstrate knowledge of sections of mathematics, physics and other natural sciences and apply them to solve engineering problems in the field of service maintenance of machinery and equipment RE3: Apply knowledge of economic laws, labor and environmental standards, rules of moral development, a culture of academic integrity at a professional level RE4: Choose the main methods and means of

	<p>obtaining, storing, processing information, to solve communication problems, use modern technical means and information technologies using traditional media, as well as information in global computer networks</p> <p>RE5: Apply innovative methods of installation and assembly of technological equipment units. Assess the technical condition and residual life of equipment, organize routine inspection and maintenance of equipment using diagnostic tools, process measurement results</p> <p>RE6: Apply modern methods to develop low-waste, energy-saving technologies that ensure the safety of people's life and protect them from the possible consequences of accidents, catastrophes and natural disasters, ways of rational use of raw materials, energy and other types of resources</p> <p>RE7: Perform work on standardization, technical preparation for certification of technical means and equipment, organize metrological support of technological processes using standard quality control methods</p> <p>RE8: Develop technical documentation, proposals and measures for the implementation of technological processes for the operation, repair and maintenance of technological machines for various purposes. Use welding technologies and equipment in repair production</p> <p>RE9: Study the basic tribological patterns to solve specific design, technological and operational problems related to friction, wear and lubrication in machines and mechanisms</p> <p>RE10: Apply modern design methods and computer graphics software to the design of machinery and equipment. Select materials when designing machines</p> <p>RE11: Demonstrate theoretical knowledge and practical skills in the field of operational reliability and technical diagnostics of machinery and equipment. Choose robotic complexes and manipulators for production processes</p> <p>RE12: Solve engineering problems using the basic laws of mechanics, electrical engineering, hydraulics, thermodynamics and heat and mass transfer</p> <p>RE13: Use the principles of setting and algorithms for solving problems of a research nature in order to systematically develop knowledge about project management. To assess the technical and economic performance of</p>
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		industrial enterprises RE14 Apply theoretical and experimental methods for calculating the parameters of machines and application software for design and verification calculations. Use the laws and methods of theoretical mechanics. Apply in practice methods for calculating parts and assess the strength of materials
13	Education form	updated
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	1. Director of the Institute of Energy and Mechanical Engineering, Yelemessov Kassym 2. Head of the department "Technological machines and equipment", Eskulov Serik 3. Professor, Myrzakhmetov Beibit 4. Associate Professor, Bortebayev Saiyn 5. Master MBA, Kanatbayev Maksat 6. Teacher, Tagauova Raikhan

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)													
				RO1	RO2	RO3	RO4	RO5	RO6	RO7	RO8	RO9	RO10	RO11	RO12	RO13	RO14
Цикл общеобразовательных дисциплин Обязательный компонент																	
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 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	5	v													

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 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	v												
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	5	v												

		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															
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 studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and	5	v													

		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 University component																		
8	Fundamentals of anti-corruption culture	The discipline studies the essence, causes, causes of sustainable development of corruption from both historical and modern points of view. Examines the prerequisites and impacts for the development of an anti-corruption culture. Studies the development of anti-corruption on the basis of social, economic, legal, cultural, moral and ethical norms. Studies the problems of the formation of an anti-corruption culture based on the relationship with various types of social relations and various manifestations. Situations of conflict of interests and moral choice are analyzed; improving the anti-corruption culture; actions in a conflict of interest situation	5		v													
9	Fundamentals of Entrepreneurship and Leadership	The discipline studies the basics of entrepreneurship and leadership from the point of view of science and law; features, problematic aspects and prospects of development; theory and practice of entrepreneurship as a	5		v													

		system of economic, organizational and legal relations of business structures; readiness of entrepreneurs for innovative receptivity. The discipline reveals the content of entrepreneurial activity, career stages, qualities, competencies and responsibilities of an entrepreneur, theoretical and practical business planning and economic expertise of business ideas, as well as risk analysis of innovative development, introduction of new technologies and technological solutions																
10	Ecology and life safety	The discipline studies the problems of ecology as a science, ecological terms, the laws of the functioning of natural systems and aspects of environmental safety in working conditions. Environmental monitoring and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5			v												
Cycle of basic disciplines																		
University component																		
11	Mathematics I	The course is designed to study the basic concepts of higher mathematics and its applications. The main provisions of the discipline are used in the study of all general engineering and special disciplines taught by graduate departments. The course sections include elements of linear algebra and analytical geometry, an	5			v												

		introduction to analysis, differential calculus of a function of one and several variables. The questions of methods for solving systems of equations, the application of vector calculus to solving problems of geometry, mechanics, physics are considered. Analytical geometry on the plane and in space, differential calculus of functions of one variable, derivative and differentials, study of the behavior of functions, Directional derivative and gradient, extremum of a function of several variables.															
12	Physics	The course studies the basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics as a science on the development of technology; the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. The course covers the following sections: mechanics, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, electrostatics, direct current, electromagnetism, geometric optics, wave properties of light, laws of thermal radiation, photoelectric effect	5		v												
13	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	5		v												

		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															
14	Engineering and computer graphics	The discipline is aimed at the study of methods for the image of objects and the general rules of drawing, using computer graphics; the study of the basic principles and geometric modeling approach and methodology for developing applications with a graphical interface; the formation of skills in the use of graphic systems for the development of drawings, using 2D and 3D modeling methods	5							v		v					
15	Introduction to the specialty	The Discipline course is one of the elective component disciplines that future representatives of the mechanic's service study. The course content allows future mechanics to get an idea of such a technically and technologically complex industry. During the study, students will be introduced to the technological processes and the main equipment of the mining and metallurgical and oil and gas industries, operational and service industries of the industry	5							v				v			
16	The basics of plumbing	The course provides for the study of basic methods related to repair, repair and operation conditions of technological equipment, repair	4														

		quality requirements, selection of necessary machinery and equipment and materials. This discipline is a course of choice for the training of mechanics. As a result of mastering the discipline, students gain practical skills in maintenance and repair of components and parts of technological equipment and apply appropriate technical means and tools															
17	Theoretical and applied mechanics	Theoretical and applied mechanics includes courses such as theoretical mechanics, theory of mechanisms and machines. Theoretical mechanics deals with the general laws of mechanical movements of material bodies and mechanical interactions between them. In the theory of mechanisms and machines, general methods of research, construction, and kinematics of mechanisms and machines are studied. We also strive to involve students in the development and solution of problems that contribute to bridging the gap between scientific theory and engineering practice.	5														
18	Hydraulics and hydraulic drive of technological machines	The study of the course is aimed at forming a complex of knowledge of the basic laws of hydraulics; the ability to apply these laws to solve practical computational problems; possession of standard hydraulic calculations and methods of experimental research of hydraulic systems. Application of knowledge in the field of technical fluid mechanics	6												v		v

		(hydraulics), for the calculation of hydraulic pressure systems, hydraulic machines, hydraulic and pneumatic drives, widely used in industry. Complete hydraulic calculation of various hydraulic systems, hydraulic and pneumatic equipment drives. Obtaining the basics of knowledge in the field of hydraulics – theoretical fluid mechanics in the field of hydraulic drives																
19	Interchangeability, standardization and technical measurements	Study of the basic laws and concepts of standardization and interchangeability, methods and means of controlling shape deviations, roughness and undulation of surfaces of parts, the role of standardization in improving the quality of machines. The course links the design, production technology and control of products into a single whole. Standardization and unification of parts and elements contribute to speeding up and reducing the cost of designing and manufacturing products.	5							v								
20	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						v

		materials. Attention is paid to lubricants and composite materials, metal corrosion and coatings																
21	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				
22	Basics of thermodynamics and heat engineering installations	Assimilation of methods for obtaining, converting, transferring and using heat, which makes it possible to save fuel and energy resources during the operation of technological machines and equipment, to intensify technological processes, to identify and use thermal energy resources	5											v			v	
23	Industrial economics	The purpose of mastering the discipline is the formation of knowledge of the complex solution of economic problems of the development of economic activity of industrial enterprises, the acquisition of the ability to independently understand the changing market conditions. The economic aspects of	5															v

		product quality, investments, fixed and working capital of the enterprise, personnel, labor productivity, wages are studied. The main technical and economic indicators of production, assessment and analysis of the economic activity of the enterprise															
24	Bases of designing and details of car	The purpose of the discipline: formation of knowledge of the basics of theory, calculation and design of machine parts and assemblies. The general principles of design and construction, construction of models and calculation algorithms for typical machine parts, taking into account the performance criteria, are considered. The types of failures of machine parts, the concept of reliability and its main indicators, the basics of the theory and methods of calculating typical machine parts, computer technologies for designing components and machine parts are studied. Basic requirements for machine parts and assemblies.	5							v			v				
25	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. Electromagnetic devices and electrical machines. Fundamentals of electronics and electrical measurements. The element base of modern electronic devices.	5								v						

		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																
26	Labor protection	The purpose of the discipline is to form knowledge of legislative acts and norms aimed at ensuring occupational safety. In the discipline, students study legal and regulatory documents on labor protection (OT), occupational hygiene and industrial sanitation. Dangerous and harmful production factors, safety measures during installation and operation of technological equipment, emergency situations and elimination of their consequences are considered. In the discipline, they study the basics of OT management, rationing, methods of assessing and forecasting OT, methods of monitoring and auditing OT	5			v			v									
27	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	4												v			v

		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															
28	Fundamentals of the theory of reliability of machines and mechanisms	The course provides students with knowledge and skills that provide a creative approach to solving problems of reliability and durability of technological machines and equipment necessary to increase the level of automation, reduce huge repair costs from machine downtime, and ensure safety during equipment operation. When studying disciplines, students master the issues of ensuring the reliability and durability of technological equipment; principles of rational use of technical parameters of technological machines.	5														v
CYCLE OF BASIC DISCIPLINES																	
Component of choice																	
29	Equipment maintenance system	Mastering the principle of operation, arrangement, 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 generation. Machines for the	5						v		v						v

		preparation of filling mixtures and mechanisms for the erection of shotcrete lining. Ensuring the safe and efficient operation of stationary installations, the ability to design such installations, the choice of equipment, the determination of rational modes of their operation and technical and economic indicators															
30	Fundamentals of the theory of wear of machinery and equipment	The course covers the fundamentals of the theory of friction and wear, the mechanisms of friction and wear, and the types of wear. The stages of wear of the friction unit and methods of lubrication are considered. To obtain practical skills, familiarization with equipment and apparatus for determining wear and characteristics of lubricants is provided. Attention is paid to the physicochemical processes occurring in tribocouplings.	5					v				v					
31	Internal combustion engines	Thermodynamic cycles of internal combustion engines. Designs of internal combustion engines used in the oil and gas industry, theory of work processes, principles of their operation, basic concepts and definitions, technical and economic indicators, designs of engine systems, rules for their technical operation, maintenance	5							v	v					v	

		and repair. The processes of compression, combustion and expansion. Calculation of working mixture parameters in these processes..															
32	Gas-pumping units	Main features and current state of pipeline transport of natural gas. Modes and indicators of operation of gas compressor units at compressor stations. Features of the properties and aerodynamics of flows in gas pumping units. Types of centrifugal superchargers used in the gas industry. Designs and characteristics of CBN natural gas. Methods for determining the technical condition and power consumption Gas-pumping units with an energy drive.	5							v	v					v	
33	Gas turbine plants	The purpose of studying the discipline is to prepare students for solving practical problems related to the operation of gas turbine units (GTU) used in the oil and gas industry as well as at compressor stations of main gas pipelines. The task of studying the discipline is to familiarize yourself with the designs and principles of operation of GTUs of various schemes and types, mastering the methods for calculating their parameters, skills for monitoring the basic	5							v	v					v	

		parameters and operating modes of the unit being carried out, methods for diagnosing units with a gas turbine drive															
34	Pumps, fans, compressors	The device of technologically important and large energy consumers in industry: pumps, fans and compressors of various types, parameters, effective modes of their operation. The methods of designing and constructing pumping stations, fan installations for the main ventilation are practically mastered. Pipeline networks, their arrangement and installation, auxiliary equipment that ensures the efficient and safe operation of pumping, fan and compressor units are studied.	5														v
35	Drives of mining machines and stationary options	training specialists to solve problems related to the design and operation of technological machine drives with complex systems of manual, remote and automatic control of operating modes and positioning of executive bodies. <i>know:</i> operating conditions of technological machine drives and loading modes of the drive; principles of operation, device and features of the use of drives and their elements.	5					v									v

		<i>be able to:</i> choose the type of drive with the desired output characteristics and the method of controlling its parameters; choose the optimal technical and economic parameters of machines with hydraulic, pneumatic and electrical wires															
36	Drives of technological machines	Structural schemes of drives of working bodies, standard solutions. Mechanical and speed characteristics of drives. Hydraulic drives and control systems. Types and features of hydraulic motors used in machine drives. Types and features of guide and control hydraulic equipment used in machine drives. Typical schemes of adjustable drives with proportional electrohydraulic control. Pneumatic drives and machine control systems	5							v		v					
37	Fundamentals of designing technological machines and machine graphics	The course is designed to study the designs, types and performance criteria of the components of all technological machines - parts, assemblies, assemblies; studying the basics of the theory of work and methods for calculating machine parts in joint work; acquisition of design and construction skills, development of creative design	6				v					v					

		abilities; mastery in the design of modern computer technology and computer graphics; mastering the basic methods of depicting spatial forms on a plane and making drawings															
38	Computer technologies in operational and service engineering	The course studies the basics of system and automated modeling and design of technical objects; technical characteristics and capabilities 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 basic knowledge, skills and abilities in design and modern methods for calculating parts, assemblies and mechanisms for stren	6				v					v					
CYCLE OF PROFILE DISCIPLINES																	
University component																	
39	Technology of repair and operation of technological machines	The reliability and durability of their work depend on the correct installation and operation of technological machines and equipment. In this discipline, the rules for installing equipment and the technology for its implementation are studied. The issues of	5					v				v					

		commissioning, diagnostics of the state of technological machines are considered. The systems and technology of operation of technological machines and their maintenance are studied. Students acquire the skills and abilities to draw up flow charts for the maintenance of machines, equipment and their electric drive															
40	Instrumentation and automation of technological machines	Formation of the knowledge of the future specialist on 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 actual engineering, technical, scientific problems in the field of quality, performance properties and rational use of fuels, oils, lubricants and technical fluids	5					v		v							
41	Installation and assembly production of technological machines	The course is designed to study the main aspects of the technologies used in the assembly and assembly production of technological machines. Forms of organization and assembly methods are considered in depth, attention is paid to documentary support, tooling and features of the assembly technology of standardized assemblies and	6					v		v							

		connections: threaded, with an interference fit, gears, rolling and sliding bearings, pipeline systems. Installation technologies are presented in accordance with the stages of the project for the production of works (PPR): acceptance of the construction part, methods of installation and alignment of equipment on the foundation, fastening, balancing and centering, stages of commissioning and commissioning using the example of overhead cranes and belt conveyors														
41	Technical diagnostics of technological equipment	the course is aimed at studying the theoretical foundations of technical diagnostics and gaining 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, systems of technical diagnostics; studying the physical foundations of non-destructive testing methods for detecting and diagnosing malfunctions of process equipment; familiarization with equipment for non-destructive testing, testing	4				v						v			

		methods, acquisition of practical skills															
42	Metal welding and cutting	<p><i>The purpose of the course:</i> the development of students technology of welding and cutting of metals, the scientific foundations of this technology. Enough well and deeply to develop materials, machines and apparatus, mechanization and automation of the welding process. Young professionals should choose the right materials and equipment, be able to use them effectively and competently.</p> <p><i>Objectives of the course:</i> the acquisition of students ' skills in the development of metal welding technology, repair of machine parts, surfacing of the surface layer with special physical and chemical properties</p>				v						v					
CYCLE OF PROFILE DISCIPLINES																	
Component of choice																	
43	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 design characteristics of various machines for breaking, loading, transportation, fastening and other auxiliary	5				v						v				v

		operations; methods for determining the main structural and operational parameters of mining and transport machines, their productivity and efficiency in mining production																
44	Equipment for metallurgical plants	General characteristics of mechanical equipment of the metallurgical industry. Classification of equipment by the nature of the operation of the drives in the working time cycle. Crushing equipment. General information about the crushing process. Types of crushing machines. Calculation of crushers. Shredding equipment. General information and classification of mills. Calculation of the main parameters. Equipment for uniform feeding of technological machines. Types, device, calculation of basic parameters. Equipment for enrichment. Methods of enrichment. Necessary mechanical equipment	5							v				v				v
45	Machinery and equipment for drilling oil and gas wells	Modern designs of equipment for drilling wells, for the purpose of oil and gas production on the shelf, the device and the main directions of further development of drilling machines and complexes in accordance with the trends of world technological progress; technological and regulatory requirements for drilling machines and installations, the rules for their installation and dismantling, operation and maintenance on the shelf. Issues of evaluating the effectiveness of machines and equipment for choosing a rational way of their	5						v					v				v

		operation.															
46	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 get acquainted with the friction process, with the basic methods of tribotechnical testing and methods of modeling tribotechnical processes; get 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	v					v
47	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 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	6								v	v					v

		lubricants and special liquids.															
48	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 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	5		v												v
49	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 indefatigable 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							
50	Machines and equipment of pumping and compressor stations	Purpose and classification of pumping and compressor station equipment. Equipment of pumping stations for the transportation of oil and petroleum products. Equipment of compressor stations for transportation of natural gases. Shut-	5					v									v

		off and control valves and equipment of oil pipelines. Shut-off and control valves and gas pipeline equipment. Technological scheme of strapping equipment of pumping and compressor stations. Automation and control of pumping and compressor stations equipment.															
51	Theory and practice of project management	The discipline is aimed at studying the general trends of project management in market conditions in order to increase productivity in the professional industry. The essence, concept, composition, tasks and problems of management. Study of the scientific methodology of project management. The concept of organization, the external and internal environment of the team, communication. Requirements for project management. The role of decision-making in project management. The concept of anti-crisis programs in the performance of managerial functions. The concept of management culture and professional etiquette	5														v
52	Operation and maintenance of drainage and pneumatic installations	The device of technologically important and large energy consumers in the mining industry: pumps, fans and compressors of various types, the main parameters and scope of application of these installations. Methods of design and installation of pumping stations, fan installations of the main ventilation. Pipeline networks, their arrangement and installation, auxiliary equipment	5					v		v				v			

		ensuring efficient and safe operation of pumping, fan and compressor units																
53	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 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.	5						v			v				v		
54	Equipment and technology of well repair and maintenance	Familiarization with promising innovative technologies and techniques in technological engineering. Awareness of the need for professional development during your 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 by experts. The ability to make a technical and economic comparison of various modifications of technological machines and equipment	5								v					v		
55	Industrial safety in the oil and gas industry	<i>The purpose of studying the discipline "Industrial safety in the oil and gas industry" is to form</i>	5						v									v

		students' ideas about the complex of scientifically grounded constructive, technological, and organizational measures aimed at minimizing the anthropogenic impact of oil and gas facilities on environmental components. As a result of studying the discipline "Industrial safety in the oil and gas industry," students should master the skills of forecasting and assessing the effects of anthropogenic impact on environmental components in the construction and operation of oil and gas facilities														
56	Industrial safety in an industrial cluster	A set of scientifically based constructive, technological, organizational measures aimed at minimizing the anthropogenic impact of oil and gas sector 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 oil and gas industry facilities. Classification, composition, sources of technogenic impact of oil and gas industry facilities. Technology of restoration and optimization of the state of components of the natural environment	5			v										v
57	Fundamentals of energy	Сформировать представление об общих принципах разработки	5			v					v					

	saving in repair and service production	стратегии энергетического обследования, современной нормативной базе энергоэффективности, методах определения нормативных и перспективных показателей уровня энергоэффективности, методах подтверждения показателей энергетической эффективности и соответствия их нормативным значениям, современных и перспективных научно-обоснованных технологиях энергосбережения, контроля и повышения качества энергии, включая использование возобновляемых источников энергии															
58	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					v			
59	Energy-saving technologies in repair and service production in the oil and gas industry	The purpose of the study: the purpose of teaching the discipline is to familiarize future specialists with the ways to solve energy-saving technologies and other relevant issues. Summary: in this discipline the basics of energy technology and secondary energy resources	5						v					v			

		(VER) are studied. Basic terms and definitions of energy saving. Energy saving in the oil and gas industry. The main directions of the use of VER. Sources VER. Prospects for the development of unconventional energy sources. Energysaving 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 VER gas turbine installations at compressor stations of main gas pipelines															
60	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
61	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, methods of	4			v											v

	<p>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 to determine the resource and reliability of technological machines and equipment used in the industry</p>														
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5. Curriculum of educational program

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



CURRICULUM
of Educational Program on enrollment for 2023-2024 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/p	SIS (including TESIS) 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															
LNG108	English language	GED, RC	10	300	0/0/6	210	E	5	5						
LNG104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	E	5	5						
M-2. Module of physical training															
KFK101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Difcredit	2	2	2	2				
M-3. Module of information technology															
CSE677	Information and communication technologies (in English)	GED, RC	5	150	2/1/0	105	E				5				
M-4. Module of socio-cultural development															
HUM137	History of kazakhstan	GED, RC	5	150	1/0/2	105	SE		5						
HUM132	Philosophy	GED, RC	5	150	1/0/2	105	E					5			
HUM120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	E					3			
HUM134	Socio-political knowledge module (culturology, psychology)		5	150	2/0/1	105	E				5				
M-5. Module of anti-corruption culture, ecology and life safety base															
HUM136	Fundamentals of anti-corruption culture and law	GED, CCH	5	150	2/0/1	105	E								
MNG489	Fundamentals of Economics and Entrepreneurship														
MSM500	Fundamentals of scientific research methods														
CHE656	Ecology and life safety														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5							
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		
SAF110	Labor protection	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 reliability of machines and mechanisms	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
AAP179	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	
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



KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV



MAJOR ELECTIVE DISCIPLINES educational program for the 2023-2024 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
		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	
		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	TEC457	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	
		TEC500	Fundamentals of energy saving in repair and service production					2/0/1	
TEC446		Robotic complexes in metallurgical production	2/0/1						
4311	TEC446	Robotic complexes in metallurgical production	8	PD	5	150	2/0/1	105	
	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 № 2 or "11" 10 2023 y.

Head of the department TM&T

Representative of the Council from employers

S.A. Bortebayev

M.A. Kanatbayev

6. Additional educational programs (Minor)

Name of additional educational programs (Minor) with disciplines	Totalnumberofcredits	Recommendedsemestersofstudy	Documents on the results of mastering the additional educational programs (Minor)