**Institute of Energy and Mechanical Engineering**
**Department of "Technological machines and equipment"**

# EDUCATIONAL PROGRAM
# 6B07115 – Technological machines and equipment (by industry)

| | |
|---|---|
| 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 ones). Independent search, analysis and evaluation |
| Study period: | 4 years |
| Amount of credits: | 240 |

**Almaty 2023**

Educational program 6B07115 – Technological machines and equipment (by industry) was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 5 dated « 14 » 11 2022.

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

Minutes # 3 dated « 17 » 11 2022.

Educational program 6B07115 – Technological machines and equipment (by industry) was developed by Academic committee based on direction « Engineering and Engineering »

| Full name | Academic degree/ academic title | Position | Workplace | Signature |
|---|---|---|---|---|
| **Chairperson of Academic Committee:** | | | | |
| Yelemessov Kassym | Candidate of Technical Sciences, Associate Professor | Director of the Institute of Energy and Mechanical Engineering | KazNRTU named after K.I. Satpaeva | |
| **Teaching staff:** | | | | |
| Eskulov Serik | Candidate of Technical Sciences, Associate Professor | Head of the department "Technological machines and equipment" | KazNRTU named after K.I. Satpaeva | |
| Myrzakhmetov Beibit | Candidate of Technical Sciences, Associate Professor | Professor | KazNRTU named after K.I. Satpaeva | |
| Bortebayev Saiyn | Candidate of Technical Sciences, Associate Professor | Associate Professor | KazNRTU named after K.I. Satpaeva | |
| **Employers:** | | | | |
| Kanatbayev Maksat | Master MBA | CEO | JSC "Almaty plant of heavy engineering" | |
| **Students** | | | | |
| Asankhanov Nurdaulet | | 3rd year student | KazNRTU named after K.I. Satpaeva | |

# Table of contents

## 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;
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;
CED – catalog of elective disciplines;
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 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 means of design, calculation, mathematical, physical and computer modeling;
- organization and execution of works on creation, installation, commissioning, maintenance, operation, diagnostics and repair of technological machines and equipment, development of technological processes for the production of parts and assemblies.

*The objects of the bachelor 's professional activity are:*

- technological machines and equipment of various complexes;
- technological equipment and means of mechanization and automation of technological processes;
- production technological 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 manufactured products;
- means of testing and quality control of technological machines and equipment;
- technological processes of metal structures assembly;
- welding equipment and power supplies, assembly and welding devices;
- regulatory and technical documentation, standardization and certification systems, methods and means of testing and quality control of products.

*The types of professional activity are:*

- experimental research;
- design and analytical;
- production and technological;
- service and operational;
- installation and commissioning;
- organizational and managerial.

*The subjects of the bachelor's professional activity are:*

- technological machines and equipment; energy equipment;
- machine drive systems;
- motion control systems;
- operator's life support systems;
- structural and operational materials;
- equipment for manufacturing, testing and disposal of technological machines;
- equipment for maintenance and repair of technological machines;
- control and measuring devices for the manufacture and operation of machines;

- equipment for automating the working processes of machines;
- equipment for designing machines

## 2. Purpose and objectives of educational program

**Purpose of EP:** Technological machines and equipment (by industry) is to provide comprehensive and high-quality training of competitive, highly qualified specialists ready to solve practical and theoretical tasks of professional activity in modern conditions based on the development of skills and abilities necessary for a future specialist

**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 providing knowledge of natural, general technical and economic disciplines as the basis of vocational education;
- the cycle of the main disciplines is aimed at studying the main theoretical aspects of technological machines, theoretical and practical methods, areas of human activity based on the creation of competitive technological machines and modern methods and means of human design, mathematical, physical and computer modeling of technological processes;
- study of disciplines that form the skills of planning and organizing research work, designing technologies and devices;
- familiarity with the technologies and equipment of enterprises at different stages of practical training;
- mastering the skills and abilities of laboratory research, technological calculations, selection and design of equipment using modern computer technologies and programs

## 3. Requirements for evaluating the educational program learning outcomes

The volume of the bachelor's degree program is 240 credits, regardless of the form of study, the educational technologies used, the implementation of the bachelor's program using the online form, the implementation of the bachelor's program according to an individual curriculum, including accelerated learning.

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 | "Technological machines and equipment (by industry)" |
| 5 | Short description of educational program | Educational program "Technological machines and equipment (by industry)" in the following industries:<br>- metallurgical machinery and equipment;<br>- mining machinery and equipment;<br>- machinery and equipment of 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 the mining and metallurgical and oil and gas industries. The development of students' personal qualities, the formation of general cultural and professional competencies |
| 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 skills<br>QC Basic literacy in natural sciences<br>QC 3.General engineering competencies<br>QC 4. Professional competencies<br>QC 5. Engineering and computer competencies<br>QC 6.Engineering and working competencies<br>QC 7. Socio-economic competencies<br>QC 8. Special professional competencies |
| 12 | Learning outcomes of educational program | RO1: Ready to use ethical and legal norms regulating the relationship of a person to a person, society, and the environment. He is able to practically 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, willingness to maintain partnerships<br>PO2: Capable of purposeful application of basic knowledge in the field of mathematical, natural, humanitarian and economic sciences in professional activity<br>RO3: Is able to choose the main and auxiliary materials and methods of implementation of the main technological processes and apply progressive methods of operation of technological equipment |

| | | |
|---|---|---|
| | | RO4: Knows the basic methods, methods and means of obtaining, storing, processing information, is able 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<br>RO5: Is able to participate in installation and commissioning during testing and commissioning of new technological equipment. He is able to check the technical condition and residual life of technological and welding equipment, organize preventive inspection and maintenance of equipment using diagnostic devices, process measurement results<br>RO6: Is able to apply modern methods for the development of low-waste, energy-saving technologies that ensure the safety of human life and their protection from possible consequences of accidents, catastrophes and natural disasters, is able to apply methods of rational use of raw materials, energy and other types of resources<br>RO7: Ready to carry out standardization work, technical preparation for certification of technical means and equipment, organize metrological support of technological processes using standard quality control methods<br>RO8: Is able to apply standard calculation methods in the design of parts and assemblies of technological machines and welded structures. Is able to take part in the calculation and design of parts and assemblies of technological equipment and welded structures in accordance with technical specifications and the use of standard design automation tools<br>RO9: Is able to develop working design and technical documentation, execute completed design work with verification of compliance of developed projects and technical documentation with standards, specifications and other regulatory documents<br>RO10: Is able to make applications for equipment and spare parts, prepare technical documentation for equipment repairs, analyze and monitor the technical condition of machines, as well as to make management decisions based on their results<br>RO11: Has knowledge and skills in the field of dynamics, reliability and technical diagnostics of technological machines of main and auxiliary production<br>RO12: Has knowledge in the field of operation and repair of lifting and transport, water-gas-oil pumping machines for integrated management and monitoring of industrial production<br>RO13: Has knowledge in the field of industrial |

| | | |
|---|---|---|
| | | enterprises. He is able to manage departments of industry-specific industries. He is able to combine knowledge in the field of engineering and technologies of industrial production<br>RO14 Performs strength calculations and calculations of machine structures, is able to design, adjust, repair equipment of various types, solve problems of efficient operation of mechanical equipment, as well as operate any complex of equipment in the technological processes of mining, metallurgical and oil and gas industries |
| 13 | Education form | full-time |
| 14 | Period of training | 4 years |
| 15 | Amount of credits | 240 |
| 16 | Languages of instruction | english |
| 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<br>2. Head of the department "Technological machines and equipment", Eskulov Serik<br>3. Professor, Myrzakhmetov Beibit<br>4. Associate Professor, Bortebayev Saiyn<br>5. Master MBA, Kanatbayev Maksat<br>6. Teacher, Tagauova Raikhan |

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

| № | Discipline name | Short description of discipline | Amount of credits | Generated learning outcomes (codes) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
| **Cycle of general education disciplines<br>Required component** | | | | | | | | | | | | |
| 1 | Foreign 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 | 5 | v | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | application programs | | | | | | | | | | |
| 4 | Modern 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 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 | 3 | **v** | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | | | | | | | | | | |
| 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 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 | 5 | **v** | | | | | | | | |
| **Cycle of general education disciplines<br>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 | 5 | | **v** | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | | | | | | | | | | |
| 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 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 | 5 | | v | | | | | | | |
| 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<br>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 | 5 | | v | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | general engineering and special disciplines taught by graduate departments. The course sections include elements of linear algebra and analytical geometry, an 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 operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory | 5 | | v | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | | |
| 15 | Fundamentals of 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 | |
| 16 | Training workshops | The course provides for the study of basic methods related to repair, repair and operation conditions of technological equipment, repair 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 | 4 | | | | | | | | | |
| 17 | Theoretical and applied mechanics | Theoretical and applied mechanics includes courses such as theoretical | 5 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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. | | | | | | | | | | |
| 18 | Fundamentals of hydraulics and hydraulic drives 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.<br>Application of knowledge in the field of technical fluid mechanics (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.<br>Obtaining the basics of knowledge in the field of hydraulics – theoretical fluid mechanics in the field of hydraulic drives | 6 | | | | | | | | | |
| 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. | 5 | | | | | | | **v** | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Standardization and unification of parts and elements contribute to speeding up and reducing the cost of designing and manufacturing products. | | | | | | | | | | |
| 20 | Structural materials of technological machines and equipment | The solution of the most important technical problems associated with the creation and development of new most economical materials, increasing the accuracy, reliability and operability of mechanisms and devices largely depends on the development of materials science and technology for obtaining and processing materials, concretization of knowledge about the relationship of composition, structure and properties of materials used to control the structure and properties of structural materials. | 5 | | | | | | | | | |
| 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** | | |
| 22 | Thermodynamics, heat transfer and heat engineering equipment | 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 | | | | | | | | | |
| 23 | Industrial economics | The purpose of mastering the discipline is the formation of knowledge of the complex | 5 | | | **v** | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 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 cars | 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** | | |
| 25 | Electrical engineering 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. Semiconductor elements. Electronic equipment power supply | 5 | | | | | | | | **v** | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | Dynamics and strength 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 | | | | | | | | | |
| 28 | Reliability of technological machines | The course provides students with knowledge and skills that provide a creative approach to solving problems of reliability and durability of technological | 5 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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. | | | | | | | | | | |
| **Cycle of basic disciplines<br>Component of choice** | | | | | | | | | | | | |
| 29 | Drilling machines and complexes | Designs of equipment for drilling wells for the purpose of oil and gas production the device and the main directions of further development of drilling machines and complexes in accordance with the trends of world technological progress. Evaluation of the effectiveness of machines and equipment for choosing a rational way of their operation. Technical level, ways to improve the design, methods of operation of drilling machines and complexes. | 5 | | | | | | **v** | | **v** | |
| 30 | Technological lines and complexes of metallurgical production | The course provides students with the necessary knowledge about the scale of metallurgical production and the continuity of its constituent processes, patterns of construction and trends in the development of technological lines of metallurgical production, necessary for production, design and research activities.<br>Mastering by students of technologies for obtaining various metals, starting with enrichment and ending with metalworking processes by pressure, the structure of existing technological lines and complexes of metallurgical workshops and prospects for the development of metallurgical production, the principle of choosing machines and mechanisms, determining the required number of them for lines and | 5 | | | | | **v** | | | | **v** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | complexes of metallurgical workshops | | | | | | | | | | |
| 31 | Mining technology | Prospects for the development of underground mining of mineral deposits. Mining and geological characteristics of mineral deposits. Basic information about mining operations in the underground development of the deposit. The order and methods of ore extraction and the sequence of mining blocks. The main indicators of ore extraction. Losses and dilution of ore. Concepts of a mine field, a mine. Stages of mine fields development. Autopsy requirements | 5 | | | | | | | v | v | |
| 32 | Technological processes in the oil and gas industry | About Training bachelors in well construction technology, well oil production, scientific understanding of the main technological processes and works in the oil and gas industry.<br>Methods of opening productive objects; the call of inflow and development of wells; the choice of methods of impact on the productive reservoir; the choice of methods of impact on the bottom–hole zone of the well; methods of well operation; calculation of operating modes of the "well-formation" system. | 5 | | | | | | | v | v | |
| 33 | Internal combustion engines | Thermodynamic cycles of internal combustion engines. Internal combustion engine designs used in the oil and gas industry, the theory of working processes, principles of their operation, basic concepts and definitions, technical and economic indicators, engine system designs, rules for their technical operation, maintenance and repair. Processes of compression, combustion and expansion. Calculation of the parameters of the working mixture in these processes | 5 | | | | | | | v | v | |
| 34 | Pumps, fans, compressors | The device of technologically important and large energy consumers in industry: pumps, fans and compressors of various | 5 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | types, parameters, effective modes of their operation. The methods of designing and installing pumping stations, fan installations of the main ventilation are practically mastered. Pipeline networks, their design and installation, auxiliary equipment ensuring efficient and safe operation of pumping, fan and compressor units are being studied. | | | | | | | | | | |
| 35 | Transport and auxiliary equipment of metallurgical workshops | General information about mechanical transport equipment of non-ferrous metallurgy plants. Equipment of warehouses of bulk charge materials. The device and designs of car dumpers. Bunkers and their closures. Feeder designs. Equipment maintenance techniques depending on its type and purpose. The main parameters of the mechanical mode. Purpose, device, principle of operation and features of operation of technological equipment of pyro- and hydrometallurgical productions | 5 | | | | | v | | | | |
| 36 | Gas pumping units | The main features and current state of natural gas pipeline transport. Modes and performance indicators of gas pumping units at compressor stations. Features of properties and aerodynamics of flows into gas pumping units. Types of centrifugal superchargers used in the gas industry. Designs and characteristics of the CBN of natural gas. Methods for determining the technical condition and power consumption of gas pumping units with power drive. | 5 | | | | | v | | | | |
| 37 | Calculation and design of technological machines and equipment | The concept of the essence and purpose of the mechanism. General principles of design of technological equipment. Kinematic schemes of technological machines and equipment, methods of obtaining new technical solutions in the design, design of gearbox housing parts; | 6 | | | | | | | | v | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | standard calculation of mechanical gears, design of the main elements of mechanical gears, including using computer-aided design methods | | | | | | | | | | |
| 38 | Computer-aided design systems for technological machines | The organization of the process of designing engineering objects, the basic principles of construction and structure of computer-aided design systems, the composition and types of support for computer-aided design systems, analysis of the work processes of technological machines using computers, elements of computer-aided design systems of technological machines. Structure and classification of computer-aided design systems, with various types of computer-aided design systems support | 6 | | | | | | | | v | |
| 39 | Computer technologies of calculation, modeling and design | The course is aimed at students learning the basics of modeling technological machines and equipment, to gain practical skills of working with computer graphics in the process of designing parts and assemblies, to form knowledge about trends in the development of computer graphics, to form a professional student's consciousness. When studying the discipline, students receive: practical skills of working with modern graphic computer graphics programs; master the methods of using computer graphics in the tasks of the discipline; knowledge of the theoretical foundations of the finite element method; obtaining skills in analyzing the results of computer modeling and design; fundamentals of system and automated modeling and design of technical objects; classification, technical characteristics and capabilities of various computer design systems and database management systems | 6 | | | | v | | | | | |
| **Cycle of profile disciplines<br>University component** | | | | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | Repair of technological machines | Wear and aging of technological machines and equipment. Design of repair production. Organization and management of the electromechanical service. Basic information on the methods of repair, improvement of technological equipment. Engineering support of repair. To identify defects in the components of machines and aggregates, to instill in students the practical skills necessary for the repair and operation of mining and metallurgical production equipment. Technologies for restoring worn parts | 5 | | | | | v | | | v | |
| 41 | Control and measuring devices and automation of technological machines | Formation of the future specialist's 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 current engineering and scientific problems in the field of quality, operational properties and rational use of fuels, oils, lubricants and technical fluids. | 5 | | | | | v | | v | | |
| 42 | Installation and operation of technological machines | The course is aimed at familiarizing students with modern methods and forms of organization of installation work, technology of assembly of components during assembly, alignment of equipment during installation on the foundation, adjustment of standardized units, running-in, testing and operation of aggregates, lubricants, lubrication systems, lubrication fittings and regeneration of lubricants. The main task of studying the discipline is to gain knowledge on the organization and engineering support of high-quality operation and installation of metallurgical equipment, instilling in students practical skills necessary for the operation and installation of technological machines. | 6 | | | | | v | | v | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | Welding and cutting of metals | Electric arc welding and cutting, as well as other types of welding are widely used in the metallurgical industry. It is enough to master materials, machines and apparatuses, mechanization and automation of the welding process well and deeply. When installing metallurgical equipment, repairing machine parts, laying pipes, manufacturing metal structures, welding and thermal cutting are one of the main technological processes | 4 | | | | | **v** | | | | |
| **Cycle of profile disciplines<br>Component of choice** | | | | | | | | | | | | |
| 44 | Transport vehicles | General information about transport vehicles. Technological schemes of transport. Fundamentals of calculation of transport vehicles. Railway transport. Automated design system for electric locomotive transport. Self-propelled transport. Scraper installations. Conveyor installations. Pneumatic and hydraulic transport installations. Pipeline container pneumatic transport installations. Mechanization of loading and unloading and installation works. Transport on the surface of mines and mines. Technological complex of the surface. Constructions of transport vehicles | 5 | | | | | **v** | | | | |
| 45 | Hydraulic machines and compressors in the oil and gas industry | Acquisition of solid theoretical and practical knowledge on the designs and principles of operation of hydraulic machines, compressors, widely used in the transportation of oil, petroleum products and gas through pipelines. General diagrams of devices of hydraulic machines and compressors. The principle of operation of volumetric, flowing machines. Varieties of hydraulic and compressor machines. Theories of action and characteristics. Areas, features of application, regulation of operating modes | 5 | | | | | | | | **v** | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 46 | Ore preparation equipment | The course is aimed at training specialists in the field of operation of technological equipment for the preparation of ore raw materials, possessing a system of theoretical and practical knowledge, equipment and technology of the ore preparation process, having an idea of the purpose and role of preparatory processes in the enrichment of minerals, methods of calculation of technological equipment, selection and technical and economic indicators of equipment, purpose, device, operation and operating conditions, as well as the basics of calculating ore preparation machines and equipment | 5 | | | | | **v** | | | | |
| 47 | Non-standard equipment | Preparation of bachelors for independent production and technical activities at enterprises for the production and repair of technological equipment based on the development of theoretical and practical material for the design of non-standard equipment, the study of the basics of the design of technical objects, the acquisition of practical skills in the design of special technological equipment | 4 | | | | | | | | **v** | **v** |
| 48 | 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, | 4 | | | | | | | | **v** | **v** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | acquisition of practical skills | | | | | | | | | | |
| 49 | Friction and wear | Patterns of external friction and wear of rough surfaces, modern friction theories, methods for determining friction coefficients, calculating and predicting the intensity of wear; types, mechanism of abrasive wear; the value of lubricants and additives during friction and wear, methods of selecting materials for rubbing parts, methods of increasing wear resistance, equipment used for research of friction and wear, directions of development. | 6 | | v | | | | | | | |
| 50 | Lubrication of technological machines | The course is aimed at training specialists for production, design and research activities in the field of creation, improvement of lubrication systems and equipment, maintenance, modernization of technological equipment.<br>The course covers: operational properties of technological machines; operational properties of elements of technological machines exposed to temperature, corrosion; lubrication of technological equipment; lubricating oils; additives to lubricating oils; greases; selection, supply and methods of calculating lubricant consumption | 6 | | | | | | | | v | |
| 51 | Fuels, oils and special fluids | Types of organic fuels, lubricants and technical liquids, their purpose and basic properties. As well as special training of engineering and technical personnel with scientific and practical knowledge in the field of chemmotology, because it solves current engineering and scientific problems in the field of quality, operational properties and rational use of fuels, oils, lubricants and technical fluids. | 6 | | | | | v | | | | |
| 52 | 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 | 5 | | | | | | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | | | | | | | | | | |
| 53 | Technology of operation 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** |
| 54 | Melting processing equipment | Training of specialists for production, design and research activities in the field of creation, improvement and operation of mechanical equipment for smelting processing of the metallurgical cycle with knowledge of the scientific principles of the organization of technological design. As a result of studying the discipline, students master advanced methods of operation of mechanical equipment, the current state and prospects for the development of metallurgical production; the main scientific and technical problems | 5 | | | | | | **v** | | | **v** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | of operation of technological equipment of metallurgical enterprises. | | | | | | | | | | |
| 55 | Oil and gas field machines and mechanisms | The design of the borehole completed by drilling. Aggregates of capital and routine well repairs. Equipment and tools for capital and routine well repairs. Equipment of wells for various ways of influencing the formation in order to increase its oil recovery. Well production collection and preparation system. Equipment for maintaining reservoir pressure and displacing oil from productive reservoirs | 5 | | | | | | | | v | |
| 56 | Machinery and equipment of gas and oil pipelines | Purpose and classification of gas and oil pipeline equipment. Equipment of pumping stations for the transportation of oil and petroleum products. Equipment of compressor stations for transportation of natural gases. Shut-off and control valves and equipment of oil pipelines. Technological scheme of strapping equipment of pumping and compressor stations. Automation and control of pumping and compressor stations equipment. | 5 | | | v | | | | | | |
| 57 | Drainage, fan 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 ensuring efficient and safe operation of pumping, fan and compressor units | 5 | | | v | | | | | | |
| 58 | Dust and gas cleaning and recycling water supply of industrial enterprises | Studying the course gives students an idea of modern systems of dust and gas cleaning and recycling water supply of industrial enterprises. Contains basic information about the features of water | 5 | | | | v | | | | | v |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | supply of industrial enterprises. The systems and schemes of industrial water supply, methods and technologies of water treatment are considered, data on the design of installations for cooling recycled water and improving its quality, preventing suspension deposits and biological fouling, scale formation and corrosion in pipelines and equipment are contained. | | | | | | | | | | |
| 59 | Well overhaul equipment and installations | Principles of operation and device; fundamentals of their theory of calculation, design and operation. Principles of economic operation of modern equipment for major well repairs. Equipment used in the overhaul of wells. Equipment for repair work on the well. Equipment for collecting and preparing oil and gas for transportation. Modern methods of environmental protection during the overhaul of wells. | 5 | | | | | | **v** | | | |
| 60 | Equipment and technology of well overhaul | Equipment and tools for the overhaul of wells; technology for the overhaul of wells operating conditions and repairs; their principles of operation and device; the basics of their theory of calculation, design and operation. New technological techniques and technical means of repair. Principles of economic operation of modern well overhaul equipment; equipment used in various methods of oil and gas production | 5 | | | | | | **v** | | | |
| 61 | Fundamentals of design of repair enterprises in the industry | The course is aimed at students acquiring theoretical knowledge and practical skills on the basics of design and reconstruction of repair enterprises of technical service of the industrial complex. Objectives of the discipline: study of the rules for designing technical service facilities of an industrial complex, substantiation of the production program of a service enterprise, design of production zones and auxiliary units, the | 5 | | | | | **v** | | | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | basics of designing a construction part, design features of repair shops, technical and economic evaluation of design solutions | | | | | | | | | | |
| 62 | Calculation and design of drilling equipment | The course is aimed at studying drilling machines and complexes that provide drilling of deep wells for oil and gas extraction from the Earth's interior. The program is focused on the training of a mechanical engineer and is aimed at an in-depth study of the physical foundations of the operation of drilling machines and equipment, as well as the design of new drilling equipment based on existing ones developed by world firms, the objectives of studying the discipline is to acquire in-depth knowledge in the field of professional activity | 5 | | | | **v** | **v** | | | | **v** |
| 63 | Calculation and design of oil and gas field equipment | Questions of theory and practice of designing machines and mechanisms, the peculiarity of designing typical types of oilfield equipment; optimization of equipment design using computer-aided design systems. Designing machines for the oil and gas industry is the basis for the development of this industry, contributes to the development of design skills. Basic design techniques for the development of parametric series of equipment for oil and gas production | 5 | | | | **v** | **v** | | | | **v** |
| 64 | Design of metallurgical machines | Training and preparation of specialists for production and research activities in the field of design of design developments and obtaining practical skills in designing typical and specific elements and assemblies of metallurgical machines using modern regulatory and technical documentation. This is due to the predominant use of specialists in industry as middle-level engineering and technical workers engaged in the creation, operation | 5 | | | | **v** | **v** | | | | **v** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | and repair of modern metallurgical machinery units. | | | | | | | | | | |
| 65 | Construction of mining and transport machines and stationary installations | Basic principles, methods of construction of mining machines and stationary installations design manufacturability. Indicators of the manufacturability of the design. Necessary documents and their registration. Establishment of rational design parameters of mining machines and stationary installations. Basic principles and methods of designing technological machines. Principles of calculation of design parameters. Construction of assembly units and machine parts. Design of GM and SU structures | 5 | | | | v | v | | | | v |
| 66 | Fundamentals of energy saving industry | 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 quality, including the use of renewable energy sources | 5 | | | | | | v | v | | |
| 67 | Equipment 3-5 converted | Classification of working stands and rolling mills. Parameters of the rolling process. Calculation of rolling force. Rolling moment and power. Determination of the power of the electric drive. Working crates. Bearings and cushions of rolling rolls. Mechanisms and devices for installing and balancing rolls. The frames of the working crates. Drive of rolls of working stands. Gear crates. Bullion trucks. Continuous hot and cold Rolling mills | 5 | | | | v | | | | | v |
| 68 | Energy-saving equipment and | Basic terms and definitions of energy | 5 | | | | | | v | v | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | technologies in the oil and gas industry | conservation. Energy saving in the oil and gas industries. The main directions of the use of VER. Prospects for the development of the use of unconventional energy sources. Energy-saving measures in the technology of the oil and gas industry. The use of heat pump installations in the systems of the gas and oil industry. Utilization and use of VER gas turbine units at compressor stations of main gas pipelines | | | | | | | | | | |
| 69 | Lifting installations | Purpose and general arrangement of lifting equipment for the transportation of people; cargo, minerals and waste rock. The purpose and designs of lifting vessels of various types, the scope of their application are studied. Information and methods of calculation and selection of ropes, lifting machines, copers. The method of calculating the elements of the kinematic and dynamic mode of operation of the lifting installation, the choice of electric drive and energy consumption | 5 | | | | | | v | | v | |
| 70 | Fundamentals of scientific research and development work | Methodological foundations of scientific knowledge. Knowledge of basic and technological aspects, theoretical provisions, technologies, operations, practical methods and techniques of conducting scientific research based on modern achievements of domestic and foreign scientists and to master the skills of choosing the topic of scientific research, scientific search, analysis, experimentation, data processing, obtaining sound effective solutions using information technology | 5 | | v | | | | | v | | |
| 71 | Technique of full-scale experiment | The purpose of the study: to give students the knowledge necessary for further production, activity about the essence and methodology of scientific research, hardware design of a full-scale experiment | 5 | | v | | | | | v | | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Expected results: The student will be able to independently prepare the equipment for tensometric studies. Connect the assembled circuit and perform calibration using a calibration beam | | | | | | | | | | |
| 72 | Methods and means of testing technological machines | The development of the discipline is aimed at acquiring knowledge and skills for the selection, creation, implementation and operation of measuring installations and systems, test benches; knowledge of methods and measuring instruments; metrological characteristics of measuring instruments; organization of testing and control activities in order to assess the conformity of products and quality indicators | 5 | | v | | | | | v | | |

# 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 KazNTU named after K.I.Satpayev
Asset Begentaev
«12» 07 2023 г.

**CURRICULUM**
**of Educational Program on enrollment for 2023-2024 academic year**

**Educational program 6B07115 - Technological machines and equipment (by industry)**
**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 | 5semester | 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** | | | | | | | | | | | | | | | |
| CSE 677 | Information and communication technologies (in English) | GED, RC | 5 | 150 | 2/1/0 | 105 | E | | | | 5 | | | | |
| **M-4. Module of socio-cultural development** | | | | | | | | | | | | | | | |
| HUM137 | 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 | 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 | | | 5 | | | | | |
| 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 | | | | | | | |
| TEC571 | Training workshops | BD, UC | 4 | 120 | 0/0/3 | 75 | E | | 4 | | | | | | |
| TEC549 | Fundamentals of 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 | | | | | |
| TEC563 | Basics of hydraulics and hydraulic drives 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 | | | | | |
| TEC460 | Construction materials processing machinery and equipment | BD, UC | 5 | 150 | 2/1/0 | 105 | E | | | 5 | | | | | |
| GEN408 | Strength of materials | BD, UC | 5 | 150 | 1/1/1 | 105 | E | | | | 5 | | | | |
| PED436 | Thermodynamics, heat transfer and heat engineering equipment | BD, UC | 5 | 150 | 2/0/1 | 105 | E | | | | | 5 | | | |
| NSE143 | Industrial economics | BD, CCH | 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 | 2/0/1 | 105 | E | | | | | 5 | | | |
| TEC555 | The dynamics and durability 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 | | | |
| TEC401 | Reliability of technological machines | 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** | | | | | | | | | | | | | | | |
| TEC459 | Repair 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 | |
| TEC559 | Installation and exploitation of technological machines | PD, UC | 6 | 180 | 2/0/2 | 120 | E | | | | | | | 6 | |
| TEC566 | Metall welding and ccutting | 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 |
| TEC570 | Technical diagnostics of technological equipment | PD, UC | 4 | 120 | 2/0/1 | 75 | Э | | | | | | | | 4 |
| AAP143 | Production practice I | PD, UC | 2 | | | | | | | | 2 | | | | |
| AAP183 | Production practice II | PD, UC | 3 | | | | | | | | | | 3 | | |
| M-9. Module of final attestation | | | | | | | | | | | | | | | |
| ECA108 | Final attestation | 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 | 112 |
| PD | Cycle of profile disciplines | | 29 | 35 | 64 |
| | *Total for theoretical training:* | *51* | *125* | *56* | *232* |
| FA | Final attestation | 8 | | | 8 |
| | TOTAL: | 59 | 125 | 56 | 240 |

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

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

**Decision of the Academic Council of the Institute E&ME. Protocol № 1 от "11" 10 22y.**

**Vice-Rector for Academic Affairs** — **B.A.Zhautikov**

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

**Head of department TM&T** — **S.A. Bortebayev**

**Representative of the Council from employers** — **M.A. Kanatbayev**

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV

SATBAYEV UNIVERSITY

APPROVED
Director of the Institute of E&ME
K.K. Yelemessov
«17» 10 2023y.

**MAJOR ELECTIVE DISCIPLINES educational program for the 2023-2024 academic year admission**
**Educational program6B07115 - Technological machines and equipment (by industry)**
**Group of Educational programs B064 - "Mechanics and metal working"**

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

| Year of study | Code of elective | Code of discipline | Name of discipline | Semestr | Cycle | Credits | Total hours | lec/lab/pr | SIW (including SIWT) in |
|---|---|---|---|---|---|---|---|---|---|
| | M-7. Module of basic training | | | | | | | | |
| | General technical training module | | | | | | | | |
| 3 | 3220 | TEC485 | Drilling machines and complexes | 6 | BD | 5 | 150 | 2/0/1 | 105 |
| | | PED137 | Technological lines and complexes of metallurgical production | | | | | 2/0/1 | |
| | | MIN173 | Mining technology | | | | | 1/0/2 | |
| | | TEC471 | Technological processes in the oil and gas industry | | | | | 2/0/1 | |
| | 3221 | TEC469 | Pumps, fans, compressors | 6 | BD | 5 | 150 | 2/0/1 | 105 |
| | | TEC476 | Organization of machine-building production in the industry | | | | | 2/0/1 | |
| | | PED175 | Auxiliary transport equipment of metallurgical shops | | | | | 2/0/1 | |
| | | TEC477 | Gas-pumping units | | | | | 2/0/1 | |
| 4 | 4222 | TEC552 | Computer-aided design of technological machines | 7 | BD | 6 | 180 | 1/0/3 | 120 |
| | | TEC550 | Computer technologies for calculation, modeling and design | | | | | 1/0/3 | |
| | | TEC551 | Calculation and design of technological machines and equipment | | | | | 1/0/3 | |
| | M-8. Module of professional activity | | | | | | | | |
| | Technology and Operations Module | | | | | | | | |
| 3 | 3302 | TEC466 | Transportation vehicles | 6 | PD | 5 | 150 | 2/0/1 | 105 |
| | | TEC127 | Hydraulic machines and compressors in the oil and gas industry | | | | | 2/0/1 | |
| | | TEC484 | Equipment for ore preparation | | | | | 2/0/1 | |
| | 3303 | TEC574 | Non-standard equipment | 6 | PD | 4 | 120 | 2/0/1 | 75 |
| | | TEC576 | Design of experiments bench and field tests | | | | | 2/0/1 | |
| 4 | 4307 | TEC572 | Friction and wear | 7 | PD | 6 | 180 | 2/1/1 | 120 |
| | | TEC567 | Lubrication of technological machines | | | | | 2/1/1 | |
| | | 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 |
| | | TEC455 | Melting processing equipmen | | | | | 2/0/1 | |
| | | TEC479 | Oil and gas field machines and mechanisms | | | | | 2/0/1 | |
| | | TEC106 | Machines and equipment for gas and oil pipelines | | | | | 2/0/1 | |
| | | NSE185 | Theory and practice of project management | | | | | 2/0/1 | |
| | 4309 | PED431 | Dewatering, fan and pneumatic plants | 8 | PD | 5 | 150 | 2/0/1 | 105 |
| | | PED118 | Dust-gas cleaning and recycling water supply of industrial enterprises | | | | | 2/1/0 | |
| | | PED157 | Well overhaul equipment and installations | | | | | 2/0/1 | |
| | | PED454 | Engineering and well workover technology | | | | | 2/0/1 | |
| | 4310 | TEC418 | Fundamentals of design of repair enterprises in the industry | 8 | PD | 5 | 150 | 2/0/1 | 105 |
| | | PED170 | Calculation and design of drilling equipment | | | | | 2/0/1 | |
| | | PED155 | Calculation and design of oil and gas equipment | | | | | 2/0/1 | |
| | | PED177 | Projection of metallurgical machines | | | | | 2/0/1 | |
| | | PED421 | Construction of mining transport vehicles and fixed installations | | | | | 2/0/1 | |
| | 4311 | TEC548 | Fundamentals of energy saving industry | 8 | PD | 5 | 150 | 2/0/1 | 105 |
| | | TEC110 | Equipment 3-5 redistribution | | | | | 2/0/1 | |
| | | PED456 | Energy-saving equipment and technologies in the oil and gas industry | | | | | 2/0/1 | |
| | | TEC114 | Lifting installations | | | | | 2/0/1 | |
| | Module"R&D" | | | | | | | | |
| 3 | 3218 | PED445 | Fundamentals of Research and Development | 5 | BD | 5 | 150 | 2/0/1 | 105 |
| | | PED430 | Technique of field experiment | | | | | 2/0/1 | |
| | | TEC436 | Methods and means of testing technological machines | | | | | 2/1/0 | |

| 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 от "11" 10 2023y.

Head of the department TM&T S.A. Bortebayev

Representative of the Council from employers M.A. Kanatbayev

## 6. Additional educational programs (Minor)

| Name of additional educational programs (Minor) with disciplines | Total number of credits | Recommended semesters of study | Documents on the results of mastering the additional educational programs (Minor) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |