



**Mining and Metallurgical Institute named after O.A. Baikonurov
Department of "Mining"**

**EDUCATIONAL PROGRAM
"6B07205 - Mining Engineering"**

Code and classification of the field of education:	6B07 – Engineering, manufacturing and construction industries
Code and classification of training areas:	6B072 – Manufacturing and processing industries
Group of educational programs:	B071 – Gornoye delo i dobycha poleznykh iskopayemykh
The level of the NRK:	Level 6 – Postgraduate education (programs leading to the academic degree of Doctor of Philosophy (PhD) and doctors in the profile and/or practical experience)
ORC Level:	Level 6 – Knowledge at the most advanced level in the field of science and professional activity
Duration of training:	4
Volume of loans:	240

Almaty, 2023

The educational program 6B07205 – «Mining Engineering» was approved at a meeting of the Academic Council of KazNRTU named after K.I. Satpayev

protocol no. 5 from "24" 11 2022

Considered and recommended for approval at the meeting of the educational and methodological Council of KazNRTU named after K.I. Satpayev

protocol no. 3 from "14" 11 2022

The educational program 6B07205 – «Mining Engineering» was developed by the academic committee in the direction of "Manufacturing and processing industries"



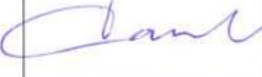

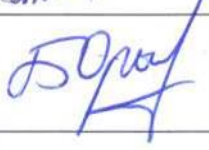
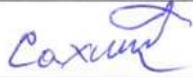



Full name	Academic degree/academic title	Post	Place of work	Signature
Chairman of the Academic Committee:				
Moldabayev S.	doctor of technical sciences, professor	Head of the Department	Kaz NRTU named after K. I. Satpayev	
Teaching staff:				
Yusupov Kh.	doctor of technical sciences, professor	professor	Kaz NRTU named after K.I. Satpayev	
Sandibekov M.	candidate of technical sciences	professor	Kaz NRTU named after K.I. Satpayev	
Employers:				
Amankulov M.		Executive Director	Antal LLP	
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Students:				
Sakhypova K.		2nd year doctoral student		
Seytkazinova B.		2nd year master's student		
Kusan A.		4th year students		
Alseytov O.		3rd year students		

Table of contents

- List of abbreviations and designations
- 1. Description of the educational program
- 2. The purpose and objectives of the educational program
- 3. Requirements for evaluating the learning outcomes of an educational program
- 4. Passport of the educational program
 - 4.1 General information
 - 4.2 Matrix of correlation of learning outcomes according to the educational program as a whole with the competencies being formed
 - 4.3 The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines
 - 4.4 Information about modules/disciplines (if there are modules, it is necessary to highlight them)
- 5. Curriculum of the educational program
- 6. Brief descriptions of disciplines

List of abbreviations and designations

NAO "Kazakh National Research Technical University named after K.I.Satpayev" – NAO KazNITU named after K.I.Satpayev;
GOSO – The State compulsory standard of education of the Republic of Kazakhstan;
MES RK – Ministry of Education and Science 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 – a working curriculum;
QED – catalog of elective disciplines;
VK – university component;
KV – component of choice;
NRK – National Qualifications Framework;
ORC – Industry qualifications framework;
RO – learning outcomes;
CC – key competencies.

1 Description of the educational program

It is intended for the implementation of specialized bachelor's degree training in the educational program 6B07205 - "Mining Engineering" at Satbayev University and was developed within the framework of the direction "Manufacturing and processing industries".

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 No. 171-VI;

- The Law of the Republic of Kazakhstan "On Amendments and Additions to Some Legislative Acts of the Republic of Kazakhstan on the expansion of academic and managerial independence of higher educational institutions" dated 04.07.18 No. 171-VI;

- Order of the Minister of Education and Science of the Republic of Kazakhstan dated 30.10.18 No. 595 "On approval of Standard rules for the activities of educational organizations of appropriate types";

- State mandatory 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, No. 604;

- Resolution of the Government of the Republic of Kazakhstan dated 19.01.12 No. 111 "On approval of Standard rules for admission to education organizations implementing educational programs of higher education" with amendments and additions dated 14.07.16 No. 405;

- Resolution of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 988 "On approval of the State Program for the Development of Education and Science of the Republic of Kazakhstan for 2020-2025";

- Resolution of the Government of the Republic of Kazakhstan dated 31.12.2019 No. 1050 "On approval of the State Program of Industrial and Innovative Development of the Republic of Kazakhstan for 2020-2025";

- "National Qualifications Framework", approved by the Protocol of 16.06.2016. Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations;

- Industry qualification Framework "Mining and Metallurgical Complex" dated 30.07.2019 No. 1;

- Strategy "Kazakhstan-2050": a new political course of the established state. Message of the President of the Republic of Kazakhstan - Leader of the Nation to the people of Kazakhstan. Astana, 14.12.2012;

- "New development opportunities in the conditions of the Fourth Industrial Revolution". Message of the President of the Republic of Kazakhstan to the people of Kazakhstan. 10.01.2018;

- "The third modernization of Kazakhstan: global competitiveness". Message of the President of the Republic of Kazakhstan to the people of Kazakhstan. 31.01.2017

The educational program 6B07205 - "Mining engineering" takes into account the production of mining operations by open, underground methods, the geotechnology of the development of uranium deposits (PSV of uranium), the construction of mines and underground structures, surveying. The OP, depending on the training trajectory, takes into account current trends in the development of mining production in market conditions with various methods of mining operations.

The field of professional activity of graduates who have mastered the bachelor's degree program includes:

- the bowels of the Earth, including production facilities, equipment and technical systems for their development;
- equipment and technologies for ensuring safe and effective implementation of geotechnologies for the extraction, processing of solid minerals and rational use of natural resources;
- mining machines and equipment of various functional purposes (for open and underground mining);
- measures to ensure the safe operation of mining machinery and equipment and to reduce their anthropogenic impact on the environment.

Types and tasks of the graduate's professional activity

List of types of professional activity and their corresponding professional tasks:

Organizational and managerial:

- organization, planning and management of mining and construction works;
- carrying out organizational and planned calculations for the creation (reorganization) of production sites;
- development of operational work plans for production units;
- preparation of initial data for the selection and justification of scientific, technical and organizational solutions based on economic calculations.

Production and technological:

- organization of the production process during the construction, operation and reconstruction of mining enterprises, various objects on the surface and underground;
- ensuring the performance of mining and construction works in accordance with projects, technical requirements and safety rules;
- selection of equipment and materials to ensure production processes;
- efficient use of materials, equipment, algorithms and programs for the selection and calculation of process parameters.

Experimental research:

- collection and systematization of scientific and technical information of domestic and international experience in relation to solving mining production problems;
- mathematical modeling of mining production processes and mining facilities based on standard computer-aided design and research packages;
- planning, conducting experiments according to specified methods, mathematical processing and analysis of the results.

Calculation, design and analytical:

- formation of the goals and objectives of the project (program), providing a modern level of technology for the construction, operation and reconstruction of

mining enterprises;

- collection and analysis of information source data for design;
- development of design documentation for the construction, operation and reconstruction of mining enterprises;
- conducting a preliminary feasibility study of design calculations;
- implementation of projects in production and author's supervision.

The subjects of the bachelor's professional activity are the improvement of mining technology, the development and creation of new mining equipment and technology, taking into account the needs of the mining and nuclear industry of the Republic of Kazakhstan.

The specific types of professional activity for which the bachelor is mainly preparing are determined by the higher educational institution together with students, scientific and pedagogical staff of the higher educational institution and employers' associations.

2 The purpose and objectives of the educational program

The objectives of OP 6B07205 – "Mining Engineering" are:

- provision of training for mining enterprises of professionally educated and competent specialists capable of working in primary engineering and technical positions;
- effectively conduct the extraction of natural resources in various mining and geological and mining engineering conditions based on the study of general education, basic and specialized disciplines
- providing in-depth knowledge of natural science, general technical and economic nature as the foundation of professional education.
- formation of the graduate's theoretical knowledge and practical skills in the field
- formation of the graduate's skills to apply the acquired knowledge in their professional activities.

The tasks of OP 6B07205 – "Mining Engineering" are:

- 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;
- the cycle of profile disciplines is focused on the study of key theoretical aspects of engineering and technology to ensure the safe and effective implementation of various technologies for the extraction, processing of solid minerals and rational use of natural resources;
- study of disciplines on the development of uranium deposits, extraction of natural resources by open and underground methods based on advanced technologies, planning the construction of industrial facilities at mining enterprises and urban underground structures for various purposes;
- study of disciplines that form knowledge, skills and abilities of planning and organization of research, design of mining operations;

- 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
- combining the efforts of the university and industrial enterprises to conduct scientific research, training and retraining of personnel in the field of studying the principles and patterns of functioning and development of cities and megacities, the features of anthropogenic impacts on urban environment objects, the principles of sustainable development of urbanized territories and measures of their organizational and legal support with the provision of true interdisciplinary education in these areas;
- formation of skills and abilities to choose and evaluate methods of environmental protection from anthropogenic impact in urbanized areas;
- strengthening the technological component of classical natural science education, to provide knowledge on modern technologies without lowering the bar of the level of fundamental education;
- fundamentals of the development and implementation of fundamental and applied research and R&D in the field of geological exploration and mineral processing, mining and metallurgy using new technological achievements, new generation equipment and eco-monitoring of enterprises;
- ensuring the interaction of fundamental and applied science with the educational process at all its stages, including the use of the results of joint research work in lecture courses, an experimental base for the implementation of educational research, laboratory and coursework, production and pre-graduate practice;
- improving the level of educational and methodological work by creating new curricula, textbooks, teaching aids, including on electronic media;
- providing training and retraining of personnel for the domestic mining and metallurgical sector in close cooperation with state corporations and the real sector of the economy, employment of graduates in high-tech innovative companies and other research centers.

3 Requirements for the evaluation of learning outcomes of the educational program

As a result of mastering the bachelor's degree program 6B07205 – "Mining Engineering", the graduate should have general cultural, general professional and professional competencies.

A graduate who has mastered the bachelor's degree program must have the following competencies:

general cultural competencies:

- the ability to use the basics of philosophical knowledge, analyze the main stages and patterns of historical development to realize the social significance of their activities;
- the ability to use the basics of economic knowledge in assessing the effectiveness of the results of activities in various fields;

- ability to communicate orally and in writing in Russian and foreign languages to solve problems of interpersonal and intercultural interaction;
- ability to work in a team, tolerantly perceiving social, ethnic, confessional and cultural differences;
- ability to self-organize and self-education;
- ability to use general legal knowledge in various fields of activity;
- ability to maintain an adequate level of physical fitness to ensure full-fledged social and professional activities;
- willingness to use basic methods of protecting production personnel and the population from possible consequences of accidents, catastrophes, natural disasters.

general professional competencies:

- willingness to use fundamental general engineering knowledge;
- willingness to critically comprehend the accumulated experience, to change, if necessary, the profile of their professional activities;
- ability to realize the social significance of their future profession;
- willingness to combine theory and practice to solve engineering problems;
- the ability to apply in practice the principles of rational use of natural resources and environmental protection;
- ability to use regulatory legal documents in their professional activities;
- willingness to choose measuring instruments in accordance with the required accuracy and operating conditions;
- ability to follow metrological norms and rules, meet the requirements of national and international standards in the field of professional activity;
- ability to use the principles of the quality management system.

professional competencies corresponding to the type (types) of professional activity that the bachelor's degree program is focused on:

research activity:

- ability to analyze and synthesize;
- ability to choose research methods, plan and conduct necessary experiments, interpret results and draw conclusions;
- willingness to use physical and mathematical apparatus to solve problems arising in the course of professional activity;
- willingness to use the basic concepts, laws and models of mining development, the behavior of a rock mass, the destruction of rocks by explosion;
- ability to choose and apply appropriate methods of modeling physical, chemical and technological processes.

design and analytical activity:

- ability to perform technical and economic analysis of projects;
- ability to use a process approach;
- ability to use information tools and technologies in solving problems arising in the course of professional activity;
- willingness to make calculations and draw conclusions when solving engineering problems.

production and technological activity:

- ability to implement and adjust technological processes in mining;

- willingness to identify objects for improvement in engineering and technology;
- the ability to select materials for products of various purposes, taking into account operational requirements and environmental protection;
- willingness to assess risks and determine measures to ensure the safety of technological processes.

design and technological activity:

- ability to perform elements of projects;
- willingness to use standard software tools in the design;
- ability to justify the choice of equipment for the implementation of technological processes.

additional competencies in the field of organizational and managerial activities, agreed with employers:

- ability to apply methods of technical and economic analysis;
- willingness to use the principles of production management and personnel management;
- willingness to use the organizational and legal foundations of managerial and entrepreneurial activity;
- ability to organize the work of the team to achieve the goal.

additional general professional competencies focused on the areas of knowledge: communication, individual and team work, lifelong education, additional engineering skills:

- the ability to acquire new, expand and deepen previously acquired knowledge, skills and competencies in various areas of life necessary for successful implementation in the field of professional activity, including at the junction of different areas of activity and fields of sciences.

Special requirements for graduation in this OP:

- the student should have a general idea of the topic of the thesis / research plans, and contact potential research supervisors one year before the expected completion of studies;
- a review meeting is held one year before the expected completion of studies in order to get acquainted with potential scientific supervisors and accelerate the selection of the topics of the thesis (project) by students;
- to collect the necessary data and study current tasks, methods and procedures on the topic of the thesis, the student undergoes an internship;
- upon completion of the internship, the student contacts the supervisor in writing or orally and reports on the results of the work, but no more than a week after the beginning of the 4th year of study;
- within 4 weeks after the start of studies, the student and the supervisor should discuss and decide on the type (research, project or independent study) and the topic of the thesis. This is an extremely important discussion and decision, since it is impossible to further change the topic and type of work;
- the topic of the thesis (project) and the supervisor are assigned to the student or a group of students no more than six weeks after the start of the final year of study and approved by the order of the rector of the higher educational institution.

4 Passport of the educational program

4.1 General information

№	Field name	Note
1	Code and classification of the field of education	6B07 – Engineering, manufacturing and construction industries
2	Code and classification of training areas	6B072 – Manufacturing and processing industries
3	Group of educational programs	B071 – Mining and mining
4	Name of the educational program	6B07205 Mining engineering
5	Brief description of the educational program	Mining operations in open-pit, underground and geotechnological mining, construction of mines and underground structures. The main technological processes: preparation of rocks for excavation, excavation and loading operations, transportation, unloading and dumping operations, primary processing of extracted minerals.
6	EP purpose	The purpose of the educational program (OP) is to provide training for enterprises of the mining complex of professionally educated and competent professionals who are able to work in primary engineering positions and effectively conduct the extraction of natural resources in various mining and geological and mining conditions on the basis of the study of General, basic and specialized disciplines.
7	Type of OP	Innovative EP
8	Level on NQF	Level 6 – higher education and practical experience
9	Level on SQF	Level 6 – a wide range of special (theoretical and practical) knowledge (including innovative). Independent search, analysis and evaluation of professional information
10	EP distinctive features	no
11	List of competencies of the educational program:	Matrix of correlation of learning outcomes according to the educational program as a whole with the competencies being formed.
12	The formed educational outcomes	<p>1) To describe in accordance with the terminology of the technology of development of solid mineral deposits and to choose the most optimal technological complexes of equipment in specific geological and mining conditions;</p> <p>2) To solve the problem of achieving digital literacy based on the study of geoinformation systems in geotechnology and geomechanics;</p> <p>3) To choose and apply software products for working with digital models of deposits, preparation of working drawings and calculation of volumes in the planning and design of mining operations, operation of mining enterprises;</p> <p>4) To identify the relationship between related technological processes of mining production in order to find reserves for increasing the volume of mineral extraction;</p> <p>5) To establish a careful attitude to the bowels of the Earth through the wide range of theoretical and practical training provided on the completeness of the extraction of all reserves and their complex</p>

		<p>development in compliance with the rules of industrial and environmental safety;</p> <p>6) To choose effective solutions for the implementation of technological processes at mining enterprises of ferrous and non-ferrous metallurgy, thermal power complex, non-metallic building materials, nuclear industry, subway construction;</p> <p>7) To determine the methods of establishing the spatial and temporal characteristics of the state of the Earth's surface and subsoil, mining systems, underground and ground structures and displaying information in accordance with modern regulatory requirements;</p> <p>8) To plan monitoring of the condition of mine workings, buildings, structures and the Earth's surface at all stages of development and protection of the subsoil using digital technologies;</p> <p>9) To apply modern information technologies and automated production management systems to create SMART mines and programs for assessing the sustainability of mine workings;</p> <p>10) Independently to develop mining passports and technological maps, technological regulations, mining development plan and propose options for the implementation of technological processes of mining production, organize their implementation in primary engineering positions;</p> <p>11) To demonstrate the required knowledge and primary skills for the ability and readiness to operate electrical systems of mining enterprises, including comprehensive electrical equipment of closed and mine execution, electric networks of open and underground mining and mining construction works, including in emergency situations;</p> <p>12) To discover and confirm the ability to choose the most appropriate technology for mining, processing and enrichment of minerals, drawing up the necessary documentation in accordance with current regulations.</p>
13	Form of training	Full - time full
14	Period of study	4
15	Volume of the credits	240
16	Language of education	Kazakh/Russian
17	The awarded academic degree	Bachelor of Engineering and Technology
18	Developer(s) and authors	Moldabaev S.K.

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

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)											
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
Cycle of general education disciplines															
Required component															
1	Foreign language	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	10	X											
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 the scientific style in order to develop and activate professional and communicative skills and abilities of students. The course allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text	10	X											
3	Physical Culture	The purpose of the discipline is to master the forms and methods of forming a healthy lifestyle within the framework of the vocational education system. Familiarization with the natural-scientific foundations of physical education, possession of modern health technologies, basic methods of independent physical education and sports. And also as part of the course, the student will master the rules of judging in all sports	8	X											
4	Information and communication technologies (in English)	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				X								
5	Modern history of Kazakhstan	The purpose of the discipline is to provide objective historical knowledge about the main stages of the history of Kazakhstan from ancient times to the present day; introduce students to the problems of the formation and development of statehood and historical and cultural processes; contribute to the formation of humanistic values and patriotic feelings in the student; teach the student to use the acquired historical knowledge in educational, professional and everyday life; evaluate the role of Kazakhstan in world history	5		X										
6	Philosophy	The purpose of the discipline is to teach students the theoretical	5				X								

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		foundations of philosophy as a way of knowing and spiritually mastering the world; developing their interest in fundamental knowledge, stimulating the need for philosophical assessments of historical events and facts of reality, assimilating the idea of the unity of the world historical and cultural process while recognizing the diversity of their skills in applying philosophical and general scientific methods in professional activities													
7	Module of socio-political knowledge (sociology, political science)	The objectives of the disciplines are to provide students with explanations on the sociological analysis of society, about social communities and personality, factors and patterns of social development, forms of interaction, types and directions of social processes, forms of regulation of social behavior, as well as primary political knowledge that will serve as a theoretical basis for understanding social -political processes, for the formation of political culture, development of a personal position and a clearer understanding of the extent of one's responsibility; help to master the political, legal, moral, ethical and socio-cultural norms necessary to act in the interests of society, form personal responsibility and achieve personal success	3				X								
8	Module of socio-political knowledge (cultural studies, psychology)	The purpose of the disciplines is to study the real processes of cultural creative activity of people who create material and spiritual values, identify the main trends and patterns of cultural development, changes in cultural eras, methods and styles, their role in the formation of man and the development of society, as well as master psychological knowledge for the effective organization of interpersonal interaction, social adaptation in the field of their professional activities	3			X									
Cycle of general education disciplines Component of choice															
9	Fundamentals of anti-corruption culture and law	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various spheres. The purpose of studying the discipline «Fundamentals of anti-corruption culture and law» is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in everyday practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption	5			X									
10	Fundamentals of economics and entrepreneurship	Discipline studies the foundations of economics and entrepreneurial activity from the point of view of science and law; features, problematic	5			X									

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		aspects and development prospects; the theory and practice of entrepreneurship as a system of economic and organizational relations of business structures; The readiness of entrepreneurs for innovative susceptibility. The discipline reveals the content of entrepreneurial activity, the stages of career, qualities, competencies and responsibility of the entrepreneur, theoretical and practical business planning and economic examination of business ideas, as well as the analysis of the risks of innovative development, the introduction of new technologies and technological solutions													
11	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity; monitoring of the environment and management in the field of its safety; sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5			X									
12	Fundamentals of scientific research methods	The main objectives of the academic discipline "Fundamentals of scientific research methods" is to form ideas about the methodological side of knowledge, using the concepts and principles of logic and dialectics, as well as to form students' knowledge and understanding of the methodology of scientific research; to teach how to draw up the structure of future scientific work; to teach the correct formulation of goals, setting goals; to teach the definition of the object and subject of research; to master the competent selection of scientific research methods	5			X									
Cycle of basic disciplines University component															
13	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to study elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course sections include the differential calculus of functions of one variable, the derivative and differentials, the study of the behavior of functions, complex numbers, and polynomials. Indefinite integrals, their properties and methods of calculation. Certain integrals and their applications. Improper integrals.	5		X	X									
14	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and self-adjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the	5		X	X									

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		plane and in space are included.													
15	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		X									X	
16	Engineering and computer graphics	The course develops the following skills in students: to depict all kinds of combinations of geometric shapes on a plane, to conduct research and their measurements, allowing for image transformations; create technical drawings, which are the main and reliable means of information, providing a link between the designer and the designer, technologist, builder, in AutoCAD.	5		X	X									
17	Geodesy	The purpose of studying the discipline is to familiarize students with the science that studies the shape and size of the Earth's surface or its individual sections by measuring, in the mathematical processing of measurements with the construction of maps, plans used to solve engineering, cadastral and other problems.	5							X	X				
18	Integrated information systems in mining	As part of the course, the student will master the practical use of information systems for design in the development of minerals. The basic knowledge and skills in the field of using computer-aided design technology and information systems in the development of mineral deposits, for independent practical activities will be presented. After completing the course, the student must demonstrate the ability to calculate, analyze, synthesize and design, as well as distinguish between software packages.	5		X	X									
19	Fundamentals of Geology	"Fundamentals of Geology" is to teach students skills in studying the field methods of the material composition of the earth's crust, the ability to study and observe the processes that form the earth's crust. In the course of studying the course, students will get an idea of current theoretical developments that explain the formation of the universe, the solar system, the earth, the atmosphere, the hydrosphere, i.e. On the conditions for the origin of the geological environment.	5	X				X							
20	Datamine Workbook	The purpose of the course is to master the basics of Datamine software products for the design of open and underground mining operations. The objectives of the course are: familiarization with the interface; creation of frame models and toposurface; analysis of block models; creation of a quarry and underground mining; development of a mining schedule.	5		X	X				X					X

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21	Shattering process	The aim of the course is to study the theory and practice of rock destruction by explosion to ensure the required degree of crushing while minimizing the consumption of explosives. Course objectives: selection of explosives and explosives; calculation of parameters of blast-hole and borehole charges, blasted blocks; choice of blasting technology and switching schemes in open pit and underground mining; industrial safety testing of explosives and blasting operations.	5				X						X		X
Cycle of basic disciplines Component of choice															
22	Borehole production of uranium	The purpose of the course is to study the technological processes of uranium mining by the method of underground borehole leaching. Course objectives: analysis of the current state and problems of uranium mining by the method of underground borehole leaching; to study the features of opening a uranium deposit, preparing a technological block for leaching, leaching and post-leaching of uranium; development of new technological solutions to problems in downhole uranium leaching.	5	X			X		X				X		X
23	Construction of mining enterprises	The aim of the course is to study the theory and practice of building mining enterprises. Course objectives: selection of stages and start-up complexes for the construction of mining enterprises in the underground and open-cast mining of mineral deposits before the delivery and development of the design production capacity; familiarization with existing and prospective technologies for driving mine workings, means of mechanization and supply of communications in underground and open pit mining.	5	X									X		X
24	Open-cast mining technology	The purpose of the course is to master the technology of overburden and mining operations in the open mining of mineral deposits. Objectives of the course: to study the whole range of features of the technology of open-pit mining in domestic and foreign quarries in the extraction of ore, coal deposits of minerals and non-metallic building rocks; to instill the skills of performing analysis and planning activities to improve the level of technological development of domestic open pits, especially after mining has reached the maximum surface contour of the open pit to the final depth.	5	X			X		X				X		X
25	Technology of underground mining operations	The purpose of the course is to master the technology of clearing and sinking operations in the underground mining of mineral deposits. Course objectives: to study the whole range of features of the technology of underground mining in domestic and foreign mines and mines, the level of mechanization and automation, the procedure and methods for extracting ore and the sequence of mining blocks; to instill skills in performing analysis and planning activities to improve the level of technological development at domestic mines, including the development	5	X			X		X				X		X

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		of polymetallic upland deposits.													
26	Physics of rock mass	The aim of the course is to study the physical, technical, mechanical, thermal, elastic, plastic, deformation, rheological properties of rocks. Course objectives: determination of compressive and elastic characteristics of rocks on presses; establishment in laboratory conditions of hydraulic and generalized mining and technological properties of rocks; establishing the relationship between the physical processes of mining production and production processes.	5							X		X			
27	Financial and economic model of a mining enterprise	The purpose of studying the discipline is to teach students to perform a technical and economic assessment of options for the development of mining operations in market conditions and to establish economically feasible investments for the planned production capacity of a mining enterprise. The objectives of the course include: calculation of the cost of production; structure and content of the financial and economic model of a mining enterprise.	5						X						X
28	Numerical 3D modeling of geomechanical processes	The purpose of studying the discipline is to master modern numerical methods of mechanics of a solid deformable body for determining the stress-strain state of mining facilities. The objectives of the course are to study the basic relations of the mechanics of rocks and soils; the use of a numerical method to solve the problem of the stress-strain state of a rock or soil massif, the implementation of deformation models of the medium, strength and stability criteria.	5		X	X						X			
29	Interconnection and planning of open cast mining processes	The course is aimed at studying the relationship between technological processes in open pit mining: the impact of preparing rocks for excavation on the productivity of excavation and loading operations in various mining, geological and mining conditions; compliance of vehicles with various types of excavation and loading equipment; ensuring the receiving capacity of dumps of the carrying capacity of vehicles; establishing a common relationship between all technological processes.	5				X		X			X			X
30	Deposit opening and development when underground mining	The course is designed to study the systems and schemes of opening in the underground mining of horizontal, gently sloping, gently sloping, inclined and steep ore deposits to provide access to deposits in upland and flat terrain. In the process of learning, students will be able to choose rational options for opening, depending on the mining and geological conditions of the occurrence of deposits: adits, pits, inclined and vertical mine shafts. They will be able to lay preparatory and threaded mine workings and establish the influence of their volume on the choice of methods for opening deposits in various mining and geological conditions.	5							X					X
31	Deposit opening and development when uranium	In the process of studying the course, the tasks of planning heap leaching sites, storing dumps, taking into account the filtration of solutions when	5						X						X

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	undeground borehole	using borehole leaching, fixing boreholes, preparing for installation work on the day surface (pipeline networks, pumps, compressors, etc.), preparation of chemical solutions , construction of workshops for the processing of productive solutions.													
32	Opening of career fields	The purpose of the course is to master the methods, systems and schemes for opening open-pit fields during the construction and operation of open-pit mines to the final depth with a decrease in capital mining and transportation costs. Separately, opening options are considered when tracing opening workings in flat, inclined and steeply dipping deposits on flat terrain and upland deposits, taking into account the practice of operating the world's leading quarries.	6						X						X
33	Geotechnological methods of development of solid minerals	The aim of the course is to show promising unconventional geotechnologies using its capabilities to develop new geotechnological mining methods. Mastering the discipline includes the processes of destruction and softening of rocks during mechanical processes of mining and heating of the massif to the required transition temperature can be performed by a coolant, exposure to a high-frequency electromagnetic field, high-density electric current, in-situ combustion during thermal mining processes, as well as recent achievements and prospects geotechnological methods for the development of solid minerals.	6				X	X					X		X
34	Uranium deposits underground mining geotechnology	In the process of studying the course will be mastered: features of geotechnology of underground mining of uranium deposits: structure; methods of opening uranium deposits, their choice, main indicators; exploitation of uranium deposits, methods for determining the efficiency of exploitation of a deposit of easy leaching, unacceptable for leaching of a deposit; plugging of uranium deposits, existing methods; implementation of underground borehole leaching of uranium by the method of physical and chemical geotechnology; the process of preparing blocks and the reagents used for the completeness and intensity of the extraction of reserves.	5				X	X					X		X
35	Solutions hydraulics when uranium development	The purpose of the course is to gain knowledge about the operational block of in-situ leaching as part of a productive horizon, which includes a group of adjacent elementary cells that are simultaneously put into operation and developed in a single hydraulic mode. This is achieved through consistent familiarization with the types of fluid movement, the main hydraulic parameters of the flow, fluid movement modes, the theory of determining pressure losses and fluid outflow through holes, nozzles, hydraulic calculations of pipelines, and the basics of the theory of fluid filtration in rocks.	5						X						
36	Opencast mine mining and transport equipment	Acquisition of mining and transport machines and equipment for open-cast mining of solid mineral deposits, depending on mining and	5	X					X					X	

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		geological and mining conditions and the distance of cargo transportation. Drilling, excavation and loading, transport and unloading (dump) equipment.													
37	Mining-and-transport equipment of underground mines	In the process of studying the course, the following will be mastered: the principle of operation, design, technical capabilities of machines and equipment for drilling holes and wells, delivery and transportation of mined minerals and waste rocks, required communications and power equipment.	6	X					X					X	
38	Subsoil use contract and license	The purpose of the course is to teach specialists to prepare a set of documents for concluding a contract and license for subsoil use with the competent authorities. On the basis of the technical project for the development of the deposit, the main tasks are aimed at allocating a contract area, drawing up a work program with a financial and economic model of a mining enterprise. At the same time, special attention is paid to writing off the reserves of the deposit on the basis of the extraction unit approved in the project.	6			X		X		X	X				
39	Mine surveying for the construction of mines	The course will provide mastering the skills of carrying out design data into nature when laying a mine shaft and constructing surface structures on the earth's surface, compiling data for planning the area, setting out and fixing the centers and axes of mine shafts, transferring design contours and axes of buildings and structures to the terrain, servicing work on installation of a copra and installation of lifting equipment.	6			X		X		X	X				
40	Mine surveying work on the surface	The course mine surveying work on the surface will allow you to gain skills: building strong mine surveying points; determination of plan coordinates of permanent and temporary centers of survey substantiation on the surface; performance of surveying works in the breakdown and survey of transport routes, vertical planning of the construction site and geodetic work to transfer the design of structures to nature.	5							X	X	X	X		
41	Surveying-geodesy instruments	Acquisition of theoretical knowledge and practical skills of working with modern surveying and geodetic instruments and their use for solving applied problems in mining.	5							X					
42	Mine surveying drawing	The study of the principles and techniques of technical and topographic drawing using modern technologies and technical means for the preparation and maintenance of surveying graphic documentation, on the example of computer-aided design (CAD) AutoCAD.	5		X					X	X				
43	Mathematical processing of surveying and geodetic measurements	The course of mathematical processing of mine surveying and geodetic measurements is based on obtaining and consolidating knowledge on the elements of probability theory, classification of measurements, random measurement errors, the law of their distribution, properties of random errors, measures of accuracy of measurement results, justification of the least squares method, on measurement weights, statistical population and	5			X				X	X				

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		distribution, statistical studies of a number of random measurement errors, equalizing calculations.													
44	Mechanics of underground structures	The course covers the study of the physical and mechanical properties of rocky and non-rocky rock massifs and mechanical processes in rock massifs resulting from the violation of their natural stress-strain state during mining and construction works, the behavior patterns of rock outcrops and loose mine workings.	5		X	X				X	X	X			
45	General course of surveying	The general course of mine surveying will introduce you to the methods of creating reference and surveying underground mine surveying networks, the underground reference network of the theodolite traverse of 1 and 2 categories, types of theodolite traverses, methods for measuring horizontal and vertical angles, the lengths of the sides of the theodolite traverse, surveying support during mine workings and setting directions mine workings in horizontal and vertical planes.	5							X	X				
46	Underground construction facilities	The course is aimed at studying the types of underground structures erected in the mining industry, the construction of vertical mine shafts, the drilling of horizontal and inclined mine workings using the drilling and blast method, the features of driving rising workings and ways to organize work on the sinking of horizontal and inclined workings, underground structures, shields.	5										X		X
47	Conducting mining operations at quarries	Within the framework of the course, it is planned to study the methods of conducting open mine workings as a set of technological processes performed in a certain sequence to create a cavity in the rock mass of the required size and shape and ensure its safety for the period of further operation. In addition to traditional inclined mine workings for road and rail transport, rational options for steep mine workings for conveyor and skip modes of transport are being studied.	5						X				X		X
48	Industrial explosives	The purpose of the discipline is to study the types and classification of industrial explosives used in the destruction of rock massifs and solid minerals, the composition of components of industrial explosives, the conditions of their use and the choice of explosives.	5						X						
49	Open-pit mining processes	Formation of students' knowledge on the main processes of mining: preparation of rocks for excavation; overburden and mining operations; transportation of overburden rocks and minerals; dumping and reclamation. Technological processes at quarries: preparation of rocks for excavation, excavation and loading operations, open-pit mining with the use of bulldozers and scrapers, transportation of rock mass.	5	X			X		X				X		
50	Underground mining operations processes	In the process of studying the course will be mastered: characteristics of technological processes in underground mining; structure of ore recovery indicators, losses and impoverishment; basic requirements for field development; ore breaking, technology, mechanization and organization	5	X			X		X				X		

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		of release, loading and delivery of ore.													
51	Field development in specific conditions	As part of the course, it is planned to study the development of deposits of solid minerals in special conditions, including weakly stable mountain ranges, a large influx of ground and underground waters, and the tendency of a mineral to spontaneous combustion. Separately, the practice of safe and efficient development in special conditions in mines, mines and quarries is considered.	5						X						X
52	Resource-saving and low-waste technology on ore mines	The purpose of the course is to reveal the reserves for the development of resource-saving and low-waste technologies in ore quarries. Course objectives: resource intensity of mining products; problems of rational use of natural resources in mining; the state and tasks of the rational use of the mineral resource base of the country; improving the quality and value of mineral raw materials and reducing the cut-off content of minerals in conditions; quantitative and qualitative losses of minerals and their assessment.	5				X	X							
53	Mineral deposits underground mining systems	The aim of the course is to gain knowledge on the most advanced development systems in the underground mining of ore, coal and polymetallic deposits, respectively, in flat and upland areas. Objectives of the course: the order and sequence of mining and preparatory, overburden and clearing works; underground mining systems in the development of ore and coal deposits on inclined, steep and steep deposits; cutting the mine field into floors, sub-levels, blocks and faces, depending on the conditions of occurrence, thickness and characteristics of the mineral.	5				X		X						X
54	Special drill-blasting operations	The course examines the conditions for the production of special blasting and the issues of their organization at various sites. Methods for calculating the parameters of charges and technology for drilling and blasting, the practice of ensuring safe conditions for blasting and choosing safe blasting modes, an analysis of specific examples of performing special blasting operations at various objects are given.	5						X				X		X
55	Special ways of building underground structures	As part of the course, it is planned to study special methods for the construction of underground structures, including the implementation of an additional set of measures, impacts that are carried out in advance of the start of mining operations in non-cohesive, weakly stable aquifers or in strong fractured and aquiferous rocks. They will create safe, comfortable conditions for rock excavation and erection of temporary or permanent support without violating the integrity of the surrounding massif and affecting the underground utilities that fall into the construction zone.	5						X				X		X
56	Construction of underground hydraulic structures	The course includes systematized material on the types and designs of underground hydraulic structures and their layouts in complex hydroelectric facilities, engineering and geological studies, building	5						X				X		

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		materials for underground structures, full-scale and model studies of structures, calculation of underground structures, technical and economic analysis and selection of parameters of structures, production technologies and organization of underground works.													
57	Technology of construction of vertical mine workings	The course examines the main issues of vertical mine workings construction technology: the preparatory period, mining operations in the shaft in normal and difficult mining and geological conditions, as well as work on deepening the shafts. The emphasis is on the selection and justification of technological schemes for the construction, drilling and blasting, methods of ventilation and fixing of workings, loading and raising rocks to the surface based on the latest achievements in theory and practice.	5						X				X		X
58	Rock conditions management	As part of the course, the management of the state of the rock mass, it is envisaged to study a set of measures for the purposeful transfer of the massif to a deliberately stable, close to limiting or unstable state. It is carried out by changing the form, parameters and duration of rock exposure during the development process, as well as changing the physical and mechanical properties of rocks that ensure economical and safe mining operations. The practice of mining operations in the conditions of the limit state of the rock mass.	5		X						X	X			
59	Shield tunneling complexes	Students gain knowledge and skills that allow them to solve engineering problems for the selection and use of shields and shield systems in various geological and hydrogeological conditions.	5	X					X						
60	Aerology of concessions	The aim of the course is to gain knowledge on the theory and practice of ventilation of mines and shafts, as well as deep quarries. Course objectives: study of the mine atmosphere and the laws of air movement, drawing up measures to ensure safe working conditions for workers, ways to ventilate mines, tunneling faces and quarries; instilling skills in determining the composition of mine air, ensuring changes in the composition of air when it moves through mine workings and utilizing toxic and radioactive impurities from mine air.	5										X		X
61	Bases of mining (Introduction to specialty)	The aim of the course is to master mining terminology and features of mining operations in open, underground and borehole mining of mineral deposits. Course objectives: to study the main production processes in the development of deposits by open pit, underground methods and in borehole mining on the basis of existing and prospective means of mechanization; give basic concepts for the processing and enrichment of mined minerals; gain skills in displaying mine workings and means of mechanization.	5	X									X		
62	Processing and enrichment of minerals	The course is designed to study a set of methods and processes for the primary processing of mineral raw materials to extract valuable minerals	4						X						X

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		from waste rock, as well as the mutual separation of valuable minerals. Students will get acquainted with domestic and foreign technologies for the processing and enrichment of minerals and gain skills in working with laboratory equipment for grinding and extracting useful components.													
63	Geotechnological wells drilling and operation	The course covers the theory and practice of drilling production and geotechnological wells: historical references to the development of drilling exploration wells; methods of drilling operational and geotechnological wells; varieties of machines and equipment for drilling production and geotechnological wells; features of preparation for operation of operational and geotechnological wells of uranium deposits; creation of cavities in the bottom hole.	5	X					X				X		X
64	Geometry of subsoil	The subsoil geometry course provides knowledge on subsoil geometrization and qualimetry: mathematical methods for processing observations of deposit indicators, drawing a projection of subsoil geometrization, mathematical operations with topographic order functions, geometrization of shapes, occurrence conditions and physical and chemical properties of a deposit, calculating reserves and managing the movement of mineral reserves in the development of deposits, subsoil qualimetry and geometric methods for solving individual problems of mining and exploration, rational extraction of minerals, quantitative and qualitative characteristics of the physical and technical parameters of rocks.	5							X	X				
65	Geomechanics	The geomechanics course is aimed at obtaining knowledge about the mechanical properties and mechanical state of a rock mass and the processes of deformation and destruction (geomechanical processes) occurring in it under certain natural conditions under the influence of mining (technological) factors. With the use of modern geophysical instruments, it will make it possible to organize monitoring of the movement of a rock mass relative to the outcrops of mine workings at existing mining enterprises.	5		X							X			
66	Mining drawing when uranium deposits underground mining	The purpose of the course is to teach how to make mining graphic materials for underground uranium leaching using special software. Course objectives: to calculate the reserves of uranium deposits using office and special programs; master the basic skills of using special software for computer processing of opening methods and preparation methods for underground uranium leaching; determine the suitability of uranium deposits.	5			X				X					
67	GIS cartography in mining	The purpose of mastering the discipline is the formation of students: - understanding of theoretical positions, basic methods and technologies of geoinformation systems; - acquisition of the ability to use GIS packages in the construction of digital maps and subsequent analysis of digital	5		X	X				X		X			

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		models of rock mass; - acquisition of the ability to use GIS packages in the work of mine surveying.													
68	Combined field development methods	At the course, combined methods of field development will learn to set and choose directions for solving the problems of mining an open-underground layer with the redistribution of profits for the construction of the required underground structures, perform experimental studies to establish the thickness of the pillar between an open mining excavation and underground structures, prepare an abstract on the analysis of the features of the technology for the production of treatment plants and tunneling operations after the transition to the underground method of field development.	5						X					X	X
69	Mines conservation	The basic concepts, acts and normative documents of RK concerning the enterprises elimination and conservation, technical actions at the enterprises elimination and conservation, bases of projection and design decisions on technical processes and operations at the enterprises elimination and conservation, technical and economic indexes at the enterprises elimination and conservation when mineral deposits underground mining.	5					X	X						
70	Uranium deposits conservation	Study of the program for the conservation of uranium mining enterprises and the elimination of the consequences of the development of uranium deposits. As a result, they will gain the skills to draw up a passport for its implementation in accordance with the long-term national program for the rehabilitation of contaminated areas.	5					X	X						
71	Mine surveying at open pit mining	Acquiring the necessary knowledge to conduct surveying work in the design, construction and operation of quarries, to master the methods of creating geodetic reference and surveying networks for the production of surveys, conducting surveying work at the stage of exploration, construction and operation of the field.	5							X	X	X	X		
72	Mine Survey of underground development systems	Horizontal connection survey. The orientation of the underground shooting through a single vertical shaft. Ways of projecting points from the surface oriented to the horizon. Simplified methods of orientation. Geometric orientation in underground mining. Targeting mining in the horizontal and in the vertical plane. The conduct of mines counter-faces. Surveying measurements of the mine workings and production volumes.	5							X	X	X	X		
73	Mine surveying of the construction of tunnels	The course is aimed at surveying support for the construction of tunnels and subways, assimilation of the specifics and globally recognized methods of work, technical means, the main provisions of regulatory documentation, a number of well-known built and built tunnels will show the significance and uniqueness of the work.	5							X	X	X	X		
74	Equipment of geotechnological fields at	The course is aimed at studying the main ways to control the quality of injection, pumping and auxiliary wells in underground well leaching of	5	X					X						

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	uranium dillhole in situ leaching	uranium. To do this, the basics of well logging, methods for determining the violation of the integrity of wells, spreading of technological solutions, clogging of filters and the near-filter zone, and types of repair and restoration work of geotechnological wells will be mastered.													
75	Open development of building materials	Teaching students scientifically based method of open development of deposits of building materials, providing high technical and economic performance of mining enterprises, rational use of natural resources and environmental protection. Know the technology of mining on quarries of building materials.	5	X			X		X				X		
76	Prospective and current planning of open cast mining operations	The course will allow you to master the methods of long-term and current planning of open pit mining using special-purpose information systems in relation to the specifics of the conditions for the development of deposits of solid minerals and to gain practice in the formation of mining plans, taking into account mining and geological, mining engineering, technological and economic conditions for the development of deposits. As a result, specialists will be able to confidently predict the implementation of the planned volumes of extraction of minerals of the required quality as a whole for the open pit and separately for each piece of excavation and loading equipment with minimal mining operations and make timely adjustments to the long-term mining plan.	5				X						X		X
77	Underground development of indigenous and alluvial deposits	When developing underground mining of primary and alluvial deposits, they proceed from the high added value of the extracted mineral raw materials. Therefore, special attention is paid to the initial data on the structure of the deposit, the nature of the distribution of useful components and the sampling of placers, their cut-off content. Therefore, underground mining of bedrocks and placers, their opening and preparation of mine fields and the procedure for mining in each specific case are established based on the completeness of extraction of all reserves with minimization of impoverishment. Otherwise, it is advisable to design concentrating plants with a complete processing cycle with a gross excavation of rock mass.	5						X				X		X
78	Sheet deposits underground mining	Study of underground development of reservoir deposits. In contrast to the development of ore deposits, when choosing systems for the development of reservoir deposits, there is practically no need to leave the pillars of the mineral, which are subsequently worked out. The course will master the schemes of opening, preparation and development systems of reservoir deposits, the basics of organization and technical means of conducting preparatory and clean-up operations, assessing the degree of manufacturability of the deposit.	5						X				X		X
79	Underground mines air supply	The course is necessary to ensure comfortable working conditions for miners in underground mining by determining the amount of air required	5										X		X

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		to ventilate the mine based on determining the sources of dust emission from mines, selecting the required mine ventilation systems and controlling the dust content of mine air and their sizes. To do this, you need to know the basics of aerosol speakers, the mine climate, methods for predicting the temperature of mine air, mine aeromechanics, the basic laws of the ventilation unit and analytical approaches to its calculation.													
80	Mine survey software	The course will allow you to study the general concepts of GIS operations, GIS data in the structure of models, gain skills in working with the information programs used to support mine surveying: Autodesk Land Desktop, CREDO complex programs and design a quarry using a sequential account of the amount of work, processing high-altitude data bases and structure of circuits, processing in the CREDO_TER system on terrestrial photo materials and processing in the CREDO_DAT system also on terrestrial photo materials.	5		X	X					X	X			
81	Advanced mining technologies in deep and ultra-deep quarries	In the course of progressive mining technologies in deep and super-deep quarries, students will perform experimental studies to establish the optimal parameters for the boundaries of the effective use of cyclic-flow technology, the final depth of open pits, the parameters of steep layers, the automated determination of the optimal volumes of mining operations and the parameters of rework without spacing the sides using innovative transport devices according to the algorithms and software products available at the department.	5			X			X			X			
82	Designing of blasting operations	The course is aimed at training specialists in the field of blasting to master the basic principles of designing blasting operations in the mining industry: designing blasting operations during trenching and working out ledges in open-pit mining; in underground mining, designing blasting operations during the sinking of mine shafts and horizontal mine workings. Particular attention will be paid to the choice of explosives, explosives, charge switching schemes and industrial safety.	5						X				X		
83	Layout of underground mines plan	Studying the basics of designing the underground mining of mineral deposits: the main documents governing the design and regulatory documents; principles of organization, types and procedure for performing design work. As a result, they will gain skills in designing mines and mines: drawing up design assignments, performing a feasibility study on the feasibility of making changes in mining technology; preparation of the mountain part of the project and author's support.	5						X				X		
84	Design of ore and coal mines	Studying the basics of designing ore and coal pits: the main documents governing the design and regulatory documents; principles of organization, types and procedure for performing design work. As a result, they will gain design skills for open pit mining: drawing up design assignments, performing a feasibility study on the feasibility of	5						X				X		

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		construction, reconstruction and technical re-equipment; allocation of construction phases and launch complexes, preparation of the mining part of the project and author's support.													
85	Design of construction of mining facilities	The course of designing the construction of mining buildings and structures is based on the study of the classification of buildings and structures and the calculation of load-bearing structures, beams and roof trusses, floor beams, foundations and bases and the organization of earthworks. It will allow to train specialists for production, technological and design activities in the field of construction of surface structures of mining enterprises.	5						X				X		
86	Designing of construction of underground mining enterprises	Methods for designing the parameters of individual underground facilities are considered. Design methods and methods of construction of the most complex objects of the mine and other underground structures. Calculation of the main and auxiliary processes in the construction of mine workings and underground structures. Methods of search and adoption of engineering, economic and organizational decisions for the construction of underground structures.	5						X				X		
87	Layout of underground deposits plan	Studying the basics of designing the development of hydrogenous uranium deposits: establishing an optimally deep well for the completeness of the extraction of deposit reserves, their number and depth, as well as annual productivity, taking into account round-the-clock work. Determining the life of a well, taking into account their number, mineral reserves and the needs of the economy.	5						X				X		
88	Industrial safety of blasting operations	At the course industrial safety of blasting operations, the Rules for ensuring industrial safety for hazardous production facilities on the basis of Interrin Scientific and Production Company LLP will be studied with passing a qualification exam for obtaining a certificate of explosives.	5					X							
89	Design and computer style for mining operations development plans	The aim of the course is to study the concept of a development plan for underground mining, its structure and computer design. Course objectives: to calculate reserves using office and special programs; build a calendar plan; carry out the calculation of losses and impoverishment; master the basic skills of using special software for computer-based design of a mining development plan; determine the degree of exploration of the deposit.	5		X	X							X		
90	Calculation of the design of underground structures	The course is aimed at instilling the skills of calculating the design of underground structures, ensuring their stability and durability at minimal cost. Calculations of underground structures by the methods of structural mechanics must be carried out taking into account the repulsion of the rock, which makes it possible to model their interaction with the enclosing rock mass.	5		X					X					
91	Reconstruction of mines	Studying the basics of the reconstruction of mines and underground	5						X			X			X

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	and underground structures	structures: expansion of existing enterprises, reconstruction, technical re-equipment, maintenance of existing capacities. As a result, they will master the main areas of reconstruction, types of work and capital costs, economic and technical feasibility of reconstruction, opening new horizons by driving shafts at a new industrial site, driving new and deepening existing vertical shafts and in mines with inclined shafts, safety devices (shelves and pillars) .													
92	Reclamation of disturbed lands on mines	In accordance with environmental requirements, the course provides knowledge on the restoration of lands disturbed by mining operations: the production of landscape restoration work; features of selective formation of dumps, taking into account the requirements for reclamation; requirements for the reclamation of the mined-out area of open mine workings; technical and economic assessment of the effectiveness of land reclamation; a comprehensive assessment of the state of disturbed lands and the development of recommendations for improving reclamation work at mining enterprises.	5					X	X						
93	Systems of open development of mineral deposits	Teaching students scientifically based method of selection and justification of the system of development of mineral deposits, providing high technical and economic performance of the quarry, rational use of natural resources and environmental protection.	5										X		X
94	Special methods of conducting open cast mining operations	The course includes special non-traditional methods of open pit mining with the use of cable cars, milling machines, innovative inter-shoulder loaders, steeply inclined conveyors, transport units for deep pits with rock lifting in skips with a varying angle of inclination, hydraulic transport.	5						X				X		X
95	Separate methods of uranium deposits development	Special methods for the development of uranium deposits include underground leaching, microbiological leaching. The basic principle of special technologies is to transfer the mineral to a mobile state and extract it to the surface. With regard to underground leaching of uranium, methods and conditions for the effective leaching of hydrogenous uranium deposits will be considered. With regard to bacterial leaching on an industrial scale, the extraction of uranium from sulfide and sulfide-oxidized ores will be studied.	5						X				X		X
96	Ways to support underground structures	The course includes the study of the theory and practice of choosing methods and means of maintaining underground workings for various mining and geological conditions, calculating the parameters of the lining, analyzing the current state and trends in the further development of the lining and the technology of its construction based on the operating conditions of the lining in mine workings and the mechanism of interaction between the lining and rock array. Basic requirements for support.	5						X				X		
97	Technological complexes	The course is aimed at establishing a close relationship between the	5	X					X						

NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»

	of open cast mining operations	technology of open-pit mining with the equipment used and allows you to choose the most rational combinations of them in specific mining and geological and mining conditions based on the technological and structural classification of technological equipment complexes. The study of the basics of equipment configuration for preparing rocks for excavation, the relationship between excavation and loading and transport equipment, transport and dump, taking into account auxiliary equipment, allows us to establish the productivity of the formed cargo flows and the production capacity of the quarry as a whole.													
98	Technology and complex mechanization of underground mining	The course is aimed at providing the right to responsible management of underground mining operations based on the study of technology and the organization of production of clearing and sinking operations using advanced drilling, excavation, loading and transport equipment. A close relationship between the applied technology and development systems is shown, depending on the conditions of occurrence of the mineral, the stability of the host rocks and the value of the extracted mineral raw materials. The production processes of the stope excavation and methods of delivering ore to the surface are described in more detail.	5	X					X				X		X
99	Technology and mechanization of piling works	The course will allow mastering the technology and mechanization of stowing operations based on its preparation, delivery and placement in the mined-out area of a stope. To do this, the most rational compositions of backfill material will be studied depending on the characteristics of the host rocks, methods of their preparation and backfilling, determination of the strength characteristics of backfill materials, areas of application for various backfills, modern materials and additives to improve the characteristics of backfill materials.	5						X				X		X
100	Technology of construction of horizontal and inclined mine workings	The course is aimed at instilling the skills of technical and economic assessment of the methods of construction of horizontal and inclined mine workings: determining the forms of cross sections and the main parameters of horizontal and inclined mine workings for various purposes, as well as technological schemes for their construction in various mining and geological conditions. It is necessary to master the technological operations of mine workings: methods of explosive destruction of rocks, methods of loading and transporting rock mass, fixing underground mine workings, as well as auxiliary operations for production purposes.	5						X				X		X
101	Technology of construction of urban underground structures	Instilling in students the knowledge and skills necessary for independent creative solutions to the problems associated with the implementation of technological processes of construction of urban underground structures for various purposes; to teach creatively apply advanced technology and technology, achieving higher rates of construction and productivity,	5						X				X		X

NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»

		improving the quality of work, reducing the cost and rational use of labor resources.													
102	Technology of construction of tunnels	Presentation of the main theoretical and practical provisions on engineering structures, the use of modern technology and technical means in the construction of tunnels for various purposes based on modern scientific achievements in the field of underground construction. Technology for the construction of tunnels in a mountain way. The technology of building tunnels with a shield method.	5						X				X		X
103	Product quality management	Averaging the quality of the extracted mineral raw materials depending on the content of the useful component in the treatment blocks. Blending of ore before shipment to the processing plant. Work with databases of the field in the preparation of technological cards of bottomholes.	5						X				X		X

5 Curriculum of the 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 6B07205 - "Mining engineering"
Group of educational programs B071 - "Mining and extraction of minerals"

Form of study: full-time			Duration of study: 4 years			Academic degree: Bachelor of Engineering and Technology											
Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	classroom volume of lek/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters									
								I course		II course		III course		IV course			
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG 108	Foreign language	GED, RC	10	300	0/0/6	210	E	5	5								
LNG 104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	E	5	5								
M-2. Module of physical training																	
KFK 101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Difcredit	2	2	2	2						
M-3. Module of information technology																	
GEN 429	Engineering and computer	BD, UC	5	150	1/1/1	105	E	5									
MIN109	Integrated information systems in mining	BD, UC	5	150	1/2/0	105	E			5							
CSE 677	Information and communication technologies (in English)	GED, RC	5	150	2/1/0	105	E				5						
MIN443	Numerical 3D modeling of geomechanical processes	BD, UC	5	150	1/2/0	105	E					5					
MIN444	Datamine Workbook	BD, UC	5	150	1/0/2	105	E						5				
M-4. Module of socio-cultural development																	
HUM 101	History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE		5								
HUM 132	Philosophy	GED, RC	5	150	1/0/2	105	E				5						
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	E				3						
HUM 134	Socio-political knowledge module (culturology, psychology)		5	150	2/0/1	150	E			5							
M-5. Module of anti-corruption culture, ecology and life safety base																	
HUM 136	Fundamentals of Anti-Corruption Culture and Law	GED, CCH	5	150	2/0/1	150	E			5							
MNG 489	Fundamentals of Economics and Entrepreneurship																
HPP128	Fundamentals of scientific research methods																
CHE 656	Ecology and life safety																
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5									
PHY 468	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																	
MAP519	Geodesy	BD, UC	5	150	1/0/2	105	E	5									
GEO475	Fundamentals of Geology	BD, UC	5	150	2/1/0	105	E			5							
AAP167	Educational practice	BD, UC	1							1							
M-8. Mining support module																	
MIN447	Physics of rock mass	BD, UC	5	150	1/2/0	105	E				5						
MIN442	Shattering process	BD, UC	5	150	1/1/1	105	E			5							
MIN448	Construction of mining enterprises	BD, UC	5	150	1/1/1	105	E				5						
MIN449	Open-pit mining processes	BD, CCH	5	150	1/0/2	105	E			5							
MIN450	Deposit opening and devoloment when underground mining				2/0/1												
MIN451	Deposit opening and development when uranium underground borehole				2/0/1												
MIN452	Industrial explosives				1/1/1												
MIN459	Mechanics of underground structures				2/0/1												
MAP530	General course of surveying				1/0/2												
MIN460	Interconnection and planning of open cast mining processes				2/0/1												
MIN454	Underground mining operations processes				2/0/1												
MIN461	Uranium deposits underground mining geotechnology	2/0/1															
MIN462	Underground construction facilities	2/0/1															
MAP529	Mine surveying drawing				0/0/3												
TEC186	Opening mine mining and transport equipment				2/0/1												

**NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»**

PED147	Mining and transport equipment of underground mines	BD, CCH	5	150	2/0/1	105	E					5			
MIN455	Shield tunneling complexes				2/0/1										
MAP531	Mine surveying work on the surface				1/0/2										
M-9. Mining production module															
MIN453	Open-cast mining technology	BD, UC	5	150	1/0/2	105	E					5			
MIN505	Borehole production of uranium	BD, UC	5	150	2/0/1	105	E								5
MIN445	Financial and economic model of a mining enterprise	BD, UC	5	150	1/1/1	105	E								5
MIN458	Technology of underground mining operations	BD, UC	5	150	1/0/2	105	E					5			
MIN466	Resource-saving and low-waste technology on ore mines				2/0/1										
MIN467	Mineral deposits underground mining systems				2/0/1										
MIN468	Solutions hydraulics when uranium development	BD, CCH	5	150	2/0/1	105	E					5			
MIN469	Technology of construction of vertical mine workings				2/0/1										
MAP532	Mathematical processing of surveying and geodetic				1/0/2										
MIN511	Opening of career fields				2/0/2										
MIN512	Subsoil use contract and license				2/0/2										
MIN510	Geotechnological methods of development of solid minerals				2/0/2										
MIN513	Special ways of building underground structures	BD, CCH	6	180	2/0/2	120	E					6			
MAP535	Mine surveying for the construction of mines				1/1/2										
MIN516	Conducting mine workings at quarries				1/0/2										
MIN520	Rock conditions management				2/0/1										
MIN517	Fields development in special conditions	BD, CCH	5	150	2/0/1	105	E					5			
MIN519	Construction of underground hydraulic structures				2/0/1										
MAP520	Surveying - geodetic instruments				1/0/2										
CYCLE OF PROFILE DISCIPLINES (PD)															
M-10. Module of professional activity															
MIN101	Bases of mining (Introduction to specialty)	PD, UC	5	150	1/0/2	105	E			5					
MET641	Processing and enrichment of minerals	PD, UC	4	120	2/1/0	75	E					4			
MIN481	Aerology of concessions	PD, UC	5	150	2/1/0	105	E							5	
M-11. Mine design module															
MIN463	Special methods of conducting open cast mining operations				2/0/1										
MIN464	Design and computer style for mining operations development plans				1/0/2										
MIN465	Mining drawing when uranium deposits underground mining	PD, CCH	5	150	1/0/2	105	E					5			
MIN456	Technology of construction of tunnels				2/0/1										
MIN457	Ways to support underground structures				2/0/1										
MAP524	Geomechanics				1/0/2										
MIN470	Technological complexes of open cast mining operations				2/0/1										
MIN131	Underground mines air supply				2/0/1										
MIN471	Geotechnological wells drilling and operation	PD, CCH	5	150	2/0/1	105	E					5			
MIN472	Calculation of the design of underground structures				2/0/1										
MAP528	GIS cartography in mining				1/0/2										
MIN473	Open development of building materials				1/0/2										
MIN474	Technology and complex mechanization of underground mining				2/0/1										
MIN475	Equipment of geotechnological fields at uranium dillhole in situ leaching	PD, CCH	5	150	2/0/1	105	E					5			
MIN476	Design of construction of mining facilities				2/0/1										
MAP521	Mine surveying at open pit mining				1/0/2										
MIN487	Prospective and current planning of open cast mining operations				2/0/1										
MIN488	Product quality management				2/0/1										
MIN489	Technology and mechanization of piling works				2/0/1										
MIN491	Designing of blasting operations	PD, CCH	5	150	2/0/1	105	E					5			

**NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»**

MIN492	Designing of construction of underground mining enterprises				2/0/1														
MAP525	Mine survey of underground development systems				1/0/2														
MIN493	Reclamation of disturbed lands on mines				2/0/1														
MIN 494	Layout of underground mines plan				2/0/1														
MIN501	Layout of underground deposits plan	PD, CCH	5	150	2/0/1	105	E										5		
MIN495	Technology of construction of horizontal and inclined mine workings				2/0/1														
MAP523	Geometry of subsoil				1/0/2														
MIN496	Design of ore and coal mines				1/0/2														
MIN497	Mines conservation				2/0/1														
MIN498	Uranium deposits conservation	PD, CCH	5	150	2/0/1	105	E										5		
MIN499	Reconstruction of mines and underground structures				2/0/1														
MAP527	Mine survey software				1/0/2														
MIN500	Systems of open development of mineral deposits				1/0/2														
MIN441	Sheet deposits underground mining				2/0/1														
MIN432	Underground development of indigenous and alluvial deposits	PD, CCH	5	150	2/0/1	105	E										5		
MIN433	Technology of construction of urban underground structures				2/0/1														
MAP526	Mine surveying of the construction of tunnels				1/0/2														
M-12. R&D module																			
MIN509	Advanced mining technologies in deep and ultra-deep quarries				1/1/1														
MIN526	Combined field development methods	PD, CCH	5	150	2/0/1	105	E											5	
MIN140	Industrial safety of blasting operations				2/0/1														
MAP499	Basics of laser scanning				1/0/2														
MIN522	Hydro-mechanization of mining of construction rocks				2/0/1														
MIN523	Special issues of underground mining operations				1/0/2														
MIN524	Special methods of development of uranium deposits	PD, CCH	4	120	1/0/2	75	E											4	
MIN525	Special drilling and blasting operations				2/0/1														
MAP575	Applied geodesy				1/0/2														
M-13. Practice module																			
MIN 521	Production practice I	PD, UC	3													3			
AAP193	Production practice II	PD, UC	3																3
M-14. Module of final attestation																			
ECA108	final examination	FA	8																8
M-15. Module of additional types of training																			
AAP500	Military affairs	ATT	0																
Total based on UNIVERSITY:																32	28	27	33
																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		81	31	176
PD	Cycle of profile disciplines		25	39	
Total for theoretical training:		51	106	75	232
FA	Final attestation	8			8
TOTAL:		59	106	71	240

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

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

Decision of the Academic Council of the Mining and Metallurgical Institute. Protocol № 3 "15" November 2022y.

Vice-Rector for Academic Affairs

B.A. Zhautikov

Director of the Institute

K.B.Rysbekov

Head of the Department

S.K.Moldabaev

Representative of the Council from employers

B.A.Bakhranov