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

EDUCATIONAL PROGRAM
"8D07203 - Mining Engineering"

Code and classification of the field of education:	8D07 – Engineering, manufacturing and construction industries
Code and classification of training areas:	8D072 – Manufacturing and processing industries
Group of educational programs:	D116 – Gornoye delo i dobycha poleznykh iskopayemykh
The level of the NRK:	Level 8 – Postgraduate education (programs leading tothe academic degree of Doctor of Philosophy (PhD) and doctors in the profile and/or practical experience)
ORC Level:	Level 8 – Knowledge at the most advanced level in the field of science and professional activity

Duration of training:	3 years
Volume of loans:	180

Almaty, 2022

The educational program 8D07203 - "Mining engineering" was approved at the meeting of the Academic Council of KazNITU named after K.I.Satpayev

Protocol no. 13 from "28" 04 2022.

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of KazNTU named after K.I.Satpayev

Protocol no. 7 from "26" 04 2022g.

The educational program 8D07203 - "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 ommittee:				
Moldabaev S.K.	doctor of technical sciences, professor	Head of the Department	KazNTU 72-45, 87015183265	
Teaching staff:				
Yusupov K.A.	doctor of technical sciences	professor	KazNTU	
Sandibekov M.N.	candidate of technical sciences	professor	KazNTU	
Employees:				
Bitimbayev M.Z.	doctor of technical sciences, professor	Expert of Kazakhmys Corporation LLP	Member of the Board of Directors of Kazakhaltyn Mining and Metallurgical Concern JSC-	
Bahramov B.A.	master of technical sciences	Managing Director of Production	JSC "Altynalmas", Almaty	
Students:				
Orynbayev B.A.	doctoral student 2 course	Senior Engineer of the Department	NP Interrin LLP, Almaty	
Amanzholov M.T.	master 2 courses	Chief Operating Officer	Mongold PTE Limited	

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List of abbreviations and designations

NAO "Kazakh National Research Technical University named after K.I.Satpayev" – NAO KazNITU named after K.I.Satpayev;

SES – The State compulsory standard of education of the Republic of Kazakhstan;

MES RK – Ministry of Education and Science of the Republic of Kazakhstan;

OP – educational program;

SRO – independent work of a student (student, undergraduate, doctoral student);

SROP – independent work of the student with the teacher (independent work of the student (master's student, doctoral student) with the teacher);

RUP – working curriculum;

CAD – 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

The educational program for the preparation of a Doctor of Philosophy (PhD) has a scientific and pedagogical orientation and assumes fundamental educational, methodological and research training and in-depth study of disciplinesin the relevant fields of sciences for the system of higher and postgraduate education and the scientific sphere.

The educational program for the preparation of a doctor in the profile involves fundamental educational, methodological and research training and in- depth study of disciplines in the relevant areas of science for the branches of the national economy, the social sphere: education, medicine, law, art, economics, business administration and in the field of national security and military affairs.

The educational programs of doctoral studies in terms of professional training are developed on the basis of studying the experience of foreign universities and research centers that implement accredited training programs for PhD doctors or doctors in the profile.

The content of the educational program of the profile doctoral program is determined by the university independently.

The main criterion for the completion of the educational process for the preparation of doctors of philosophy (PhD) (doctors in the profile) is the development of at least 180 academic credits by a doctoral student, including all types of educational and scientific activities.

The duration of doctoral studies is determined by the amount of academic credits mastered. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a Doctor of Philosophy (PhD) degree or by profile, the educational program of the doctoral program is considered fully mastered.

The content of the doctoral program consists of:

1) theoretical training, including the study of cycles of basic and core disciplines;

2) practical training of doctoral students: various types of practices, scientific or professional internships;

3) research work, including the execution and defense of a PhD thesis;

4) final certification.

The training of personnel in doctoral studies is carried out on the basis of educational programs of doctoral studies in two directions:

1) scientific and pedagogical with a training period of at least three years;

2) profile with a training period of at least three years.

The content of the OP "Mining Engineering" on the basis of the development of a multi-level system of personnel training, the fundamental nature and quality of training, continuity and continuity of education and science, unity of training, education, research and innovation activities aimed at maximum satisfaction of consumer needs should ensure:

- obtaining a full-fledged and high-quality professional education in the field

of mineral deposits development (MPI), confirmed by the level of knowledge and skills, skills and competencies, based on the criteria established by the State Educational Standard, their assessment, both in content and in volume:

- training of professional and competitive specialists in the field of MPI development and creation of new mining production technologies and production management;
- using methods of analysis and evaluation of experimental results.

2 The purpose and objectives of the educational program

8D07203 – "Mining Engineering" are:

- creation, based on the integration of education and science, of an effective system for training scientific, scientific and pedagogical personnel of a new formation capable of solving issues of improving society, economy, production, science and the development of new technologies;
- harmonization of domestic technologies for the training of highly qualified scientific and pedagogical personnel with international standards, as well as advanced solution of issues of their scientific, methodological, legal, financial, economic, personnel and logistical support;
- implementation of the educational process in accordance with the principles of international practice of training highly qualified scientific and pedagogical personnel who are competitive in the modern labor market.

The goal reflects the desire to ensure high-quality training through the integration of education, science and production, strengthening the material and technical base and human resources of the university, the use of modern methods and technologies in the educational process. The training involves serious research work, the performance of which significantly increases the status of a doctoral student as a young scientist in his field.

The tasks of OP 8D07203 – "Mining Engineering" are:

- preparation of PhD doctors who are competitive both within the country and on the international labor market, integration of national doctoral programs into the global educational space;
- monitor, analyze and evaluate the actions of subordinates, manage a team of performers, including in emergency situations;
- to carry out work on the improvement of production activities, the development of projects and programs for the development of the enterprise (divisions of the enterprise);
- analyze the processes of mining, mining and construction industries and complexes of used equipment as control objects;
- plan and carry out theoretical, experimental and laboratory studies, process the results obtained using modern information technologies;
- to carry out patent search, to study scientific and technical information, domestic and foreign experience on the subject of research;
- to develop models of processes, phenomena, to evaluate the reliability of the

constructed models using modern methods and means of information analysis;

- to carry out a technical and economic assessment of deposits of solid minerals and underground construction facilities, the efficiency of the use of technological equipment;

- perform calculations of technological processes, productivity of technical means of complex mechanization of works, throughput of transport systems of mining enterprises, make schedules of work organization and calendar plans for the development of production;

- substantiate design decisions to ensure industrial and environmental safety, economic efficiency of production facilities for operational exploration, extraction and processing of minerals, during the construction and operation of underground facilities;

- develop the necessary technical documentation as part of creative teams and independently;

- independently draw up projects and passports of mining and drilling and blasting operations;

- to carry out the design of enterprises for the extraction and processing of solid minerals, as well as the construction of underground facilities using modern information technologies.

3 Requirements for evaluating the learning outcomes of an educational program

Persons who have mastered the educational program of doctoral studies and defended a doctoral dissertation, with a positive decision of the dissertation councils of a university with a special status or the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan, according to the results of the examination, are awarded the degree of Doctor of Philosophy (PhD) or doctor in profile and a state-issued diploma with an appendix (transcript). Persons who have received a PhD degree, in order to deepen scientific knowledge, solve scientific and applied problems on a specialized topic, perform a postdoctoral program or conduct scientific research under the guidance of a leading scientist of the chosen university.

Students have direct access to CAT, curricula, syllabuses, which are posted on the university's website, and also have the opportunity to get acquainted with presentations of academic disciplines posted on the university's website and departments (http://portal.kaznitu.kz/?q=ru/node/1442).

The cycle of basic disciplines is the foundation of professional education.

The purpose of the cycle of specialized disciplines is to provide deep theoretical knowledge and practical application of special engineering knowledge.

Requirements for the key competencies of doctoral graduates:

1) have an idea:

- about the main stages of development and paradigm shift in the evolution of science;

- on the subject, ideological and methodological specifics of the natural (social, humanitarian, economic) sciences;
- about scientific schools of the relevant branch of knowledge, their theoretical and practical developments;
- about scientific concepts of world and Kazakh science in the relevant field;
- on the mechanism of implementation of scientific developments in practical activities;
- on the norms of interaction in the scientific community;
- about the pedagogical and scientific ethics of a research scientist.

2) know and understand:

- current trends, trends and patterns of development of Russian science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakh science in the relevant field;
- (to realize and accept) the social responsibility of science and education;
- perfect foreign language for scientific communication and international cooperation.

3) be able to:

- to organize, plan and implement the process of scientific research;
- analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
- analyze and process information from various sources;
- conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;
- generate your own new scientific ideas, communicate your knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
- plan and predict your further professional development.

4) have skills:

- critical analysis, evaluation and comparison of various scientific theories and ideas;
- analytical and experimental scientific activities;
- planning and forecasting of research results;
- public speaking and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- planning, coordination and implementation of scientific research processes;
- a systematic understanding of the field of study and demonstrate the quality and effectiveness of the selected scientific methods;
- participation in scientific events, fundamental scientific domestic and international projects;
- leadership management and team management;
- responsible and creative attitude to scientific and scientific-pedagogical activity;
- conducting patent search and experience in the transfer of scientific

information using modern information and innovative technologies;

- protection of intellectual property rights to scientific discoveries and developments;
- free communication in a foreign language;

5) be competent:

- in the field of scientific and scientific-pedagogical activity in the conditions of rapid updating and growth of information flows;
- in carrying out theoretical and experimental scientific research;
- in the formulation and solution of theoretical and applied problems in scientific research;
- to conduct a professional and comprehensive analysis of problems in the relevant field;
- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in the examination of scientific projects and research;

Requirements for the research of a student under the Doctor of Philosophy (PhD) program:

1) compliance with the main problems of the educational program of the doctoral program on which the doctoral dissertation is being defended;

2) relevant and contains scientific novelty and practical significance;

3) based on modern theoretical, methodological and technological achievements of science and practice;

4) is based on modern methods of data processing and interpretation using computer technology;

5) performed using modern methods of scientific research;

6) contains research (methodological, practical) sections on the main protected provisions.

The practice is conducted in order to form practical skills of scientific, scientific, pedagogical and professional activities.

The educational program of the doctoral program includes:

1) pedagogical and research practice – for students of the PhD program;

2) industrial practice – for students in the program of specialized doctoral studies.

During the period of pedagogical practice, doctoral students, if necessary, are involved in conducting classes in bachelor's and master's degrees.

The doctoral student's research practice is conducted in order to study the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as to consolidate practical skills, apply modern research methods, process and interpret experimental data in dissertation research.

The doctoral student's industrial practice is carried out in order to consolidate the theoretical knowledge gained in the course of training and improve the professional level.

The content of research and production practices is determined by the topic of the doctoral dissertation.

Students complete the internship program, keep diaries, observe the rules of labor regulations at the places of internship, study and follow the rules of TB. At the end of the practice, they provide the head of the practice with a report on the practice, a written diary and defend the report on the practice in due time.

4 Passport of the educational program

4.1 General information

№	Field name	Note
1	Code and classification of the field of education	8D07 – Engineering, manufacturing and construction industries
2	Code and classification of training areas	8D072 – Manufacturing and processing industries
3	Group of educational programs	D116 – Gornoye delo i dobycha poleznykh iskopayemykh
4	Name of the educational program	Mining Engineering
5	Brief description of the tional program	The educational program "Metallurgy and Mineral Processing" includes fundamental, natural science, general engineering and professional training of bachelors in the field of secondary metallurgy and recycling of industrial and industrial waste in accordance with the development of science and technology, as well as the changing needs of the mining and metallurgical industry
6	Purpose of the EP	The purpose of this educational program is to create, on the basis of the integration of education and science, an effective system of training scientific, scientific and pedagogical personnel of a new formation capable of solving issues of improving society, economy, production, science and the development of new technologies and the implementation of the educational process in accordance with the principles of international practice of training highly qualified scientific and pedagogical personnel, competitive in modern the labor market
7	Type of EP	New
8	The level of the NRK	Level 8 – Postgraduate education (programs leading to the academic degree of Doctor of Philosophy (PhD) and doctors in the profile and/or practical experience)
9	ORC Level	Level 8 – Knowledge at the most advanced level in the field of science and professional activity
10	Distinctive features of the EP	No
11	List of competencies of ducational program:	
12	Learning outcomes of the educationalprogram:	
13	Form of training	Full - time full
14	Duration of training	3 years
15	Volume of loans	180
16	Languages of instruction	Kazakh/Russian
17	Academic degree awarded	Doctor of PhD
18	Developer(s) and authors:	Moldabaev S.K.

4.2 Matrix of correlation of learning outcomes in the educational program as a whole with the competencies being formed

Key competencies /Learning outcomes	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
КС1 Professional competencies	X		X	X					X	
КС 2, КС10 Research competencies	X				X	X		X		
КК 3 Basic competencies and knowledge		X			X					X
КК 4 Communication competencies				X		X		X	X	
КК 5 Universal competencies				X				X		
КК 6 Management competencies			X				X			
КК 7 Cognitive competencies	X		X						X	
КК 8 Creative competencies		X								
КК 9 Information and communication competencies	X			X	X				X	

4.3 The relationship between the achievability of the formed learning outcomes according to the educationalprogram 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
Cycle of basic disciplines M-1. Basic training module (university component)													
1	Academic writing	The course is aimed at developing academic writing skills and writing strategies for doctoral students in the field of engineering and natural sciences. The course focuses on the basics and general principles of academic writing for; writing effective sentences and paragraphs; using tenses in scientific literature, as well as styles and punctuation; writing abstracts, introductions, conclusions, discussions, conclusions, literature and resources used; quoting in the text; preventing plagiarism, and making presentations at a conference	5		X	X	X	X	X		X		
2	Research methods	The concept of science and scientific research, methods and methodology of scientific research, methods of collecting and processing scientific data, principles of organizing scientific research, methodological features of modern science, ways of developing science and scientific research, the role of technical sciences, informatics and engineering research in modern science, the structure of technical sciences, the use of general scientific, philosophical and special methods scientific research in theory and practice	5		X	X	X	X	X				X
Component of choice													
3	Geotechnical support for the development of underground space	The course is aimed at solving the problems of developing underground space on the basis of world experience in their integrated use, modern methods of sinking underground mine workings, taking into account the requirements for the safety of the mined-out space of mines and mines and for environmental facilities	5	X	X	X	X	X	X	X	X		X
4	Managing the spatial position of the contours of deep quarries	The course is aimed at mastering the skills of establishing the optimal spatial position of the final and current contours of a quarry on digital models of deposits using integrated mining and geological information systems based on the developed methods: nonlinear in justifying the design parameters of the pit walls, Bellman optimal control in dynamic programming for uniform distribution of the ore body along the perimeter of the open pit	5		X	X	X	X	X	X	X	X	X

5	The development of the theory and design methods of drilling and blasting operations in the development of mineral deposits	The course is aimed at studying modern approaches to the theory of explosion action in the destruction of heterogeneous rock masses and developing on its basis effective methods for designing drilling and blasting operations in open and underground mining of mineral deposits that provide the required degree of crushing with minimization of oversized output	5			X	X	X		X	X	X	X
Cycle of profile disciplines M-2. Profile training module (optional component)													
6	Geotechnical support for the development of underground space	The course is aimed at solving the problems of developing underground space on the basis of world experience in their integrated use, modern methods of sinking underground mine workings, taking into account the requirements for the safety of the mined-out space of mines and mines and for environmental facilities	5	X	X	X	X	X		X	X	X	X
7	Scientific support of technical solutions for underground mining processes	Problems, prospects of development of the mining industry and scientific support of new technological solutions in the processes of underground mining of ore and non-metallic minerals	5		X	X	X	X	X	X	X	X	X
8	Automated design and production of mass explosions in open pits	The course is aimed at mastering software modules for automated design and production of mass explosions in open pits. The set of software modules "Graunulometric composition of natural fragments in a rock mass", "Dimensions of zones of intensive crushing of rocks", "Rational parameters for the location of charges in a ledge", "Graunulometric composition of the blasted rock mass", "Participation of heterogeneous rocks in the collapse" is an information and experimental a platform for controlling the process of destruction of rocks by the action of an explosion in quarries	5	X		X		X		X	X	X	
9	Physico-chemical geotechnology	The course is aimed at studying physical and chemical geotechnology as a science that consistently reveals the stages of its formation, various methods for processing certain natural resources in the bowels of the Earth, and physical and geological factors that determine the efficiency of mining a deposit in an innovative way	5			X	X	X	X		X		
10	Designing the combined development of mineral deposits	The course is aimed at mastering design skills during the transition from open to underground mining of mineral deposits, in particular, establishing the parameters of an open-underground layer, which determines the effectiveness of a safe transition to an underground method with the construction of underground workings. At the same time, the geomechanical substantiation of the maximum height of the open-underground layer and the thickness of the pillar left between the open and underground workings serve as the basis for the expedient use of the combined method of developing deep deposits	5	X	X	X			X	X	X	X	X
11	Scientific substantiation of	The course is aimed at familiarization with special methods of	5		X	X	X	X	X	X	X	X	X

	the construction of special underground structures	construction of underground structures in difficult mining and geological conditions, including special methods of production and organization of mining operations and technical support for their safe implementation, numerical volumetric modeling of the stress-strain state of a rock mass near a mine working, taking into account the presence of tectonic faults , karst cavities, watering and strong fracturing.											

4.4 Information about modules/disciplines

№	Name of the discipline	Brief description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)
Cycle of general education disciplines University component				
1	Academic writing	The course is aimed at developing academic writing skills and writing strategies for doctoral students in the field of engineering and natural sciences. The course focuses on the basics and general principles of academic writing for; writing effective sentences and paragraphs; using tenses in scientific literature, as well as styles and punctuation; writing abstracts, introductions, conclusions, discussions, conclusions, literature and resources used; quoting in the text; preventing plagiarism, and making presentations at a conference	5	KK3, KK7, KK9
2	Research methods	The concept of science and scientific research, methods and methodology of scientific research, methods of collecting and processing scientific data, principles of organizing scientific research, methodological features of modern science, ways of developing science and scientific research, the role of technical sciences, informatics and engineering research in modern science, the structure of technical sciences, the use of general scientific, philosophical and special methods scientific research in theory and practice	5	KK3, KK7, KK9
3	Geotechnical support for the development of underground space	The course is aimed at solving the problems of developing underground space on the basis of world experience in their integrated use, modern methods of sinking underground mine workings, taking into account the requirements for the safety of the mined-out space of mines and mines and for environmental facilities	5	KK3, KK7, KK9
4	Managing the spatial position of the contours of deep quarries	The course is aimed at mastering the skills of establishing the optimal spatial position of the final and current contours of a quarry on digital models of deposits using integrated mining and geological information systems based on the developed methods: nonlinear in justifying the design parameters of the pit walls, Bellman optimal control in dynamic programming for uniform distribution of the ore body along the perimeter of the open pit	5	KK4, KK5
5	The development of the theory and design methods of drilling and blasting operations in the development of mineral deposits	The course is aimed at studying modern approaches to the theory of explosion action in the destruction of heterogeneous rock masses and developing on its basis effective methods for designing drilling and blasting operations in open and underground mining of mineral deposits that provide the required degree of crushing with minimization of oversized output	5	KK3, KK7, KK8, KK9
Cycle of profile disciplines				

M-2. Profile training module (optional component)				
6	Geotechnical support for the development of underground space	The course is aimed at solving the problems of developing underground space on the basis of world experience in their integrated use, modern methods of sinking underground mine workings, taking into account the requirements for the safety of the mined-out space of mines and mines and for environmental facilities	5	KK4, KK5
7	Scientific support of technical solutions for underground mining processes	Problems, prospects of development of the mining industry and scientific support of new technological solutions in the processes of underground mining of ore and non-metallic minerals	5	KK4, KK5
8	Automated design and production of mass explosions in open pits	The course is aimed at mastering software modules for automated design and production of mass explosions in open pits. The set of software modules "Graunulometric composition of natural fragments in a rock mass", "Dimensions of zones of intensive crushing of rocks", "Rational parameters for the location of charges in a ledge", "Graunulometric composition of the blasted rock mass", "Participation of heterogeneous rocks in the collapse" is an information and experimental a platform for controlling the process of destruction of rocks by the action of an explosion in quarries	5	KK1, KK3, KK8, KK9
9	Physico-chemical geotechnology	The course is aimed at studying physical and chemical geotechnology as a science that consistently reveals the stages of its formation, various methods for processing certain natural resources in the bowels of the Earth, and physical and geological factors that determine the efficiency of mining a deposit in an innovative way	5	KK1, KK3, KK8, KK9
10	Designing the combined development of mineral deposits	The course is aimed at mastering design skills during the transition from open to underground mining of mineral deposits, in particular, establishing the parameters of an open-underground layer, which determines the effectiveness of a safe transition to an underground method with the construction of underground workings. At the same time, the geomechanical substantiation of the maximum height of the open-underground layer and the thickness of the pillar left between the open and underground workings serve as the basis for the expedient use of the combined method of developing deep deposits	5	KK1, KK3, KK8, KK9
11	Scientific substantiation of the construction of special underground structures	The course is aimed at familiarization with special methods of construction of underground structures in difficult mining and geological conditions, including special methods of production and organization of mining operations and technical support for their safe implementation, numerical volumetric modeling of the stress-strain state of a rock mass near a mine working, taking into account the presence of tectonic faults , karst cavities, watering and strong fracturing	5	KK1, KK3, KK8, KK9

5 Curriculum of the educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board
Rector of Rektor named after K.Satpayev
M.Zh. Begentaev
«29» 09 2022 y.

CURRICULUM
of Educational Program on enrollment for 2022-2023 academic year

Educational program 8D07203 - "Mining Engineering"
Group of educational programs D116 - "Mining Engineering"

Form of study: full-time **Duration of study: 3 year** **Academic degree: Doctor PhD**

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters					
								I course		2 course			
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester
CYCLE OF BASIC DISCIPLINES (BD)													
M-1. Module of basic training (university component)													
MET322	Scientific research methods	BD UC	5	150	2/0/1	105	E	5					
LNG305	Academic writing	BD UC	5	150	0/0/3	105	E	5					
Component of choice													
MIN313	Innovative technologies for the extraction of uranium by in-situ leaching	BD CCH	5	150	2/0/1	105	E	5					
MIN324	Management of the spatial position of the contours of deep quarries												
MIN311	The development of the theory and design methods of drilling and blasting operations in the development of mineral deposits												
CYCLE OF PROFILE DISCIPLINES (PD)													
M-2. Module of professional activity (component of choice)													
MIN313	Geotechnical support for the development of underground space	PD, CCH	5	150	2/0/1	105	E	5					
MIN315	Scientific support of technical solutions for underground mining processes												
MIN316	Automated design and production of mass explosions in open pits												
MIN317	Physico-chemical geotechnology	PD, CCH	5	150	2/0/1	105	E	5					
MIN320	Designing the combined development of mineral deposits												
MIN319	Scientific substantiation of the construction of special underground structures												
M-3. Practice-oriented module													
AAP350	Pedagogical practice	BD UC	10						10				
AAP355	Research practice	PD UC	10							10			
M-4. Experimental research module													
AAP336	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	5					5					
AAP347	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	40						20	20			
AAP356	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	60								30	30	
AAP348	Research work of a doctoral candidate, including internships and completion of a doctoral dissertation	RWDS UC	18										18
M-5. Module of final attestation													
ECA303	Writing and defending a doctoral dissertation	FA	12										12
	Total based on UNIVERSITY:							30	30	30	30	30	30
								60		60		60	

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
			university component (UC)	component of choice (CCH)	Total
BD	Cycle of basic disciplines		20	5	25
PD	Cycle of profile disciplines		10	10	20
	Total for theoretical training:	*0*	*30*	*15*	*45*
	RWDS				*123*
FA	Final attestation	12			12
	TOTAL:	**12**	**30**	**15**	**180**

Decision of the Academic Council of Kaznu named after K.Satpayev. Protocol № 13 от "28" 04 2022 y.

Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № 7 от "26" 04 2022 y.

Decision of the Academic Council of the Mining and Metallurgical Institute. Protocol № 5 от "20" 12 2021 y.

Vice-Rector for Academic Affairs _____ **B. Zhautikov**

Director of the Institute of Mining and Metallurgical _____ **K. Rysbekov**

Head of the Department "Mining" _____ **S. Moldabayev**

Council representative from employers _____ **B. Bakhramov**

6 Brief descriptions of the disciplines

Scientific research methods
CODE – MET322
КРЕДИТ – 5 (2/0/1)

PURPOSE AND TASKS OF THE COURSE

The purpose of the discipline is to develop doctoral students' skills and abilities in the field of methodology of scientific knowledge. The objectives of studying this discipline are: - Mastering the methodological foundations of scientific knowledge and creativity; - Gaining knowledge in the field of similarity and modeling of physical processes, computational experiment; - mastering the technique of setting up an optimal experiment and processing measurement results.

BRIEF DESCRIPTION OF THE COURSE

The concept of methodology as a system of principles and methods of organization, construction of theoretical and practical activities. The concept of "activity". Structural components of activity. Scientific foundations of the methodology of science. Scientific knowledge and scientific research. Science as a social institution. General laws of the development of science. The structure of scientific knowledge. Scientific profiles and their relationship with extra-scientific professional (including teaching) activities. Opportunities for changing the scientific profile of a professional activities. Criteria for the scientific character of knowledge. Classification of scientific knowledge. Theoretical and empirical research, their relationship. Fundamental and applied research. Forms of organization of scientific knowledge.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

doctoral student should know:

- features of the choice of the direction of scientific research and the stages of its implementation;
- tasks and methods of theoretical research;
- classification, types and objectives of experimental research; - information support of scientific research;

A doctoral student must be able to:

- to analyze the trends of modern science, to determine the promising directions of scientific research in the subject area of professional activity, the composition of research papers, which determine their factors;
- to use experimental and theoretical research methods in professional activities;
- to adapt modern achievements of science and science-intensive technologies to the educational and self-educational process;
- work with natural science literature of different levels (popular science publications, periodicals), including in foreign languages.

must own:

- modern methods of scientific research in the subject area;
- ways of comprehending and critical analysis of scientific information; - skills

to improve and develop their scientific potential.

Academic writing
CODE – LNG305
CREDIT – 5 (0/0/3)

PURPOSE AND TASKS OF THE COURSE

The aim of the course "Academic writing" is the formation of professional competence and the expansion of communicative competence associated with analytical textual activity; the formation of students' skills of linguistic and pragmatic thinking, the ability to analyze expressive units of the language and competently select the desired unit, depending on the goals and conditions of communication. The aim of the course is to improve the ability to write scientific articles for subsequent publication in international scientific journals.

The objective of the course is to acquaint with the peculiarities of academic genres (annotations, abstract, analytical review, as well as messages about a scientific event (conference)); define the main goals of analytical word processing; teach to analyze texts on professional topics.

BRIEF DESCRIPTION OF THE COURSE

The Academic Writing course teaches effective academic writing using practical examples and exercises. Academic writing skills are required for academic staff and university students for publications in foreign scientific journals, participation in international scientific conferences, master's or doctoral studies at a foreign university within the framework of academic mobility programs.

KNOWLEDGE, ABILITY, SKILLS TO COMPLETE THE COURSE

The doctoral student should know:

- the goals and objectives of analytical processing of texts in the modern information space;
- genre and stylistic characteristics of annotation, abstract, analytical review, scientific communication;
- the principles of the communicative organization of annotation and abstract;
- rules for writing reviews; be able to:
- conduct a stylistic analysis of scientific, scientific and technical and popular science texts,
- to determine the stylistic and genre affiliation of the text in the sphere of professional information;
- highlight the style-forming elements of texts,
- carry out a semantic analysis of the text and highlight its keywords;
- determine the means of speech expression;
- transfer the content of texts in the form of annotations, abstracts, reviews; own:
- methods of semantic analysis of the text;
- the method of communicative analysis of the text; - genres of annotation and abstract.

Development of the theory and methods of design of drilling and blasting operations in the development of mineral deposits

CODES-MIN 311
CREDIT – 5 (2/0/1)
PREREQUISITES

COURSE GOALS AND OBJECTIVES

The purpose of the course is to train highly qualified specialists in the field of mining and metallurgical production. The purpose of the course is to study innovative methods of conducting drilling and blasting operations in the extraction of minerals.

BRIEF DESCRIPTION OF THE COURSE

Modern technology of drilling operations. The range of industrial explosives used in Kazakhstan and abroad. Study of factors affecting the quality of explosives (industrial AND manufactured at mining enterprises). Chemistry of explosives; Physical bases of deformation and destruction of solids; Physical modeling of fast-flowing processes; Modern methods of initiating industrial EXPLOSIVES. Technologies of blasting operations in open-pit mining; Design and manufacture of drilling and blasting in the mining of useful iskopaemykh underground method; Shooting-blasting in the oil and gas industry; Synergy mining processes of drilling and blasting. Resource-saving technologies for drilling and blasting operations. Modeling and design of explosive technologies on a computer. Environmental aspects of drilling and blasting operations.

KNOWLEDGE AND SKILLS AT THE END OF THE COURSE

The process of studying the discipline is aimed at developing the following competencies:

- as a result of mastering the course, doctoral students have knowledge in the field of mining and blasting, development and implementation of measures to ensure industrial and environmental safety of mining, development and quality control of drilling and blasting projects, development, approval and approval of documents regulating the procedure for performing mining and blasting operations;

Ability to control the quality of blasting operations and ensure that they are performed correctly by performers; draw up drilling and blasting projects, work schedules and long-term plans, instructions, estimates, requests for materials and equipment, fill out the necessary accounting documents in accordance with the established forms.

The doctoral student should know: modern technologies of drilling operations, the range of industrial explosives, innovative methods of conducting drilling and blasting operations in the extraction of minerals.

The doctoral student should be able to: choose rational methods of conducting drilling and blasting operations in specific mining and geological conditions, apply optimization of development parameters and completeness of extraction of minerals from the subsurface, draw up technical documentation for conducting drilling and blasting operations.

The doctoral student must know: the method of strategic planning for the development of blasting operations at mining enterprises using modern software products.

Methodology of scientific research in open Geotechnology
CODE-MIN 312
CREDIT – (2/0/1)
PREREQUISITE

COURSE GOALS AND OBJECTIVES

Training of specialists for planning research work, including theoretical, experimental and industrial methods of achieving knowledge.

The objective of the discipline is to study the subject, content and structure of mining science; the specifics of research in mining; methodological foundations for evaluating research results and methods for performing theoretical and experimental research.

BRIEF DESCRIPTION OF THE COURSE

Fundamentals of mining science and mining. Classification of science and their interaction. History of mining and mining science. Subject and content of mining science and its structure. Post-industrial future and mining science. Methods for achieving knowledge. Classification of research. The specificity of the research in mining. Experiment. Experimental and industrial work. Methodological foundations of economic assessment.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

After completing the course, the doctoral student will master the methods of achieving theoretical knowledge; methods of conducting experiments and experimental-industrial work; skills of preparing a research plan and forming scientific statements submitted for defense.

The doctoral student should know: the subject, content and structure of mining science, methods for achieving new knowledge, the theoretical basis for planning and conducting theoretical and experimental research.

A doctoral student should be able to: draw up a research plan based on theoretical knowledge, justify the number of necessary experiments, make an expert assessment of the effectiveness of the results obtained, formulate the goal, objectives, scientific novelty and scientific provisions of scientific research, and predict the desired result.

Geotechnical support of underground space development
CODE – 313 MIN
CREDIT – (2/0/1)
PREREQUISITE –

PURPOSE AND PURPOSE OF THE COURSE

The purpose of the discipline is to study the scientific and practical foundations of integrated and effective development of underground space based on the analysis

and evaluation of fundamental technical solutions from the point of view of their innovation. The main task of studying the discipline is to master the methods of designing the construction of underground structures for various purposes and their calculation with a wide use of software products, in relation to specific operating conditions.

BRIEF DESCRIPTION OF THE COURSE

Problems, directions and ways to solve the problems of developing the underground space of megacities. World experience in integrated use of underground space. Modern methods of construction of vertical shafts. Requirements for the safety of the developed space of mines and mines. Mining companies. Underground industrial enterprises. Underground utilities. Underground transport structures. Underground environmental objects. Systematization of underground structures by main features. Modern methods of construction of large cross-section workings. Technology and construction of underground metro facilities. Technology and organization of construction of distillation tunnels using mining boards. Technological schemes for the construction of metro stations. Construction of underground structures in an open way. Technology of construction of underground passages using push-through installations and micro-panels. Technology of construction of collector tunnels technology of construction of transport interchanges, technology of construction of underground garages and other large-section workings.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Student's competencies formed as a result of mastering the discipline:

- use of normative legal and instructional documents in their activities; Awareness of the social significance of their future profession, the presence of high motivation to perform professional activities;

- readiness to make a technical and economic assessment of construction conditions, investments; to choose space-planning solutions and basic parameters of engineering structures of underground facilities, to calculate their strength, stability and deformability; to choose materials for engineering structures of underground and mining buildings, and structures on the surface;

- ability to develop technological schemes and construction schedule, choose methods, equipment and technology of mining and construction works, focusing on innovative developments.

As a result of mastering the discipline, the student must:

The doctoral student should know: the characteristics of the exploitation of mineral resources and key technologies of construction of underground structures for various purposes; problems of complex development of mineral resources; the functions of the geological environment; scientific and engineering basis of the choice of technologies for mining and construction works and labour protection during the construction of underground structures; legal framework for the activities of mining manufactures and objects; design features at the complex system of preparation of project documentation of objects of the mining and use of underground space; requirements for the safety of the developed space of mines and mines.

The doctoral student should be able to: draw up and execute scientific, technical and service documentation; assess risks and determine measures to ensure the safety of technological processes in mining; apply the principles of rational use of natural resources and environmental protection in practice; organize the work of production units in the field of underground construction; draw up standard design, technological and working documents to ensure the rational use of underground space.

Innovative technologies for mining uranium by underground well leaching

CODE – 314 MIN

CREDIT – (2/0/1)

PREREQUISITE

COURSE GOALS AND OBJECTIVES

The purpose of the course is to train specialists for production and research activities in the field of uranium mining by underground well leaching.

The aim of the course is to study modern, innovative technologies of underground borehole leaching of uranium.

BRIEF DESCRIPTION OF THE COURSE

Characteristics of minerals suitable for mining uranium by underground borehole leaching, problems with underground borehole leaching of uranium, geotechnological processes, modern methods of activating working solutions, innovative ways to eliminate colmatation and increase the inter-repair cycle of geotechnological wells, composition of solutions, equipment of the geotechnological field, reagents used in geotechnological methods of development, protection of the subsurface.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Get the skills and abilities to open, extract and process uranium using geotechnological methods.

Scientific support of technical solutions in underground mining processes

CODE – 315 MIN

CREDIT – (2/0/1)

PREREQUISITE-

GOALS AND OBJECTIVES

The purpose of the course is to train specialists to scientifically substantiate new technical solutions in underground mining processes

The purpose of the course is to provide scientific support for new methods, methods, and technologies for underground mining.

BRIEF DESCRIPTION OF THE COURSE

Problems, prospects of development of the mining industry and scientific support of new technological solutions in the processes of underground mining of ore and non-metallic minerals

KNOWLEDGE, SKILLS AT the end of the COURSE

As a result of mastering the course, doctoral students should know the ways of scientific support of new methods, methods, and technologies for underground mining. Get the skills and knowledge of scientific support of new methods, methods, and technologies for underground mining.

Computer-aided design and production of mass explosions at quarries
CODE-MIN 316
CREDIT – 5 (2/0/1)
PREREQUISITE –

COURSE GOALS AND OBJECTIVES

The GOAL is to teach doctoral students to improve the efficiency of blasting operations in quarries by upgrading their technologies using innovative methods for determining the location of explosive charges (EXPLOSIVES)in the rock mass.

The task of the discipline is to study innovative methods for determining the parameters of the location of EXPLOSIVE charges in a rock mass at a given well diameter. Establishing dependencies of the resistance line along the bottom of the ledge, the distance between wells, the length of the charge above the level of the ledge sole, the length of the uncharged part of the well, the length of the drill, the length of the charge in the well.

BRIEF DESCRIPTION OF THE COURSE

Composition and content of project documentation for blasting operations. The trend of development of explosive technologies with the deepening of mining operations. Characteristics of rock mass explosivity. Limit radius of the cavity during the explosion of a cylindrical EXPLOSIVE charge. Analytical determination of the geometric dimensions of the camber. Models of the collapse of rocks on the ledges in various technologies of explosive works. Designing parameters for the location of charges in the array. Designing the results of a mass explosion.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

After completing the course, the doctoral student will master methods for achieving theoretical knowledge; innovative methods for determining the parameters of the location of EXPLOSIVE charges in the rock mass at a given well diameter.

The doctoral student should know: creating a scientific basis for choosing effective blasting technologies that provide the required lumpiness of blasted rocks, their compact placement in the collapse, which increases the productivity of excavation and loading and transport equipment and ensures the competitiveness of quarry products.

The doctoral student should be able to: Determine the maximum relative radius of the explosive cavity in rocks; Perform appropriate calculations to determine the maximum relative radius of the cavity. Determine the parameters of the location of EXPLOSIVE charges in the rock mass for a given well diameter. To substantiate the principles of innovative methods for determining the parameters of the location of EXPLOSIVE charges in the rock mass. Determine the granulometric composition of the blasted rock mass during single-row blasting.

Physical and chemical Geotechnology
CODE – 317 MIN
CREDIT – 5 (2/0/1)
PREREQUISITES - COURSE

GOALS AND OBJECTIVES

The purpose and task of studying the discipline is the development of doctoral students ' knowledge on the basics of physics and chemical geotechnologies used in the complex use of underground space for the placement of objects of various functional purposes and the development of solid minerals. Instilling the skills of engineering calculations necessary for choosing the conditions, means and method of development of a solid mineral Deposit, as well as the construction of other mining structures using physical and chemical methods of Geotechnology in close connection with environmental protection.

BRIEF DESCRIPTION OF THE COURSE

The role of physical and chemical Geotechnology in the integrated use of underground space for placing objects of various functional purposes. Physical and chemical Geotechnology as a science. Definition of FHG as a science that studies the conditions, means and methods of developing solid minerals, as well as creating voids for their further use for the construction of underground structures. Current state of FHG. Stages of formation of physico-chemical methods of investigation (FHMG) and the current state FKHG. Objects of industrial development. Physical and chemical methods of Geotechnology and their classification. The essence of FHG methods. Physical, chemical and combined methods of FCH. Basic concepts and definitions. The main directions of FHG development. Cardinal tasks of the FHG. Establishment of optimal operation algorithms, management of processes and their complexes. The environment of the mountains, rocks, minerals and their properties. State of the mountain range. Hydraulic properties of the massif mining production. Physical and geological factors that determine the effectiveness of the mine FHMG. Chemical and mineralogical composition of deposits and host rocks. Mechanical properties of the Deposit and host rocks. Chemical composition, density and viscosity of underground water, etc. Requirements of FHG methods for the physical and geological environment. Requirements for the mining and geological conditions of the massif. Geological-hydrogeological work for the company, working FHMG. The main purpose of geological and hydrogeological services. Techniques geological service FHMG. Preparation of hydrogeological documents. Conditions for the construction of underground reservoirs in rock salt. Basic concepts and definitions. Space-planning conditions for placing underground reservoirs. Basic space-planning schemes for placing tanks. Defining the parameters of workings. Geological conditions for creating underground storage facilities in rock salt. Promising areas for the construction of underground reservoirs for the storage of gaseous and liquid products, and the disposal of industrial waste. Technology of construction of underground reservoirs. Theory and practice of creating underground workings-tanks in rock salt. The construction of the underground storage with the use of camouflet explosions. The essence of the

method. Requirements for engineering and geological conditions. Drilling and blasting operations. Stability and fixing of underground workings-tanks for concrete splashes. Economic and social aspects of FHG methods. Protection of the earth's surface, air and water resources. Social significance of geotechnological methods.

KNOWLEDGE, SKILL, AND SKILLS AT THE END OF THE COURSE

The process of studying the discipline is aimed at developing the following competencies:

- the concept of FHG as a science that studies the conditions, means and methods of developing solid minerals, as well as creating voids for their further use for the construction of underground structures;

- readiness to use physical, chemical and combined methods of Geotechnology (fhmg) in the development of mineral deposits and construction of underground structures for various functional purposes.

As a result of studying the discipline, the doctoral student should know:

- history of creation of underground and buried objects for various purposes by methods of physical and chemical Geotechnology; design features and experience in the production of works; space-planning solutions and structures of objects for various purposes under construction by the FHG method; environmental problems of integrated use of FHG.

The doctoral student should be able to: navigate the main directions of integrated development of underground space by the FHG method.

Managing the spatial position of deep pit contours

CODE-MIN 318

CREDIT – 5 (2/0/1)

PREREQUISITE –

COURSE GOALS AND OBJECTIVES

Training of specialists for research and design work in the field of open-pit mining of ore and coal deposits.

The objective of the discipline is to study methods for managing the optimization of the spatial position of deep pit contours in order to select the most optimal and safe parameters of current Board structures that ensure stable extraction of minerals of the required quality with high-performance use of mining equipment and minimal costs.

BRIEF DESCRIPTION OF THE COURSE

Management of the spatial position of the contours of deep pits as a further development of a promising major scientific direction - management of the development of mining operations. The management of mining development has been enriched with ideas about the procedure for developing deposits in areas with different intensity, with a combination of different methods of development, equipment and technologies, as well as with the purposeful formation and use of the developed quarry space as a man-made resource. All this requires the development of methods for evaluating and optimizing the order of field development. In the far abroad, the algorithm for optimizing the current spatial position of the pit contours

was tested with maximizing the NetPresentValue indicator for mining projects (in comparison with traditional mining planning, the proposed dynamic optimization method will reduce the dependence of the NetPresentValue indicator on the overburden coefficient due to multi-stage stabilization of the excavation rate). Kazakhstan has developed a technology for high-rhythm mining operations on steep sides with safe high-performance use of excavator-automobile complexes).

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

After completing the course, the doctoral student will master the knowledge to establish safe optimal parameters of the quarry and indicators of development of the mining transport system.

The doctoral student should know: methods for optimizing design solutions for periods and stages of open development of mineral deposits for the subsequent implementation of highly rhythmic mining operations.

The doctoral student should be able to: define pitwall stability, and substantiate the main parameters of the quarry, to establish the optimal direction uglubki and determine its speed at different number of used excavators, to perform mining-geometrical analysis of career fields and transforming it results in the optimal schedule of mining operations, to prepare financial and economic model of the quarry and to assess the required investments.

Scientific justification for the construction of special underground structures

CODE-MIN 319

CREDIT – 5 (2/0/1)

PREREQUISITE –

COURSE GOALS AND OBJECTIVES

The purpose of studying the discipline is to train highly qualified graduates who are able to organize the work of a team of performers, plan the design and construction of special underground structures in complex mining, geological and hydrogeological conditions, make independent technical decisions; conduct geotechnical surveys and scientific research for the design of buildings and underground structures, drawing up their plans; organize the process of construction of underground structures and structures using special technologies and modern equipment; conduct a feasibility study for the construction of underground structures and structures.

The main objectives of the discipline are: - study of special methods of construction of underground structures in complex mining and geological conditions; - mastering the methods, methods of production and organization of mining operations in complex mining and geological conditions; formation of skills of practical management of the process of construction of underground structures by special methods.

BRIEF DESCRIPTION OF THE COURSE

Generalities. Classification of special methods. Plugging of watered rocks in underground construction. General requirements for grouting solutions.

Strengthening of soils and rocks physical-chemical methods: cementation, bituminaria, silicification, solitary etc.Equipment for preparation and injection of grouting solutions. Design of grouting works. Organization of grouting operations when sinking a mine shaft. Construction of underground structures under compressed air. Construction of mine workings using water reduction. Construction of underground structures using the "Wall in the ground" method. Special methods for sinking the mouths of trunks in unstable rocks. Construction of mines with use of the freezing rocks. Calculations of stability and strength of ice-ground fences. Brine network and hydraulic calculations of the brine network. Scientific and technical basis of the method of freezing rocks. Sinking of horizontal and inclined mine workings by special methods.

KNOWLEDGE SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline

The doctoral student should know: - ways of development and improvement of special methods of construction of underground structures; the essence of each method and the possibility of its application; technology and sequence of work in one or another special way for the construction of vertical, horizontal and inclined mine workings in various mining and geological conditions; regulatory documents and technical documentation that is used in production.

The doctoral student must be able to: - independently choose and justify the method of construction of underground structures using special methods, taking into account specific mining and geological and hydrogeological conditions; independently calculate the main parameters, select the necessary materials and equipment for performing work in this way; develop projects for the construction of underground structures in a special way; manage the implementation of a special method in production; improve the technology of performing these works; work with basic legal and regulatory documents; metrological rules, norms, normative and technical documents on standardization and quality management of construction; comply with environmental requirements during construction and improve labor safety conditions for employees.

Design of combined development of mineral deposits

CODE-MIN 320

CREDIT – 5 (2/0/1)

PREREQUISITE-

GOALS AND OBJECTIVES

The purpose of the course is to teach the future specialist the design features of combined development of mineral deposits

The goal of the course is to master the features of development and design in the combined development of mineral deposits

BRIEF description of the COURSE

Scientific basis for the design of opening and preparation, the main processes of clearing excavation in the combined development of ore deposits, software products for design.

KNOWLEDGE, SKILLS, SKILLS AT the end of the COURSE

As a result of mastering the course, doctoral students should master knowledge about the features of combining open and underground methods of field development in space and time, the design of opening and preparation, the main processes of treatment excavation in the combined development of ore deposits, software products for design, technical, economic, environmental and organizational relationships of technological processes in mining.

Teaching practice

CODE - AAP350

Credit-10

PURPOSE AND OBJECTIVES OF THE COURSE

The purpose of pedagogical practice: formation and development of professional skills of a doctoral student as a teacher of Higher education; mastering the basics of pedagogical skills, skills and abilities of independent conduct of educational work.

Doctoral students as future teachers of Higher education should be guided in the problems of organizing educational work, searching for new innovative approaches to teaching and educating students in the conditions of institutions of higher professional education in accordance with the trends and directions of development of modern education.

Tasks of pedagogical practice:

- to form a clear understanding of the planning of the content of the educational process of the Department;;
- improvement of analytical and professional activity of teachers;
- improve the skills of conducting training sessions with students;
- improve the skills of developing educational and methodological literature;
- to form an adequate self-assessment, responsibility for the results of their work.

BRIEF DESCRIPTION OF THE COURSE

Pedagogical practice of doctoral students is a practical training of future teachers, conducted in conditions as close as possible to the professional activity of a teacher. In the process of teaching practice, the professional and personal development of future teachers is activated. During the practice, doctoral students make and implement a plan of educational activities with a group of students, develop and conduct a system of classes that reflect the completed segment of the educational process based on the content of specialized disciplines, demonstrate their knowledge of modern technologies and teaching methods.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

To perform the program of pedagogical practice, the doctoral student must have knowledge in the field of pedagogy and technology of vocational training, psychology of adult education.

Pedagogical practice equips doctoral students with the necessary experience of professional and pedagogical activity and involves mastering the following

professional and pedagogical skills:

- navigate the organizational structure and regulatory documentation of the vocational education institution;
- to be guided in the theoretical foundations of the science of the subject being studied;
- didactically transform the results of modern scientific research in order to use them in the educational process;
- independently design, implement, evaluate and adjust the educational process;;
- use modern innovations in the process of professional training;
- master the methods of self-organization of activity and improvement of the teacher's personality;
- build relationships with colleagues, find, make and implement management decisions in their scientific and pedagogical practice;
- master the conduct of various types of classes with students in a given academic discipline;
- master the culture of speech and communication.

Research work of a doctoral student including passing an internship and completing a doctoral dissertation

CODE - AAP345

CREDIT – 24

PURPOSE AND OBJECTIVES OF THE COURSE

The objectives of the research internship are:

- formation of professional and research competencies that contribute to the qualified conduct of scientific research within the chosen topic of the dissertation research;
- study of the latest theoretical, methodological and technological achievements of domestic and foreign science;
- consolidation of practical skills and application of modern methods of scientific research, analysis, processing and interpretation of experimental data in the dissertation research.

The main task of the research practice is the acquisition of doctoral students ' experience in conducting research and mastering such skills as:

- identification and formulation of current scientific problems;
- development of research and development programs, organization of their implementation;
- development of research methods and tools and analysis of their results;
- development of organizational and managerial models of processes, phenomena and objects, evaluation and interpretation of results;
- search, collection, processing, analysis and systematization of information on the research topic;
- practical participation in the research work of research teams;
- preparation of scientific reviews, reports, publications.

BRIEF DESCRIPTION OF THE COURSE

Research practice is a mandatory component of the doctoral program and is a type of practical activity related to the conduct of scientific research within the chosen topic of dissertation research, the preparation of scientific publications and the analytical part of the dissertation work.

Research practice of doctoral students is aimed at deepening and systematization of theoretical and methodological training of doctoral students, as well as at the formation and development of research competencies necessary for the analysis of modern scientific achievements, the use of research methods in solving practical scientific problems.

KNOWLEDGE, SKILLS AND ABILITIES AT THE END OF THE COURSE

To prepare for a scientific study, a doctoral student should study:

- methods of research and experimental work;
- rules of operation of research equipment;
- methods of analysis and processing of experimental data;
- physical and mathematical models of processes and phenomena related to the object under study;
- information technologies in scientific research, software products related to the professional sphere;
- requirements for the design of scientific and technical documentation;
- the procedure for implementing the results of scientific research and development.

At the same stage, the doctoral student develops a methodology for conducting the experiment.

Conducting an experimental study.

At this stage, the doctoral student assembles an experimental setup, installs the necessary equipment, develops a computer program, and conducts an experimental study.

Processing and analysis of the results obtained.

At this stage, the doctoral student conducts statistical processing of experimental data, draws conclusions about their reliability, analyzes them, and checks the adequacy of the mathematical model.

Innovative activity.

The doctoral student analyzes the possibility of implementing the research results, using them to develop a new or improved product or technology. Prepares an application for a patent, for participation in the competition of scientific works, an article for publication.

Defense of the doctoral dissertation

CODE-ECA 303

CREDIT -12

The purpose of the doctoral dissertation is to assess the scientific-theoretical and research-analytical level of the doctoral student, formed professional and managerial competencies, readiness to independently perform professional tasks and

compliance of his training with the requirements of the professional standard and the educational program of the doctoral program.

BRIEF DESCRIPTION

Doctoral thesis - scientific work of doctoral candidate, which is an independent study which developed the theoretical principles, the totality of which can be qualified as a new scientific breakthrough, or solved a scientific problem, or set forth scientifically grounded technological, economic or technological solutions, implementation of which makes a significant contribution to the economic development of the country.

Doctoral dissertation-the result of research experimental research work of a doctoral student, conducted during the entire period of study of the doctoral student.

The defense of a doctoral dissertation is the final stage of master's training. The master's thesis must meet the following requirements –

- the topic of the dissertation must be related to priority areas of scientific development and / or state programs or programs of fundamental or applied research.

- the content of the dissertation, the goals and objectives set, and the scientific results obtained must strictly correspond to the topic of the dissertation.

- the dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.