



Institute of Geology and Oil-Gas Business named after K. Turyssov
Department "Geological survey, prospecting and exploration of mineral deposits"

EDUCATIONAL PROGRAM
**8D07216 - "Geology and exploration of solid mineral
deposits"**

Code and classification of the field of education: 8D07 Engineering,
manufacturing and construction branches

Code and classification of training directions: 8D072 Industrial and
manufacturing branches

Group of educational programs: D121 Geology

Level based on NQF: 8

Level based on IQF: 8

Study period: 3 year

Amount of credits: 180

Almaty 2025

Educational program 8D07216 - "Geology and exploration of solid mineral deposits" was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 10 dated «06» 03 2025.

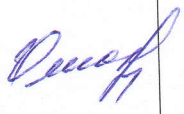
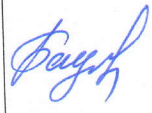
was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes # 3 dated «20» 12 2024.

Educational program 8D07216 - "Geology and exploration of solid mineral deposits" was developed by Academic committee based on direction «8D072 Industrial and manufacturing branches»

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of the Academic Committee:				
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Teaching staff:				
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NON-COMMERCIAL JOINT STOCK COMPANY «KAZAKH NATIONAL RESEARCH TECHNICAL
UNIVERSITY named after K.I.SATBAYEV»

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			Ministry of Industry and Construction of the Republic of Kazakhstan "Yuzhkaznedra"	
Kabaziev B.	Master of Technical Sciences	General Director	LLP "JV Kogadoy"	
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List of abbreviations and designations

NQF	National Qualifications Framework
BC	basic competences
PC	professional competence
UNT	Unified National Testing
CTT	credit technology of training
RC	required component
BD	basic disciplines
PD	profile disciplines
ECTS	The European Credit Transfer and Accumulation System
EP	educational program
AS	academic staff
ATS	auxiliary teaching staff
SOSE	state obligatory standard of education
LO	learning outcome
RWS	Research work of the student
RWSD	Research work of the doctoral student
SDGs	Sustainable Development Goals

1. Description of educational program

The doctoral education program is designed to provide fundamental educational, methodological, and research training, along with an in-depth study of disciplines in relevant scientific fields for various sectors of the national economy and social sphere, including education, medicine, law, arts, economics, business administration, national security, and military affairs.

The objective of the educational program is to train highly qualified specialists capable of conducting scientific research, solving tasks related to the exploration, evaluation, and rational utilization of solid mineral resources, as well as implementing modern methods and technologies in geological exploration, in accordance with Sustainable Development Goal (SDG) 9 and 13.

At the doctoral level, training in the specialty «Geology and Exploration of Solid Mineral Deposits» follows specialized trajectories aimed at developing educational programs for geological sector professionals with advanced technical-analytical, scientific, and predictive training.

2. Purpose and objectives of educational program

Purpose of EP:

The objective of the educational program is to train highly qualified specialists capable of conducting scientific research, solving problems related to exploration, evaluation, and rational utilization of solid mineral resources, as well as implementing modern methods and technologies in geological exploration, in accordance with Sustainable Development Goals (SDG) 9 and 13.

The training of specialists who develop and implement innovative methods for mineral exploration and extraction contributes to the efficient use of resources and the adoption of environmentally friendly technologies, aligning with the principles of sustainable industrial development (SDG 9). Strengthening scientific research and enhancing the technological potential of the industry is achieved through training professionals proficient in advanced geological modeling methods, digital technologies, and geographic information systems (GIS).

The educational program also supports national technologies and innovations, guiding specialists toward the application of modern engineering solutions and sustainable practices in the geological sector. This approach helps minimize the environmental impact of mining activities and address climate change risks (SDG 13).

Educational Program Tasks in Accordance with SDGs:

- Training specialists in experimental research and project-based activities in the field of geology, with a focus on the implementation of innovative technologies, industrial infrastructure development, and reducing negative environmental impact (SDG 9, SDG 13).

- Developing specialists' skills in data acquisition, processing, and integration to solve professional tasks aimed at modernizing the geological sector and developing sustainable methods for mineral exploration and extraction, minimizing environmental risks (SDG 12, SDG 15).

- Enhancing competencies in scientific communication, management, and research activities, considering industrial innovations and climate adaptation in the field of geological exploration.

- Promoting continuous learning and professional development to help specialists adapt to modern technological challenges, implement environmentally safe solutions, and actively contribute to sustainable industrial development.

3. Requirements for evaluating the educational program learning outcomes

Individuals who have completed the doctoral educational program and successfully defended their doctoral dissertation, upon a positive decision by the dissertation councils of a university with 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 based on the results of the conducted examination, are awarded a Doctoral degree in their respective profile and issued a state-standard diploma with an appendix (transcript).

The main criterion for the completion of the doctoral education process is the acquisition of at least 180 academic credits by the doctoral candidate, including all types of academic and research activities.

3.1 Requirements for key competencies of doctoral graduates:

1) have an idea:

- about the main stages of development and the change of paradigms 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;
- on the scientific concepts of world and Kazakh science in the relevant field;
- on the mechanism of implementation of scientific developments in practice;
- about the norms of interaction in the scientific community;
- about the pedagogical and scientific ethics of the scientist-researcher;

2) know and understand:

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

3) be able 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;

- to carry out 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;
- to choose and effectively use modern research methodology;
- plan and predict your further professional development;

4) have skills:

- critical analysis, assessment and comparison of various scientific theories and ideas;
- analytical and experimental scientific activities;
- planning and forecasting research results;
- oratory and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- planning, coordination and implementation of 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 leadership;
- responsible and creative attitude to scientific and scientific-pedagogical activities;
- conducting patent search and experience in transferring 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 conditions of rapid renewal 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;
- in conducting a professional and comprehensive analysis of problems in the relevant area;
- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in the examination of scientific projects and research;
- in ensuring constant professional growth.

3.2 Requirements for research and development of a student under the PhD program:

- 1) compliance with the main problems of the educational program of doctoral studies, on which the doctoral dissertation is being defended;
- 2) is relevant and contains scientific novelty and practical significance;
- 3) is 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) carried out using modern scientific research methods;
- 6) contains scientific research (methodological, practical) sections on the main protected provisions.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	8D07 Engineering, manufacturing and construction branches
2	Code and classification of training directions	8D072 Industrial and manufacturing branches
3	Educational program group	D121 Geology
4	Educational program name	8D07205 - "Geology and exploration of solid mineral deposits"
5	Short description of educational program	The doctoral education program is designed to provide fundamental educational, methodological, and research training, along with an in-depth study of disciplines in relevant scientific fields for various sectors of the national economy and social sphere, including education, medicine, law, arts, economics, business administration, national security, and military affairs. The objective of the educational program is to train highly qualified specialists capable of conducting scientific research, solving tasks related to the exploration, evaluation, and rational utilization of solid mineral resources, as well as implementing modern methods and technologies in geological exploration, in accordance with Sustainable Development Goal
6	Purpose of EP	The objective of the educational program is to train highly qualified specialists capable of conducting scientific research, solving problems related to exploration, evaluation, and rational utilization of solid mineral resources, as well as implementing modern methods and technologies in geological exploration, in accordance with Sustainable Development Goals. The training of specialists who develop and implement innovative methods for mineral exploration and extraction contributes to the efficient use of resources and the adoption of environmentally friendly technologies, aligning with the principles of sustainable industrial development
7	Type of EP	New EP
8	The level based on NQF	8
9	The level based on IQF	8
10	Distinctive features of EP	-
11	List of competencies of educational	1. Cycle of basic disciplines (BD)

	program	2. Cycle of profile disciplines (PD)
12	Learning outcomes of educational program	LO1 - Possess profound and up-to-date knowledge in the field of geology and exploration of solid mineral deposits, demonstrating the capacity for original scientific thinking and the development of innovative approaches within the discipline. Be capable of independently conducting research, critically evaluating results, and effectively applying them in both professional and academic contexts to contribute to the advancement of the field. Actively engage in the dissemination of scientific knowledge, the improvement of educational programs, and the training of qualified specialists, thereby supporting the sustainable development of geological science and practice. LO2 - Be able to apply appropriate modern qualitative and quantitative analysis methods, effectively collect, interpret, and integrate geological data in accordance with industry standards, ensuring scientifically and practically sound decision-making. LO3 - Be able to demonstrate teaching skills for undergraduate and graduate students, work with students, and supervise them. LO4 - Be able to conduct independent and original research aimed at the development of geological science and the industry, using innovative methods, digital technologies, and best global practices that contribute to infrastructure modernization, sustainable use of natural resources, and technological progress. LO5 – Be able to communicate both orally and in writing in a professional and ethical manner, effectively interacting in academic and industrial environments. LO6 - Be able to demonstrate professionalism and ethical conduct when interacting with various stakeholders.
13	Education form	Full-time
14	Period of training	3 year
15	Amount of credits	180
16	Languages of instruction	Russian, Kazakh, English
17	Academic degree awarded	Doctor of Profile
18	Developer(s) and authors	Baibatsha A., Arshamov Y., Assubayeva S., Baisalova A., Zhunusov A., Dauletuly A.

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

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)					
				LO1	LO2	LO3	LO4	LO 5	LO6
Cycle of basic disciplines									
University component									
1.	MET322 Methods of scientific research	Purpose: It consists in mastering knowledge about the laws, principles, concepts, terminology, content, specific features of the organization and management of scientific research using modern methods of scientometry. Contents: structure of technical sciences, application of general scientific, philosophical and special methods of scientific research, principles of organization of scientific research, methodological features of modern science, ways of development of science and scientific research, the role of technical sciences, computer science and engineering research in theory and practice.	5		v			v	v
2.	LNG305 Academic writing	Purpose: To form the system competencies of doctoral students and young researchers in the field of academic writing as a key tool for scientific communication and publication activities. Content: Scientific discourse and academic communication; Typology of scientific texts: from dissertation to publication; Creation of original scientific content; Scientific text: structure and logic of construction; Comparative analysis of sources and preparation of a literary review; Work with metadata and scientometric tools; Preparation of articles for international peer-reviewed journals; Work with reviews and the scientific	5		v			v	v

		community; Academic mobility and grant support for research; Annotations, patents, reports: science beyond the article; Planning of publication strategy and research career; English language of scientific communication.							
Cycle of basic disciplines Component of choice									
3.	GEO340 Geological modeling of mineral deposits	The objective of the course is to teach how to work with computer programs for visualization and interpretation of geological exploration data in a 3D environment, as well as modeling of deposits and assessment of reserves using Micromine software. Content: the course covers the use of programs for visualization and interpretation of various geological exploration data in a 3D environment and three-dimensional modeling of mineral deposits.	5	✓		✓	✓		
4.	MNG350 Sustainability Science	Objective: to develop a deep understanding among doctoral students of the interactions between natural and social systems, as well as to develop skills for identifying and developing strategies for sustainable development that promote long-term human well-being and environmental preservation. Content: complex interconnections between ecosystems and societies. An analysis of sustainability issues at local, national, and international levels.	5	✓			✓		✓
Cycle of profile disciplines Component of choice									
5.	GEO301 Geology and mineralogy of noble metals deposits	The aim of the course is to study the geological characteristics of various geological and industrial types of noble deposits. Contents: the course covers the main types of ores and productive paragenetic associations of gold for each type of	5	✓		✓	✓		✓

		deposit. Typomorphic features of the leading gold-concentrating minerals and the distribution patterns of the noble metal in them. Microscopic studies of gold-bearing ores, with the establishment of the size of gold particles and the forms of its occurrence.							
6.	GEO302 Geology and mineralogy of the rare metals deposits	The aim of the discipline is to study geological processes that form deposits of rare metals, their mineralogical composition, and exploration and evaluation methods. Includes analysis of the genesis, structural features, geochemistry and economic significance of rare metal ores. Content: the discipline covers the following key aspects: genesis and classification of rare metal deposits, geochemical and mineralogical characteristics of ores, methods of prospecting and exploration of deposits, modern analytical methods for studying minerals and ores, patterns of distribution of rare metals in nature, as well as environmental aspects of their extraction and processing.	5	✓		✓	✓		
7.	GEO303 Geology and mineralogy of the deposits non-ferrous metals	The aim of the discipline is to study geological processes and conditions of formation of deposits of non-ferrous metals, such as copper, aluminum, nickel and others. Content: the course covers the mineralogical composition of these deposits, methods of their exploration, assessment of reserves and features of exploitation. Includes analysis of genesis, structural and tectonic features, geochemistry of ores and their economic significance. Particular attention is paid to modern research methods and environmental aspects of non-ferrous metal mining.	5	✓		✓	✓		
8.	GEO304 Geology and mineralogy of	The aim of the course is to study the geological features of various genetic types of ferrous metal	5	✓		✓	✓		

	deposits ferrous metals	deposits. Content: the course covers the macro- and microscopic characteristics of ores with the identification of the leading types of ores for each genetic type, the identification of zonality in their placement, their mineral composition, typomorphic features of ore-forming minerals, distribution and forms of occurrence of valuable elements in ores.							
9.	GEO305 Volumetric modeling and predictive evaluation of mineral deposits	The aim of the course is to train doctoral students in modern methods of 3D modelling and forecasting of deposit reserves, as well as to develop skills in interpreting, interpolating and visualising geological and geochemical data. Doctoral students will master tools for creating digital models of deposits, which helps to improve the accuracy and efficiency of exploration work and ore body assessment. Content: the course covers such aspects as 3D wireframe and block modelling of ore bodies based on factual material; methods of interpreting, interpolating and visualising geological and geochemical data and preparing geological exploration data and importing it into Micromine Well logging.	5	v		v	v		



WORKING CURRICULUM

Academic year	2025-2026 (Autumn, Spring)
Group of educational programs	D121 - "Geology"
Educational program	8D07216 - "Geology and exploration of solid mineral deposits"
The awarded academic degree	Doctor of Engineering (Industry)
Form and duration of study	full time (professional track) - 3 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters						Prerequisites	
									1 course		2 course		3 course			
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																
CYCLE OF BASIC DISCIPLINES (BD)																
M-1. Module of basic training (university component)																
MET322	Methods of scientific research		BD, UC	5	150	30/0/15	105	E	5							
LNG305	Academic writing		BD, UC	5	150	0/0/45	105	E	5							
M-2. Basic geological training module (component of choice)																
GEO340	Geological modeling of mineral deposits	1	BD, CCH	5	150	30/0/15	105	E	5							
MNG350	Sustainability Science	1	BD, CCH	5	150	30/0/15	105	E	5							
CYCLE OF PROFILE DISCIPLINES (PD)																
M-3. Module of professional geological training (component of choice)																
GEO305	Volumetric modeling and predictive evaluation of mineral deposits		PD, UC	5	150	30/15/0	105	E	5							
GEO301	Geology and mineralogy of noble metals deposits	1	PD, CCH	5	150	30/0/15	105	E	5							
GEO302	Geology and mineralogy of the rare metals deposits	1	PD, CCH	5	150	30/0/15	105	E	5							
GEO303	Geology and mineralogy of the deposits of non-ferrous metals	1	PD, CCH	5	150	30/0/15	105	E	5							
GEO304	Geology and mineralogy of the deposits of ferrous metals	1	PD, CCH	5	150	30/0/15	105	E	5							
M-4. Practice-oriented module																
AAP371	Industrial internship		PD, UC	20				R		20						
M-5. Experimental research module																
AAP372	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	5				R	5							
AAP376	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	10				R		10						
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R			30					
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R				30				
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R					30			
AAP375	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	18				R						18		
M-6. Module of final attestation																
ECA325	Final examination (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			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	0	0	0	0

BD	Cycle of basic disciplines	0	10	5	15
PD	Cycle of profile disciplines	0	25	5	30
Total for theoretical training:		0	35	10	45
RWDS	Research Work of Doctoral Student				0
ERWDS	Experimental Research Work of Doctoral Student				123
FA	Final attestation				12
TOTAL:					180

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 28.11.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs

Uskenbayeva R. K.

Approved:

Vice Provost on academic development

Kalpeyeva Z. B.

Head of Department - Department of Educational Program
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Zhumagaliyeva A. S.

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of mineral deposits

Baisalova A. .

Representative of the Academic Committee from Employers
____Acknowledged____

Mendygaliyev A.

