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 2026

The Educational Program 8D07216-"Geology and exploration of solid mineral deposits"
was approved at the meeting of the Management Board of Satbayev University
Minutes No. 5 dated 10 03, *2026*.

Reviewed and recommended for approval at the meeting of the Educational and Academic Council of K.I. Satbayev Kazakh National Research Technical University
Minutes No. 8 dated 26 02, *2026*.

Reviewed and recommended for approval at the meeting of the Educational and Methodological Council of K.I. Satbayev Kazakh National Research Technical University
Minutes No. 3 dated 25 12, *2025*.

The Educational Program 8D07216-"Geology and exploration of solid mineral deposits" was reviewed and developed at the meeting of the Academic Committee.

Minutes No. 5 dated 27 11, 2025.

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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 -** Capable of applying advanced knowledge in the field of geology and exploration of solid mineral deposits in their professional and academic careers, contributing to the dissemination of scientific knowledge, the development of education, and the training of qualified specialists in the industry. **LO2 -** are able to apply appropriate methods of analysis, both qualitative and quantitative, to collect and integrate information in the best possible way and in accordance with the standards of the geological industry **LO3 -** able to demonstrate skills in teaching undergraduate and graduate students, working with students, and supervising them **LO4 -** Capable of conducting independent original research aimed at advancing geological science and industry, utilizing innovative methods, digital technologies, and best global practices to support infrastructure modernization, sustainable use of natural resources, and technological progress. **LO5** - able to communicate, both written and oral, in a professional and ethical manner **LO6 -** are able to demonstrate high professional qualities and ethics 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
17	Academic degree awarded	Doctor of Profile
18	Developer(s) and authors	Baibatsha A., Kembayev M., Zhunussov A., Kabazyev B., Bulegenov K.

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 Metods of scientific research	The course includes: 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 (differentiation, integration, systems approach, abstraction, concretization, synergetic paradigm, evolutionism , logic, instrumental analysis, etc.), 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 (including marketing and investment) scientific research in theory and practice.	5		v			v	v
2.	LNG305 Academic writing	Particular attention is paid to the basic requirements for scientific texts of various genres, the development of the technique of preparation, design, composition and argumentation in written academic texts, the formation of the skills of the author's writing of analytical abstracts, reports, theses, articles, dissertations, editing of scientific text. The approaches to working with scientific information that have developed in seismology,	5		v			v	v

		geology and geophysics, principles, rules, norms of preparation, writing, editing of an academic text for the purpose of public presentation of scientific results of theoretical, empirical and applied levels are considered. Much attention will be paid to the analysis of the structure, construction, composition and style of a scientific text, practical skills in writing written texts of an academic nature.							
Cycle of basic disciplines Component of choice									
3.	GEO340 Geological modeling of mineral deposits	During the course of studying the discipline, master and doctoral students will master how to correctly process geological materials using modern digital technologies using the geostatistical interpolation method based on the theory of kriging, as well as apply the processed results in scientific research when solving complex geological problems such as evaluating useful components, construction of maps of geochemical and geophysical anomalies, prediction of natural disasters, etc.	5	**v**		**v**	**v**		
4.	MNG350 Sustainability Science	The course covers theoretical and practical aspects of sustainability at the global, regional and local levels. It studies the interaction of ecological, economic and social systems with the aim of ensuring a long-term balance between the needs of the present and the preservation of resources for future generations. The course examines key concepts of sustainability, principles of green economy, methods of environmental assessment and ways of integrating sustainable practices into various sectors and policies.	5	**v**			**v**		**v**

Cycle of profile disciplines Component of choice									
5.	GEO301 Geology and mineralogy of noble metals deposits	Geological characteristics of various geological and industrial types of noble deposits. The main types of ores and productive paragenetic associations of gold for each type of deposits. Typomorphic features of the leading minerals-concentrators of gold 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. Fine-dispersed ore beneficiation technologies developed by beneficiation technologists and also used for the extraction of so-called invisible gold.	5	**v**		**v**	**v**		**v**
6.	GEO302 Geology and mineralogy of the rare metals deposits	The following topics are included for the study of the subject: study of the mineral composition of the ores of the deposits; determination of the types of ores and their constituent paragenetic associations; determination of zoning in the placement of types of ores; study of the main ore-forming minerals and their typomorphic features; identification of patterns of distribution of valuable components; study of textures and structures of ores; drawing up a diagram of the mineral formation process.	5	**v**		**v**	**v**		
7.	GEO303 Geology and mineralogy of the deposits non-ferrous metals	The following topics are included for the study of the subject: study of the mineral composition of the ores of the deposits; determination of the types of ores and their associated paragenetic associations; determination of zoning in the placement of types of ores; study of the main ore-forming minerals and their typomorphic features; identification of patterns of distribution of	5	**v**		**v**	**v**		

		valuable components; study of textures and structures of ores; drawing up a diagram of the mineral formation process.							
8.	GEO304 Geology and mineralogy of deposits ferrous metals	Geological features of various genetic types of rare metal deposits. Macro- and microscopic characteristics of ores with the identification of the leading types of ores for each genetic type, identification of zoning in their location, their mineral composition, typomorphic features of ore-forming minerals, distribution and forms of occurrence of valuable elements in ores. Mineral formation conditions based on a complex of macro- and microscopic studies of ores.	5	**v**		**v**	**v**		
9.	GEO305 Volumetric modeling and predictive evaluation of mineral deposits	Three-dimensional modeling of mineral deposits is one of the leading methods in forecasting, prospecting, metallogenic and exploration work. Three-dimensional wireframe and block modeling of ore bodies based on factual material provides knowledge about methods of interpretation, interpolation and visualization of geological and geochemical data. Three-dimensional modeling of deposits is based on the preparation of exploration data and their import into the Micromine GIS, as well as geostatistical analysis of data and the construction of digital models of the surface and quarry.	5	**v**		**v**	**v**		
10.	ECA303 Writining and defending a doctoral dissertation	Doctoral dissertation is a scientific work of a doctoral student, which is an independent study, in which theoretical provisions are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem is solved, or scientifically grounded technical, economic or technological solutions are stated, the implementation of which makes a significant	12	**v**			**v**	**v**	**v**

		contribution to development the country's economy. The doctoral dissertation is the result of the research / experimental research work of a doctoral student, carried out during the entire period of study of a doctoral student. The defense of a doctoral dissertation is the final stage of the master's preparation. A master's thesis must meet the following requirements: - The topic of the dissertation should be related to priority areas of development of science and / or government programs or programs of fundamental or applied research. - The content of the thesis, the goals and objectives, the scientific results obtained must strictly correspond to the topic of the thesis. - The dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.							

5. Curriculum of educational program