



**Geology and Oil-gas Business Institute named after k. Turyssov  
Department of "Geophysics"**

**EDUCATIONAL PROGRAM  
8D07104 «Oil and gas and ore Geophysics»**

Code and classification of the field of education: **8D07 «Engineering, Manufacturing and Civil engineering»**

Code and classification of training areas: **8D071 «Engineering and engineering trades»**

Group of educational programs: **D109 «Oil and ore geophysics»**

NQF Level: 8

IQF Level: 8

Duration of training: 3 years

Volume of credits: 180

**Almaty 2022**








The educational program 8D07104 – «Oil and gas and ore geophysics» was approved at the meeting of the Scientific Council of NJSC «KazNRTU named after K.I.Satbayev.



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Protocol No. 2 of January 21, 2022.

The educational program 8D07104 «Oil and gas and ore geophysics» was developed by the academic committee in the direction 8D071 «Engineering and engineering trades».

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### **List of abbreviations and designations**

STATE – state mandatory standards of education;  
ICT – information and communication technologies;  
NJSC «KazNJSC named after K.I.Satbayev» – Non-profit joint stock company «Kazakh national research technical university named after K.I. Satbayev»;  
NQF – National Qualifications Framework;  
GCC – general cultural competencies;  
GPC– general professional competencies  
IQF – Industry Qualifications Framework;  
PC – professional competencies;  
LO – learning outcomes of the educational program;  
S – special and managerial competencies;  
SIS- student independent study;  
EP-educational program;  
BD- basic discipline;  
PD- profile discipline;  
UC- University component;  
CC-Component of choice;  
FA- final assessment;  
RWDS - research work doctoral student.

## **1. Description of the educational program**

The educational program of the doctoral program in the field of training 8D07104 "Oil and gas and ore geophysics" provides the formation of general cultural, general scientific, social, informational, professional and pedagogical competencies. Develops the responsibility of doctoral students, the desire for self-development and the disclosure of their creative potential, teaches the mastery of the culture of thinking, awareness of the social significance of the profession of geophysicist, the ability to make organizational decisions in various situations and willingness to take responsibility for them.

Doctoral studies in the direction 8D07104 "Oil and gas and ore geophysics" form professional competencies that are necessary for solving complex problems and require the application of:

- application of in-depth fundamental knowledge;
- abstract thinking and originality of analysis;
- going beyond the issues covered by standards and practices;
- development of non-standard solutions to problematic problems;
- adaptation to new situations, reassessment of accumulated experience, creation of new knowledge based on geophysical research;
- setting innovative professional tasks in the field of research and practical activities;
- search for optimal solutions to professional tasks, taking into account their validity, cost, information, social and economic security; solving managerial tasks in the conditions of actual production structures.

The educational program of the doctoral program in the direction of "Oil and gas and ore geophysics" provides:

- a) training of highly qualified specialists in the field of geophysical methods of prospecting and exploration of mineral deposits;
- b) obtaining high-quality and professional knowledge on the stages and rational complexes of geological and geophysical research, organization and conduct of field, borehole and airborne geophysical observations, hardware, methodological and software, including processing, interpretation and modeling of the obtained data;
- c) acquisition of skills in synthesis and system analysis of geological and geophysical data, their structuring, classifications of target objects in mineral deposits; formulation and solution of direct and inverse problems during exploration tasks.

Professors from leading universities near and far abroad, leading experts from manufacturing companies and research institutes are invited to conduct lectures and consultations on modern problems of geophysics and geology of solid minerals, oil and gas.

Doctoral students practice in research institutes, operator and service companies of the near and far abroad.

Graduates of the doctoral program in the field of training 8D07104 "Oil and gas and ore geophysics" receive the qualification of Doctor of Philosophy Ph.D in

oil and gas and ore geophysics, work in oil and gas and mining companies, in research institutes in senior positions.

***Field of professional activity:***

The field of professional activity of graduates who have mastered the doctoral program in the field of "Oil and gas and ore geophysics" includes solving problems and problems requiring the application of fundamental theoretical and applied knowledge in the Earth sciences within the framework of scientific research, practical prospecting, exploration and prediction of mineral deposits (including onshore and borehole geophysical research; geophysical monitoring of the state of the geological environment of exploited oil and gas and ore deposits), detailed geological and geophysical study of the structure of oil and gas-bearing areas, areas and individual hydrocarbon deposits, ore areas, areas and deposits of solid minerals.

***Objects of professional activity:***

The objects of professional activity of doctoral students in the profile of preparation "Oil and gas and ore geophysics" are the upper part of the Earth's crust, its composition, structure, evolution of geological development; rocks and mineral resources; mineral deposits and their research, monitoring of the state of the subsoil and development forecasts; geophysical fields; natural and man-made geological processes in the areas exploited mineral deposits, physical and geological models of formations, sections, mineral deposits in the process of their prospecting, exploration and development; computerized and software-controlled information-measuring and processing systems and complexes.

***Subjects of professional activity:***

Study of the structure of the Earth's crust, its physical models and petrophysical properties of rocks; conducting scientific and applied research using geoelectric, seismic, gravitational, geomagnetic, nuclear geophysical methods and borehole geophysical observations; performing field observations, processing, interpretation and modeling of the data obtained in the study of geological objects, as well as measures to ensure safety during carrying out geophysical works and reducing their anthropogenic impact on the environment.

***Types of professional activity:***

The types of professional activity are: research and teaching activities in the field of Earth sciences.

Doctoral students in the educational program 8D07104 "Oil and gas and ore geophysics" are preparing for research and scientific-production professional activities. In accordance with the fundamental and professional training they have received, they can perform the following activities:

a) organizational and managerial activities:

- planning, organization and management of research and scientific-production field, laboratory and interpretive geological and geophysical works;
- development of operational work plans for geophysical parties and detachments;
- selection and justification of scientific, technical and organizational solutions based on geological and geophysical data and economic calculations.

- planning and organization of scientific and production seminars and conferences.

b) research activities:

- independent selection and justification of the goals and objectives of the performed geological and geophysical research;

- independent selection of equipment/equipment and methods of solving tasks when conducting field, laboratory, interpretive research using modern geophysical equipment, instruments and information technologies;

- generalization, analysis and evaluation of the results of research works using modern achievements of science and technology, advanced domestic and foreign experience in the field of geophysics and geology; preparation of scientific reports, publications, reports, preparation of applications for inventions and discoveries.

c) production activities:

- independent preparation and carrying out of production and scientific-production, field, laboratory and interpretation work in solving practical problems of geology and geophysics;

- independent selection, preparation and professional operation of modern geophysical field and laboratory equipment and instruments;

- collection, analysis and systematization of available (a priori) geological and geophysical information using modern information technologies;

- complex processing, interpretation and modeling of field and laboratory geological and geophysical information in order to solve production tasks;

- assessment of the economic efficiency of operational and service tasks of production geological and geophysical research;

- participation in the development of regulatory methodological documents in the field of geological and geophysical work.

d) project activities:

- design and implementation of scientific and technical projects in geology and geophysics;

- design of works in the field of rational subsoil use and protection of the geological environment;

- participation in the examination of projects of geological and geophysical works.

e) scientific and pedagogical activity:

- participation in the preparation and conduct of seminars, laboratory and practical classes;

- participation in the management of undergraduates and students studying under the educational program "Oil and gas and ore geophysics".

***Areas of professional activity:***

The professional activity of a graduate of the OP "Oil and Gas and ore Geophysics is carried out in: academic and departmental research institutes and organizations; in geological exploration service and operator companies engaged in prospecting, exploration and extraction of mineral raw materials; in organizations related to environmental monitoring and solving environmental problems; in general education institutions of secondary and higher professional education.



*The areas of professional activity are:*

*With the right direction:* organizational and technological; settlement and design; service and operational; production and technological activities in:

- Ministry of Energy and Ministry of Industry and Infrastructure Development of the Republic of Kazakhstan;

- academic and departmental research organizations related to solving geological problems;

- operator and service companies engaged in prospecting, exploration and additional exploration of mineral deposits, as well as exercising control over the development of these deposits;

- organizations related to environmental monitoring and solving environmental problems.

*In the scientific and pedagogical direction:* organizational and managerial; research; educational (pedagogical) activities of various directions in higher, secondary specialized and vocational educational institutions.

Scientific activity – in information services, research institutions, public administration bodies, educational institutions, design organizations, industrial enterprises.

## **2. The purpose and objectives of the educational program**

### **EP purpose:**

Preparation of highly qualified specialists for the scientific, scientific, pedagogical, industrial and innovative fields of activity in solving geological problems: prospecting and development of mineral deposits based on innovative methods and technologies of geophysical research (including modern software), using advanced registration tools

The preparation of a doctoral dissertation is combined with high scientific activity, academic mobility and is aimed at preparing a doctoral dissertation for obtaining the highest scientific qualification – the degree of Doctor of Philosophy.

### **EP tasks:**

- preparation of a graduate competent in production and management, design, organizational and technological, scientific and pedagogical fields on the basis of modern training tools of information technology and information resources, ready for:

- a) organizational and professional activities, continuous self-improvement and self-development, mastering new knowledge, skills and abilities in innovative areas of oil and gas and ore geophysics;

- b) to carry out design geophysical works, to develop and design technical solutions and technical tasks for conducting geological and geophysical research;

- the formation of professional competencies among doctoral students that will allow them to navigate modern scientific concepts, competently set and solve research and practical tasks, participate in production and research activities, master the basic methods of teaching, education and a set of knowledge, teaching methods in educational institutions of all levels and forms.

- improvement of natural science education, including those focused on professional activities in oil and gas and ore geophysics;
- improving the skills and abilities of using modern information and communication technologies in research and teaching activities.
- improvement of knowledge of a foreign language, including for use in professional activities.

*With the profile direction:*

- in-depth study of the theoretical and methodological foundations of oil and gas and ore geophysics;
- formation of skills of independent research activities and the ability to independently expand and deepen knowledge in oil and gas and ore geophysics;
- acquisition of skills in organizing and conducting scientific and applied research, conducting experiments according to a given methodology, drawing up a description of the research being conducted;
- development of new theories and models in oil and gas and ore geology and geophysics; mathematical modeling of processes and objects.

*At the pedagogical direction:*

- providing high-quality education based on modern educational programs in accordance with state educational standards and taking into account the knowledge gained in the field of university pedagogy and psychology and teaching experience at the university.
- training of competitive specialists with a high level of professional culture, able to teach at universities, successfully carry out research and management activities;
- development and introduction into practice of effective mechanisms for the integration of higher education with science;
- development of science, technology and technologies through scientific research and creative activity of scientific and pedagogical personnel and students;
- development of mutually beneficial international cooperation in the field of higher education.

### **3. Requirements for the evaluation of learning outcomes of the educational program**

The content of the doctoral program in the direction of "Oil and gas and ore geophysics" on the basis of the development of a multi-level system of personnel training, the fundamentals 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 oil and gas and ore geophysics, 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 highly qualified specialists capable of applying innovative methods in the search and exploration of mineral deposits; use methods, skills and modern technical

means necessary for the identification and exploration of oil and gas prospective structures and deposits of solid minerals; apply methods of system analysis in the evaluation of the obtained geological and geophysical and field-geophysical data;

- formation of: a) the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks; b) teamwork skills, but at the same time to show individuality, and if necessary to solve problems independently; c) to conduct a comprehensive analysis of geological and geophysical data and monitoring of geophysical work, as well as to make management decisions based on their results;

- formation of industrial and ethical responsibility, the ability to understand the problem and to work together with various specialists, to find optimal solutions, the need to improve their knowledge and skills.

A graduate of the doctoral program in the field of preparation "Oil and gas and ore geophysics should have an idea of current trends in the development of the geophysical specialty and possess: deep systematic knowledge in the field of geophysical methods of prospecting and exploration of mineral deposits.

PhD doctors in the field of "Oil and gas and ore geophysics" should have the ability to:

- abstract thinking, analysis, synthesis of geological and geophysical information; draw conclusions and conclusions, formulate conclusions and recommendations, be ready to act in non-standard situations, bear social and ethical responsibility for decisions made, show a desire for self-development, self-realization, use of creative potential;

- independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities; be able to independently formulate research goals and establish the sequence of solving professional tasks; apply in practice knowledge of fundamental and applied sections of disciplines that determine the direction of the company/organization where they work;

- to form diagnostic solutions to geophysical problems of oil and gas and ore geophysics by integrating fundamental sections of geological sciences and specialized knowledge on geophysical methods of prospecting and exploration of mineral deposits.

Doctors in the field of training "Oil and gas and ore geophysics" must have:

- skills of conducting independent production and scientific-production field, laboratory and interpretive geophysical work; preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles.

- communication skills to present suggestions and recommendations in oral and written forms;

- competence in the search and interpretation of technical information using various search engines (patent search, literary review of magazines and books, the Internet), in the selection and creative use of modern equipment for solving scientific and practical problems of oil and gas and ore geophysics.

PhD doctors in the field of "Oil and gas and ore geophysics" should be able to:

- critically analyze, present, defend, discuss and disseminate the results of their professional activities;

- to use effective methods of processing, interpretation and modeling of complex information to solve production and research tasks; to create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge;

- adapt to new situations in a professional environment.

PhD doctors in the direction of "Oil and gas and ore geophysics" should have the ability to:

- to perceive diversity and cross-cultural difference, to appreciate diverse approaches to understanding and solving the problems of society;

- to organize cooperation in a team, to show creativity and breadth of interests to solve interdisciplinary problems. A graduate must be tolerant of social, ethnic, confessional and cultural differences, be capable of criticism and self-criticism, have skills of interaction and cooperation, be ready to accept the role of a team leader.

PhD doctors in the direction of "Oil and gas and ore geophysics" must:

- be socially mobile, appreciate the traditions of other cultures, their diversity in modern society;

- be ready for communication in oral and written forms in Kazakh, Russian and foreign languages to solve the tasks of professional activity;

- to support the rules of ethics in society, at work and in interpersonal communication, to demonstrate the ability to achieve goals, solve problems in non-standard situations; to take care of environmental protection and, by improving skills, to serve the development of the welfare of the whole society.

## 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	8D071 «Engineering and Engineering trades»
3	Group of educational programs	D109 «Oil and ore geophysics»
4	Name of the educational program	8D07104 «Oil and gas and ore geophysics»
5	Brief description of the educational program	<p>The content of the doctoral EP in 8D07104 “Oil and gas and ore geophysics” is built on the basis of the development of a multi-level system of personnel training, fundamentality and quality of training, continuity and continuity of education and science, unity of training, education, research and innovation activities, aimed at maximizing customer satisfaction.</p> <p>A graduate of the doctoral program in the field of preparation "Oil and gas and ore geophysics should have an idea of current trends in the development of the geophysical specialty and possess: deep systematic knowledge in the field of geophysical methods of prospecting and exploration of mineral deposits.</p>

		<p>The educational program of the doctoral program in the direction 8D07104 "Oil and gas and ore geophysics" provides:</p> <ul style="list-style-type: none"> <li>- acquisition of in-depth theoretical knowledge and practical skills in the field of fundamental research of the earth's crust, methodologies and methods of conducting onshore and borehole and aerogeophysical research in the search and exploration of mineral deposits</li> <li>- training of highly qualified specialists who are able to apply innovative methods in the search and exploration of mineral deposits; use methods, skills and modern technical means necessary for the identification and exploration of oil and gas prospective structures and deposits of solid minerals; apply methods of system analysis in the evaluation of the obtained geological and geophysical and field-geophysical data;</li> <li>- formation of: a) the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks; b) teamwork skills, but at the same time to show individuality, and if necessary to solve problems independently; c) to conduct a comprehensive analysis of geological and geophysical data and monitoring of geophysical work, as well as to make management decisions based on their results;</li> <li>- formation of industrial and ethical responsibility, the ability to understand the problem and to work together with various specialists, to find optimal solutions, the need to improve their knowledge and skills.</li> </ul>
6	Purpose of the EP	<p>Training of highly qualified specialists for scientific, scientific-pedagogical, industrial and innovative fields of activity in solving geological problems: prospecting and development of mineral deposits based on innovative methods and technologies of geophysical research (including modern software), using advanced means of registering geophysical fields.</p> <p>The preparation of a doctoral dissertation is combined with high scientific activity, academic mobility and is aimed at preparing a doctoral dissertation for obtaining the highest scientific qualification – the degree of Doctor of Philosophy.</p>
7	Type of EP	New EP
8	The level of the NQF	8
9	IQF Level	8
10	Distinctive features of the EP	no
11	<b>General cultural competencies (GC):</b>	<p>GC1 – ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction;</p> <p>GC2 – understanding and practical use of healthy lifestyle norms, including prevention issues, the ability to use physical culture to optimize performance;</p> <p>GC3 – the ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position;</p> <p>GC4 – the ability to use the basics of philosophical knowledge to form a worldview position;</p> <p>GC5 – the ability to critically use the methods of modern science in practice;</p>

	<p>GC6 – awareness of the need and acquisition of the ability to independently study and improve their qualifications throughout their working life;</p> <p>GC7 – the meaning and understanding of professional ethical standards, mastery of professional communication techniques. Ability to work in a team, tolerantly perceiving social, ethnic, confessional and cultural differences;</p> <p>GC8 – The ability to use the basics of economic knowledge in various fields of activity.</p> <p><b>General Professional Competencies (GPC):</b></p> <p>GPC-1 – the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities;</p> <p>GPC-2 – the ability to put into practice knowledge of fundamental and applied sections of geophysical disciplines that determine the focus (profile) of the doctoral program in geophysics;</p> <p>GPC-3 – the ability to independently design and carry out research activities in the field of geophysics based on the use of modern research methods and information and communication technologies using integrated geophysical and interdisciplinary research;</p> <p>GPC-4 is an understanding of the essence and significance of the relationship between theoretical and practical research in geophysics, which makes it possible to effectively and rationally solve geological and geophysical problems.</p> <p><b>Professional Competencies (PC)</b></p> <p>PC 1 – knowledge of promising areas of development and problems of geophysics, the current level of elaboration of problems. The ability to participate in work on innovative projects, set specific geophysical tasks and solve them based on the use of modern equipment, software and information technologies using the latest domestic and foreign experience;</p> <p>PC 2 – the ability to form diagnostic solutions to professional geophysical problems by integrating fundamental and applied sections (gravimagnetic exploration, geoelectrics, borehole geophysics and seismic exploration) and specialized geological and geophysical knowledge (about physical processes occurring in the Earth and the internal structure of the Earth) for analyzing field data and solving problems of geophysics;</p> <p>PC 3 – the ability of general technical and administrative management and ensuring timely collection of materials for field geophysical work. General technical and administrative management and ensuring timely execution of work on the preparation of geophysical equipment and observation systems for stationary and field geophysical measurements;</p> <p>PC 4 – the ability of general technical and administrative management, planning and ensuring timely execution of field geophysical surveys using modern geophysical complexes.;</p> <p>PC 5 – the ability to organize and manage primary field and desk processing of field geophysical data results and transformation of the data obtained for analysis and effective interpretation. The ability to ensure timely execution of the interpretation of geophysical data, the design of the results;</p> <p>PC 6 – the ability to organize and guide geological</p>
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		<p>interpretation. Ensuring the implementation of geological and geophysical modeling methods for assessing prospects and calculating mineral deposits. Creating a digital archive of reporting data;</p> <p>PC 7 – the ability to coordinate and guide the interaction of structural units in the preparation of accounting documentation;</p> <p>PC 8 – the ability to independently carry out production field, laboratory and interpretation work in solving practical problems of geophysics;</p> <p>PC 9 – the ability to identify and systematize the main ideas in scientific publications; critically evaluate the effectiveness of various approaches to solving geophysical problems; formulate an independent view of the proposed problem taking into account the latest domestic and foreign experience.</p>
12	<b>Learning outcomes of the educational program:</b>	<p>ON1: Apply knowledge in the field of oil and gas and ore geophysics in their scientific, pedagogical, industrial and innovative fields of activity;</p> <p>ON2: Independently understand and professionally solve the assigned geophysical tasks, collect and integrate information in the best way according to the standards of the geological and geophysical industry;</p> <p>ON3: Demonstrate teaching and leadership skills of bachelors, undergraduates;</p> <p>ON4: Organize and conduct scientific and applied research, experiments according to a given methodology, independently compile a description of ongoing research in the oil and gas field;</p> <p>ON5: Develop and set scientific tasks, apply appropriate methods of complex interpretation, both qualitative and quantitative, master methods of collecting, processing, analyzing and systematizing scientific and technical information of domestic and foreign experience in oil and gas and ore geology and geophysics;</p> <p>ON6: Demonstrate high professional qualities and ethics when interacting with various stakeholders</p>
13	Form of training	full - time
14	Duration of training	3
15	Volume of loans	180
16	Languages of instruction	Russian, Kazakh
17	Academic degree awarded	Doctor of Philosophy PhD
18	Developer(s) and authors:	<p>1). Professor Abetov A.E.,</p> <p>2). Associate Professor Umirova G.K.</p>

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

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)					
				LO1	LO2	LO3	LO4	LO5	LO5
Cycle of basic disciplines									
University component									
1	Research methods	It is a theoretical basis for passing research practice, performing research work and writing a doctoral dissertation. Provides preparation for independent research work and educational activities. The concepts of scientific research methods, their theoretical and empirical components, the development of research methodology, and the classification of methods of scientific knowledge are considered. Theoretical (induction, deduction, axiomatic method, analysis) and empirical (observation, comparison, experiment, measurement, abstraction) methods of scientific research, their relationship and addition are studied.	5	✓	✓	✓			✓
2	Academic Writing	The discipline forms the skills and competencies for expressing the results of scientific research in the form of a clear, scientific text confirmed by arguments. The learning outcomes will help in working with information in various scientometric databases, in creating your own original view of a particular solution of scientific research, in summarizing scientific articles related to the direction of study	5	✓	✓	✓			✓
3	Pedagogical practice	Pedagogical practice is an obligatory component that consolidates the knowledge and skills acquired by undergraduates as a result of mastering theoretical disciplines, develops practical skills and contributes to the formation of universal and general professional competencies. The purpose of pedagogical practice is to study the basics of pedagogical and educational–methodical work in universities, mastering the pedagogical skills of conducting training sessions and preparing teaching materials in the disciplines of the educational program "Oil and gas and ore geophysics".	10	✓		✓		✓	✓



		<p>The basis for conducting pedagogical practice is the Department of Geophysics of the IGNGD KazNRTU named after K.I. Satpayev.</p> <p>The objectives of the practice are to gain experience in teaching work, as well as:</p> <ul style="list-style-type: none"> <li>- formation of a holistic view of pedagogical activity, pedagogical systems and the structure of higher education;</li> <li>- development of stable skills of practical application of professional and pedagogical knowledge obtained in the process of theoretical training;</li> </ul> <p>development of professional and pedagogical orientation of undergraduates; familiarizing them with real problems and tasks solved in the educational process; studying methods, techniques, technologies of pedagogical activity in higher education.</p>							
<p align="center"><b>Cycle of basic disciplines</b> <b>Component of choice</b></p>									
4	Systematic approach to the study of oil and gas reservoirs	<p>The features of the application of methods of system analysis of geological and geophysical, field and technological information in the search, exploration and additional exploration of oil and gas reservoirs in hydrocarbon fields are considered. The main directions of theoretical and applied research in the field of geology and geophysics of oil and gas are presented, the need for effective management of field development based on a systematic approach to the entire process, from the predictive stage to the industrial assessment of hydrocarbon accumulations, is substantiated.</p>	5	✓				✓	✓
5	3D static (geological) modeling and hydrocarbon deposits reserves evaluation based on integrated interpretation of geological and geophysical data	<p>The purpose of studying the discipline is to master the theoretical and practical foundations for building digital 3D physical and geological models in order to calculate reserves in mineral deposits. Modern classifications of reserves of mineral deposits are considered in their preparation for industrial development. Modern methods of three-dimensional geological modeling of mineral deposits based on the effective integration of geological and geophysical data are being studied.</p>	5		✓			✓	✓
6	Geological section prediction and mineral deposits	<p>The issues of predicting the lithological composition and conditions of formation of rocks of the sedimentary cover before drilling are considered; identification of reservoirs,</p>	5	✓	✓	✓		✓	

	reserves evaluation	determination of types of structural traps and search for non-anticlinal traps, determination of the type of fluid in the reservoir in natural conditions, construction of geological columns for forecasting at well locations; assessment of values of abnormally high reservoir pressure; detailed study of productive horizons based on a comprehensive analysis of seismic and GIS data							
7	Integrated geological and geophysical research for the purpose of prospecting and exploration of unconventional reservoirs	Patterns of oil and gas placement in unconventional reservoirs. Definition of basic concepts. Brief information about unconventional and complex oil and gas reservoirs. Unconventional and complex rocks are reservoirs of sedimentary, metamorphic, magmatic genesis. Conditions of their formation and patterns of placement. Reservoir properties of unconventional reservoir rocks (porosity and permeability). Characteristics of the void space of collectors. Oil-producing rocks. Methods of studying unconventional reservoirs.	5	✓	✓			✓	
<b>Cycle of profile disciplines</b> <b>University component</b>									
8	Research practice	<p>Research practice strengthens the knowledge and skills acquired by doctoral students as a result of mastering theoretical disciplines, develops practical skills and contributes to the complex formation of professional and general professional competencies.</p> <p><u>The objectives of the research practice are:</u></p> <ul style="list-style-type: none"> <li>- mastering by doctoral students of methods and principles of conducting field and desk geophysical work, studying methods of planning such work; obtaining experimental (theoretical, laboratory, field) material for writing a doctoral dissertation;</li> <li>- consolidation of the skills of scientific or industrial work in oil and gas and ore geophysics; formation of their skills and abilities to compile scientific and technical reports and public presentations;</li> <li>- organization of practical use of the results of scientific research, including publications, promotion of the results of their own scientific activities.</li> </ul> <p><u>The objectives of the research practice are:</u></p>	10	✓	✓	✓	✓		✓

		<p>- ensuring the direct participation of doctoral students in research works on oil and gas and ore geophysics; obtaining the necessary material to solve a scientific problem or a practical bare-geophysical problem;</p> <p>- obtaining practical knowledge on the identification of oil and gas prospective structures and ore areas, nodes and fields, deposits of solid minerals;</p> <p>- study of data collection and storage systems and methods of their processing, interpretation and modeling; mastering technical means of presenting scientific results;</p> <p>acquisition of professional competencies in accordance with the types and tasks of geological exploration.</p> <p>The content of the doctoral student's research practice in the direction of "Oil and gas and ore geophysics" depends on the orientation, the task and the topic of the doctoral dissertation.</p> <p>The research practice plan is drawn up individually for each doctoral student and is a program of theoretical, experimental or field work.</p>							
<p align="center"><b>Cycle of profile disciplines</b> <b>Component of choice</b></p>									
9	A new approach in the prediction and classification of mineral deposits	<p>Application of methods of system analysis of geological and geophysical data in the search, exploration and additional exploration of solid mineral deposits. Concepts of a systematic approach, levels of organization of matter or its hierarchy in the study of ore areas, ore nodes and fields, deposits of solid minerals, classification of ore-forming processes; principles of formation typing of deposits; effective management of field development from the forecast stage to industrial evaluation; establishing the integrity and structure of the most complex geological objects.</p>	5		✓			✓	
10	Theoretical background for interpretation of potential fields	<p>Methods and means of studying potential fields, modern technologies for solving direct and inverse problems from the point of view of the geological interpretation of geophysical data are considered. The aims, tasks, basic algorithms of geological interpretation of potential fields are studied. The significance of a priori and a posteriori physical and geological information is shown in the selection of a useful signal and</p>	5		✓			✓	

		interference; reliability of the approximation process and the obtained solutions. The role and place of potential fields in the complex of geological and geophysical works are considered.							
11	Theory and practice of analysis of possible geophysical fields and geological modeling.	The current state of the theory and practice of interpretation of gravimetry, magnetometry, electrometry data. Theoretical aspects, modern algorithms and computer technologies of processing and geological interpretation of geophysical fields, principles of integration of geophysical methods are considered. Special attention is paid to the features and methods of modeling various potential fields in two-dimensional and three-dimensional cases, physical and geological modeling of objects of	5	✓	✓		✓		
12	Field-geophysical control over the development of hydrocarbon deposits	Fundamentals of modern field and geophysical integrated control of the development of oil and gas fields in order to intensify production and increase the oil recovery coefficient. Theory, processing and application of hydrodynamic, geophysical and field-technological methods of research of the exploited well stock; substantiate the methodological criteria of the development control system, technology of automated analysis and application of the results of system borehole studies when creating digital dynamic models of deposits and preparing design documents.	5	✓			✓	✓	
13	Simulation of geological environments on geophysical	Theoretical and methodological foundations for constructing three-dimensional digital geological models based on geophysical data for solving the problems of prospecting and exploration of mineral deposits are considered; calculation of mineral reserves; planning of industrial development of MPI; conducting engineering surveys and environmental monitoring of the subsoil. Main components of modeling: object, parameters and characteristics of the object, modeling process, modeling results; principles of building quantitative physical-geological models (FGM); features of modern methods for constructing three-dimensional digital geological models	5		✓		✓	✓	✓



**SATBAYEV  
UNIVERSITY**

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. Satbayev



APPROVED  
by the Management Board  
of the University named after K. Satbayev  
M.M. Begentaev  
2022 y.

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

Educational program 8D07104 - "Oil and gas and ore Geophysics"  
Group of educational programs D109 - "Oil and ore Geophysics"

Form of study: full-time		Duration of study: 3 year		Academic degree: Doctor of Philosophy (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					
								1 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)													
GPH323	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													
GPH324	Systematic approach to the study of oil and gas reservoirs	BD CCHBD CCH	5	150	2/0/1	105	E	5					
GPH301	3D static (geological) modeling and hydrocarbon deposits/reserves evaluation based on integrated interpretation of geological and geophysical data												
GPH302	Geological section prediction and mineral deposits reserves evaluation												
CYCLE OF PROFILE DISCIPLINES (PD)													
M-2. Module of professional activity (component of choice)													
GPH325	A systems concept to forecasting and typing of solid mineral deposits	PD, CCH	5	150	2/0/1	105	E	5					
GPH304	Theoretical background for interpretation of potential fields												
GPH305	Theory and practice of analysis of possible geophysical fields and geological modeling												
GPH326	Field-geophysical control over the development of hydrocarbon deposits	PD, CCH	5	150	2/0/1	105	E	5					
GPH315	Integrated geological and geophysical research for the purpose of prospecting and exploration of unconventional reservoirs												
GPH322	Simulation of geological environments on geophysical												
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
								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 Kazntu named after K.Satpayev. Protocol № 3 от 24 " 10 2022 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 2 от 21 " 10 2022 y.



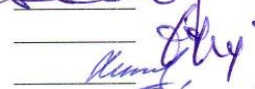

Decision of the Academic Council of the Institute \_\_\_\_\_, Protocol № 2 от 14 " 10 2022 y.

Vice-Rector for Academic Affairs

Institute Director

Department Head

Specialty Council representative from employers

 B.A. Zhautikov  
 A.H. Syzdykov  
 B.T. Ratov  
 D.M. Khitrov