K.Turysov Institute of Geology and Oil and Gas Engineering
Department of "Geophysics"

EDUCATIONAL PROGRAM
8D07104 Oil and gas and ore Geophysics

the cipher and the name of the educational program

Code and classification of the field of education: 8D07 Engineering, manufacturing and construction industries
Code and classification of training areas: 8D071 Engineering and Engineering
Group of educational programs: D109 Petroleum and Ore Geophysics
NQF Level: 8
IQF Level: 8
Duration of training: 3 years
Volume of credits: 180

Almaty 2022

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

Protocol № 4 of January 14, 2020

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

Full name	Academic degree/ academic title	Post	Place of work	Signature
Chairman of the Academic Committee:				
Iskakov R.M.	Professor, PhD	Vice-Rector for Academic Work	JSC Kazntu Named after K.I.Satpayev	
Teaching staff:				
Abetov A.E.	Doctor of Geological Sciences, Professor	Head of the Department of "Geophysics"	JSC Kazntu named after K.I.Satpayev	
Umirova G.K.	Doctor Ph.D	Assoc.Professor	JSC Kazntu named after K.I.Satpayev	
Employers:				
Kovrizhnykh P.N.	Candidate of Geological Sciences, Laureate of the State Prize of the Republic of Kazakhstan in the field of science and technology named after Al-Farabi	1 Deputy. General Director of the Geoken SPC	SPC "GEOKEN" LLP	
D. Khitrov	c.t.s.	PGS Center Manager	«PGS Kazakhstan LLP»	
A.Zh.Akhmetzhanov	к.g-м. Sciences	Chief Geologist	KNOC	
From partner universities:				
V.I. Kostitsyn	Doctor of Technical Sciences, Professor	Head of the Department of Geophysics	Perm State National Research University	
S.O.Makarov	Doctor of Physical and Mathematical Sciences	Vice-Rector for Science	Perm State National Research University	
V.I. Isaev	Doctor of Geological Sciences	professor, corresponding member. Russian Academy of Sciences	Tomsk State Technological University	
Students				
Isagalieva A.K.	Master of Engineering and Technology	Lecturer of the Department of Geophysics	JSC Kazntu named after K.I.Satpayev	
Aliakbar M.	Master of Engineering and Technology	Lecturer of the Department of Geophysics	JSC Kazntu named after K.I.Satpayev	

Table of contents

List of abbreviations and designations

STATE – state mandatory standards of education;
ICT – information and communication technologies;
KazNRTU – Kazakh National Research Technical University;
MES RK – Ministry of Education and Science of the Republic of Kazakhstan;
NQF – National Qualifications Framework;
GCC – general cultural competencies;
GPC– general professional competencies
IQF – Industry Qualifications Framework;
PC – professional competencies;
RAS RF– Republican Academy of Sciences of the Russian Federation;
LO – learning outcomes of the educational program;
S – special and managerial competencies.

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) they receive high-quality and professional knowledge on the stages and rational complexes of geological and geophysical research, organization and conduct of field, borehole and aero-geophysical observations, hardware, methodological and software, including processing, interpretation and modeling of the data obtained;

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 field of training 8D07104 "Oil and gas and ore geophysics" are preparing for research and scientific and 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

The purpose of the EP:

Training of highly qualified specialists for scientific, scientific-pedagogical, industrial and innovative fields of activity in solving geological problems related to:

- search and development of mineral deposits based on the use of innovative methods and technologies of geophysical research (including modern software) with the use of advanced means of registering geophysical fields;

- creation of new and improvement of existing theories and methods of measuring geophysical fields, methods of processing and geological interpretation of measurement results, technologies for the application and equipment of field geophysical methods, logging, laboratory methods for studying rocks in order to reproduce the mineral resource base by searching for minerals, reliable assessment of their reserves, geological justification of optimal development of deposits, taking into account conditions and requirements of rational subsoil use.

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	Code and classification of training areas: 8D071 Engineering and Engineering
3	Group of educational programs	D109 Petroleum and ore geophysics
4	Name of the educational program	8D07104 "Oil and gas and ore geophysics"
5	Brief description of the educational program	The content of the PhD program in the direction of "Oil and gas and ore geophysics" is based on 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. 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. The educational program of the doctoral program in the direction 8D07104 "Oil and gas and ore geophysics" provides: - 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 aero-geophysical research in the search and exploration of mineral deposits. - 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 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, and also 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.
6	Purpose of the EP	- Training of highly qualified specialists for scientific, scientific-pedagogical, industrial and innovative fields of activity in solving geological problems related to: - search and development of mineral deposits based on the use of innovative methods and technologies of geophysical research (including modern software) with the use of advanced means of registering geophysical fields; - creation of new and improvement of existing theories and methods of measuring geophysical fields, methods of processing and geological interpretation of measurement results, technologies for the application and equipment of field geophysical methods, logging, laboratory methods for studying rocks in order to reproduce the mineral resource base by searching for minerals, reliable assessment of their reserves, geological justification of optimal development of deposits, taking into account conditions and requirements of rational subsoil use.
7	Type of EP	New
8	The level of the NQF	8
9	IQF Level	8
10	Distinctive features of the EP	no
11	**General cultural competencies (GC):** GC1 – ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction; GC2 – understanding and practical use of healthy lifestyle norms, including prevention issues, the ability to use physical culture to optimize performance; GC3 – the ability to analyze the main stages and patterns of the historical development of society for the formation of a civic position; GC4 – the ability to use the basics of philosophical knowledge to form a worldview position; GC5 – the ability to critically use the methods of modern science in practice; GC6 – awareness of the need and acquisition of the ability to independently study and improve their qualifications throughout their working life; 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;	

	GC8 – The ability to use the basics of economic knowledge in various fields of activity. **General Professional Competencies (GPC):** GPC-1 – the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities; 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; 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; 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. **Professional Competencies (PC)** 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; 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; 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; PC 4 – the ability of general technical and administrative management, planning and ensuring timely execution of field geophysical surveys using modern geophysical complexes.; 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; PC 6 – the ability to organize and guide geological interpretation. Ensuring the implementation of geological and geophysical modeling methods for assessing prospects and calculating mineral deposits. Creating a digital archive of reporting data; PC 7 – the ability to coordinate and guide the interaction of structural units in the preparation of accounting documentation; PC 8 – the ability to independently carry out production field, laboratory and interpretation work in solving practical problems of geophysics; 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.	
12	**Learning outcomes of the educational program:** LO1: apply knowledge in the field of oil and gas and ore geophysics in their scientific, educational, industrial and innovative fields of activity; LO2: 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; LO3: demonstrate teaching and leadership skills of bachelors, undergraduates; LO4: to organize and conduct scientific and applied research, experiments according to a given methodology, independently compile a description of the research conducted in the oil and gas field; LO5: 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; LO6: Demonstrate high professional qualities and ethics when interacting with various stakeholders	
13	Form of training	full - time

14	Duration of training	3
15	Volume of loans	180
16	Languages of instruction	russian
17	Academic degree awarded	doctor
18	Developer(s) and authors:	Professor Gabitov A.E., Associate Professor Umirova G.K.

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	Methods of scientific research	The purpose of studying the discipline is to master the theoretical and practical foundations of building digital 3D physical and geological models in order to calculate reserves in mineral deposits. Modern classifications of reserves of mineral deposits in their preparation for industrial development are considered. Modern methods of three-dimensional geological modeling of mineral deposits are studied on the basis of effective integration of geological and geophysical data.	2/0/1	✓	✓	✓		✓	✓
2	Academic Writing	The discipline forms skills and competencies for expressing the results of scientific research in the form of a clear, argumentative scientific text. The results of the training will help in working with information in various scientometric databases, in creating your own original view of a particular solution of scientific research, in reviewing scientific articles related to the field of study	0/0/3	✓	✓	✓			✓
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	10	✓		✓	✓		✓

		pedagogical skills of conducting training sessions and preparing teaching materials in the disciplines of the educational program "Oil and gas and ore geophysics". The basis for conducting pedagogical practice is the Department of Geophysics of the IGNGD KazNITU named after K.I. Satpayev. The objectives of the practice are to gain experience in teaching work, as well as: - formation of a holistic view of pedagogical activity, pedagogical systems and the structure of higher education; - development of stable skills of practical application of professional and pedagogical knowledge obtained in the process of theoretical training; - 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.							
Cycle of basic disciplines Component of choice									
4	A systematic approach to the study of oil and gas bearing formations	The features of the application of methods of systematic analysis of geological, geophysical, field and technological information in the search, exploration and additional exploration of oil and gas bearing formations in hydrocarbon deposits 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 of the entire process, from the forecast stage to the industrial	2/0/1	✓				✓	✓

		assessment of hydrocarbon accumulations is substantiated. The concepts of a systematic approach, the levels of organization of geological formations and their hierarchy in the study of oil and gas reservoirs are described. The definition of the boundaries of the system and the differences from the host environment, the structurality of the exploration process in the study of these systems, implying both the sequence of stages and stages of the process of prospecting and exploration, and the structure of methods used to solve prospecting and exploration tasks. The course is focused on the study of methods of system analysis in solving the problems of organizing and optimizing the exploration process based on the basic principles of the system approach: integrity, structurality, hierarchy, interdependence of the system and the environment; on the development of rational methods of prospecting and exploration of oil and gas deposits.							
5	Construction of a 3D physico-geological model and calculation of hydrocarbon reserves based on the results of a comprehensive interpretation of geological and geophysical data	The purpose of studying the discipline is to master the theoretical and practical foundations of building digital 3D physical and geological models in order to calculate reserves in mineral deposits. Modern classifications of reserves of mineral deposits in their preparation for industrial development are considered. Modern methods of three-dimensional geological modeling of mineral deposits are studied on the basis of effective integration of geological and geophysical data.	2/0/1		✓			✓	✓
6	Forecasting of the geological section and estimation of	The course is designed to study: - forecasting the lithological composition and conditions of formation of sedimentary	2/0/1	✓	✓				✓

	reserves of mineral deposits	cover rocks before drilling operations; - identification of reservoirs, determination of types of structural traps and search for non-anticlinal hydrocarbon deposits, determination of the type of fluid in the reservoir under natural conditions; - construction of geological columns for forecasting at the well sites; - estimates of the values of abnormally high reservoir pressure; - detailed structure of productive horizons based on a comprehensive analysis of seismic and GIS data.							
Cycle of profile disciplines **University component**									
7	Research practice	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. <u>The objectives of the research practice are:</u> - 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; - 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; - organization of practical use of the results of scientific research, including publications,	10	✓	✓		✓	✓	✓

		promotion of the results of their own scientific activities. The objectives of the research practice are: - 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; - obtaining practical knowledge on the identification of oil and gas prospective structures and ore areas, nodes and fields, deposits of solid minerals; - study of data collection and storage systems and methods of their processing, interpretation and modeling; mastering technical means of presenting scientific results; - acquisition of professional competencies in accordance with the types and tasks of geological exploration. 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. The research practice plan is drawn up individually for each doctoral student and is a program of theoretical, experimental or field work.							
Cycle of profile disciplines **Component of choice**									
8	A systematic approach to forecasting and typification of solid mineral deposits	The purpose of the course is to master theoretical knowledge on basic forecasting methods in a complex geological environment; to form a body of knowledge in the field of industrial use of various types of solid minerals, principles of technological and industrial	2/0/1	✓			✓	✓	

		typification of minerals, their industrial and genetic types. The course is focused on: - study of methods of systematic analysis of geological and geophysical data in the search, exploration and additional exploration of deposits of solid minerals; justification of the need for effective management of the development of these deposits based on a systematic approach of the entire process, from the forecast stage to industrial evaluation; - understanding and assimilation of the 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. At the same time, attention is focused on the classification of ore-forming processes based on the principles of the theory of systems, the principles of the formation typification of mineral deposits, as well as the placement of ore fields, deposits, their internal structure, the scale and practical significance of the mineral resources contained in them are revealed.							
9	Theoretical foundations of interpretation of potential fields	The role and place of potential fields in the complex of geological and geophysical works, as well as methods and methods of studying these fields, modern technologies for solving direct and inverse problems from the point of view of geological interpretation of geophysical data are considered. The goals, objectives, and basic algorithms of geological interpretation of potential fields are studied. The importance of a priori and a posteriori physico-geological information in the allocation of a useful signal and interference is shown; the	2/0/1		✓		✓		

		reliability of the approximation process and the solutions obtained.							
10	Theory and practice of interpretation and geological modeling of potential geophysical fields	The course is designed to study the current state of the theory and practice of interpretation of gravimetry, magnetometry, and electrometry data. Theoretical aspects, modern algorithms and computer technologies of processing and geological interpretation of geophysical fields are considered; principles of integration of geophysical methods. 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 study, optimal parameters of models and types of interference, complex interpretation of geophysical materials based on modeling.	2/1/0	✓	✓		✓		
11	Field and geophysical control over the development of hydrocarbon deposits	The course is aimed at studying: the basics 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. Considers the theory, processing and application of hydrodynamic, geophysical and field-technological methods of research of the exploited well stock; methodological criteria of the development control system, technologies of automated analysis and application of the results of system borehole studies in the creation of digital dynamic models of deposits and the preparation of project documents.	2/0/1	✓			✓	✓	
12	Complex geological and geophysical research for the purpose of	The course is aimed at studying the patterns of oil and gas placement in unconventional reservoirs. Definition of basic concepts. The focus of attention is put on the	2/1/0	✓	✓			✓	

	searching and exploration of unconventional reservoirs	consideration of the structure, history of formation and conditions of occurrence and potential areal distribution of unconventional and complexly constructed oil and gas reservoirs of sedimentary, metamorphic, magmatic genesis. A large place in the course is devoted to the methods of studying unconventional reservoirs, oil and gas mother rocks, tires, reservoir properties of rocks of unconventional reservoirs (porosity and permeability) and characteristics of the void space of these reservoirs.							
13	Modeling of geological environments based on geophysical data	The course is aimed at studying: - theoretical and methodological foundations for the construction of three-dimensional digital geological models based on geophysical data to solve the problems of prospecting and exploration of mineral deposits; - calculation of mineral reserves; - - planning of industrial development of a mineral deposit; - conducting engineering surveys and environmental monitoring of subsurface resources; - principles of construction of quantitative physico-geological models (FGM); - the main components of modeling: object, parameters and characteristics of the object, process and simulation results;	2/0/1		✓		✓	✓	✓

5. Curriculum of the educational program

K.I. SATPAYEV KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY

SATBAYEV UNIVERSITY

I APPROVE
Chairman of the
Management Board
Rector of Kaz NRTU
named after K.I.Satpayev
_____ M.M.Begentaev
«____» _____ 2022

CURRICULUM

EDUCATIONAL PROGRAMS for recruitment for the 2022-2023 academic year
Educational program 8D07104 - Oil and gas and ore geophysics
Group of educational programs D109 - Petroleum and ore geophysics

Form of study: full-time **Period of study**: 3 years **Academic degree:** Doctor of Philosophy (Ph.D.)

Discipline code	Name of disciplines	Cycle	Total amount in loans	Total hours	Classroom volume of lek/lab/pr	SRS (including SRSP) in hours	Form of control	Distribution of classroom classes by courses and semesters					
								I course		2 course			
								1 term	2 term	3 term	4 term	5 term	6 term
CYCLE OF BASIC DISCIPLINES (BD)													
M-1. Basic training module (university component)													
GPH323	Methods of scientific research	BD UK	5	150	2/0/1	105	Э	5					
LNG305	Academic Writing	BD UK	5	150	0/0/3	105	Э	5					
Component of choice													
GPH324	A systematic approach to the study of oil and gas bearing formations	BD CC	5	150	2/0/1	105	Э	5					

GPH301	Construction of a 3D physico-geological model and calculation of hydrocarbon reserves based on the results of a comprehensive interpretation of geological and geophysical data												
GPH302	Forecasting of geological section and estimation of mineral deposit reserves												
CYCLE OF PROFILE DISCIPLINES (PD)													
M-2. Profile training module (optional component)													
GPH325	A systematic approach to forecasting and typification of solid mineral deposits	PD, CC	5	150	2/0/1	105	Э	5					
GPH304	Theoretical foundations of interpretation of potential fields				2/0/1								
GPH305	Theory and practice of interpretation and geological modeling of potential geophysical fields.				2/1/0								
GPH326	Field and geophysical control over the development of hydrocarbon deposits	PD, CC	5	150	2/0/1	105	Э	5					
GPH315	Complex geological and geophysical research for the purpose of searching and exploration of unconventional reservoirs				2/1/0								

GPH322	Modeling of geological environments based on geophysical data				2/0/1								
M-3. Practice-oriented module													
AAP350	Pedagogical practice	BD UK	10						10				
AAP355	Research practice	PD UK	10							10			
M-4. Research module													
AAP336	Research work of a doctoral student, including internships and the completion of a doctoral dissertation	RWDS (UK)	5					5					
AAP347	Research work of a doctoral student, including internships and the completion of a doctoral dissertation	RWDS (UK)	40						20	20			
AAP356	Research work of a doctoral student, including internships and the completion of a doctoral dissertation	RWDS (UK)	60								30	30	
AAP348	Research work of a doctoral student, including internships and the completion of a doctoral dissertation	RWDS (UK)	18										18

M-5. Module of final certification													
ECA303	Writing and defending a doctoral dissertation	FC	12										12
	Total by UNIVERSITY:							30	30	30	30	30	30

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
			university component (UC)	component of choice (CC)	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***
FC	Final certification	12			12
	TOTAL:	**12**	**30**	**15**	**180**

The decision of the Academic Council of KazNRTU named after K. Satpayev.
Protocol № 13 of «28» 04 2022

The decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev.
Protocol №. 7 of «26» 04 2022

Decision of the Scientific Council of the Institute of Geology and Oil and Gas Business
Protocol № 4 of «30» 12 2021

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

Director of the Institute **A.H.Syzdykov**

Head of the Department **A.E.Abetov**

Representative of the Specialty Council from employers **D.M.Khitrov**