

«Kazakh national research technical University named after K. I. Satpayev»

Institute of «Geology, Oil and Mining  
named after K. Turysov»

Department of «Geophysics»

## CURRICULUMPROGRAM

Doctor of Philosophy in the educational program  
8D07104- «OIL-GAS AND ORE GEOPHYSICS»

2nd edition  
in accordance with the SES of higher education 2018

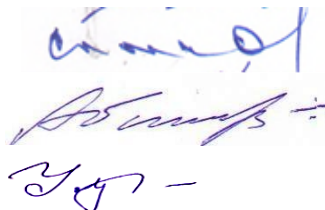
**Almaty 2021**

Developed:	Considered: meeting of the US Institute	Approved: UMS KazNTU	Page 1 of 38
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**The program is drawn up and signed by the parties:**

**From KazNRTU named after K. Satpayev::**

- 1. Director of the Institute**
- 2. Head of Department**
- 3. Secretary of Teaching group  
Department, Senior Lecturer**



**A.Kh. Syzdykov**  
**A.E. Abetov**  
**G.K. Umirova**

**From the employer:**

1. Cand. GEOL.-mineral. Sciences, 1 Deputy General Director of SPC "GEOKEN", Winner State prize of the Republic of Kazakhstan in field of science and technology named after al-Farabi, P. N. Kovrizhnykh
2. Data processing center Manager of "PGS Kazakhstan LLP" Ph. D., D. M. Khitrov
3. Chief geologist of KNOC, PhD., A. Zh. Akhmetzhanov

**From partner Universities (Perm State national Research University, Tomsk state Technological University):**

1. Head of the Department of Geophysics, doctor of technical Sciences, Professor, V. I. Kostitsyn
2. Vice-rector for science, S. O. Makarov
3. Dr. GEOL.- doctor of science, Professor, member-Corr. RAS RF, V. I. Isaev

Approved at the meeting of the Educational and methodical Council of the Kazakh national research technical University named after K. Satpayev. Protocol No. 4 of 14.01.2020

**Квалификация:**

Level 8D-National qualifications framework  
 8D07-Engineering, manufacturing and construction industries  
 8D71-Engineering and engineering

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**Professional competence:** providing in-depth theoretical knowledge and practical skills in the field of fundamental research of the earth's crust, methodologies and methods of ground and borehole geophysical research in the search and exploration of mineral deposits.

A graduate of the Department on the doctoral program should know:

- goals and objectives of Geophysics in the system of Earth Sciences;
- to be aware of the social importance of their future profession, have a high motivation to perform professional activities;
- be able to assess the possibilities and navigate the applicability of each geophysical method;
- to possess skills of work with geophysical, geological equipment, with laboratory devices, installations and the equipment and geophysical data;
- have computer skills as an information management tool;
- demonstrate the ability of the research team to participate in the preparation of reports, abstracts, bibliographies on the subject of scientific research, in the preparation of publications;
- to apply in practice methods of collection, processing, analysis and generalization of stock, field and laboratory geological and geophysical information (according to the profile of preparation);
- participate in the organization of scientific and practical seminars and conferences.

## 1. Short description of the program

### *Introduction:*

Doctoral studies in the direction of training 8D07XX "oil And gas and ore Geophysics" provides the formation of General cultural, General scientific, social, information, professional and pedagogical competencies. Doctoral students develop responsibility, commitment to self-development and discovering their creative potential, learns the possession of culture of thinking, the awareness of the social significance of the profession of Geophysics, the ability to make organizational decisions in different situations and readiness to bear responsibility for them.

Doctoral studies in the direction of "oil And gas and ore Geophysics" forms professional competencies that are necessary for solving complex problems and require: the use of in-depth fundamental knowledge; abstract thinking and originality of analysis; goes beyond the issues covered by standards and practice; development of non-standard solutions to problem problems; adaptation to new situations, reassessment of experience, creating new knowledge based on geophysical research; formulation of innovative professional tasks in the field of research and practice; search for optimal solutions to professional problems, taking into account their validity, cost, information, social and economic security; management tasks in the conditions of actual production structures.

The educational program of doctoral studies 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 and borehole geophysical observations, processing, interpretation and modeling of the obtained data; C) acquisition of skills of the analysis of geological and geophysical data, their structuring, classifications of target objects on mineral deposits; statement and the decision of direct and inverse problems at search and exploration of mineral deposits.

For lectures and consultations on modern problems of Geophysics and Geology of solid minerals, oil and gas invited professors from leading Universities near and far abroad, leading experts from manufacturing companies and research institutes.

Doctoral students are trained in research institutes, operators and service companies of the near and far abroad.

Graduates receive the qualification of doctor of engineering and technology in oil and gas and ore Geophysics, work in oil and gas and mining companies, in research institutes in senior positions.

### *The purpose of the educational program:*

Training of highly qualified specialists for scientific, scientific-pedagogical, industrial and innovative spheres of activity in solving geological problems: prospecting and development of mineral deposits on the basis of innovative methods and technologies of geophysical research (including modern software), with the use of advanced means of registration of geophysical fields.

Preparation of the 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.

***The main objectives of the educational program:***

- formation of professional competencies of doctoral students, defined by the profile of "oil And gas and ore Geophysics", which will allow to navigate in modern scientific concepts, competently set and solve research and practical problems, participate in applied activities, possess the basic methods of training, education and knowledge complex, 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;

- improvement of 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 right direction:

- in-depth study of 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;

- training of highly qualified geophysicists with a high level of professionalism, including the culture of professional communication;

- collection, processing, analysis and systematization of scientific and technical information, domestic and foreign experience in oil and gas and ore Geology and Geophysics;

- skills of organizing and conducting scientific and applied research, experiments on a given methodology, drafting of a description of ongoing research;

- 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; training of competitive specialists with a high level of professional culture, in demand in the labor market and possessing a set of necessary knowledge and skills, able to formulate and solve modern scientific and practical problems of oil and gas and ore Geophysics, teach in universities, successfully carry out research and management activities;

- development and introduction into practice of effective mechanisms of integration of higher education with science;

- development of science, technology and technology through research and creative activities of scientific and pedagogical staff and students;

- obtaining knowledge in the field of University pedagogy and psychology and teaching experience in the University.

- development of mutually beneficial international cooperation in the field of higher education.

***Field of professional activity:***

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The area of professional activity of the graduates who have completed the doctoral program in specialization "Oil and gas and mining Geophysics" includes the solution to problems requiring basic and applied knowledge in the Earth Sciences within the basic research areas, geophysical methods of prospecting, exploration and forecast of mineral deposits (including surface and borehole geophysical surveys; geophysical monitoring of the geological environment of the exploited oil and gas and ore deposits), detailed geological and geophysical study of the structure of oil and gas areas and specific deposits, ore areas, areas and deposits of solid minerals.

The professional activity of the PhD student is carried out in: academic and departmental research institutes and organizations; in geological exploration and mining companies and companies engaged in the search, exploration and production of mineral raw materials; organizations associated with environmental monitoring and environmental problems; in General education institutions of secondary and higher professional education.

***Objects of professional activity:***

The objects of professional activities of doctoral students according to specialization "Oil and gas and mining Geophysics" are the upper part of the earth's crust, its composition, structure, and evolution of development; rocks and minerals; mineral deposits and their study, monitoring of the subsurface conditions and forecasts; geophysical fields; natural and technogenic geological processes in the areas of exploited deposits of mineral raw materials, physico-geological model of layers, sections, mineral deposits in their exploration and development; computerized and software-controlled information-measuring and processing systems and complexes.

***Types of professional activity:***

Types of professional activity are: research and teaching activities in the field of Earth Sciences.

Doctoral students in the direction of training 7M071 "oil And gas and ore Geophysics" are preparing for research and scientific and industrial professional activity. According to the received fundamental and professional training they can perform the following activities:

**a) organizational and managerial activities:**

- planning, organization and management of research and production field, laboratory and interpretation geological and geophysical works;
- development of operational work plans of 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 goals and objectives of scientific geological and geophysical research;
- independent selection and development of methods for solving tasks in the field, laboratory, interpretation studies using modern geophysical equipment, instruments and information technologies;

- analysis and generalization 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;

- evaluation of the results of geophysical research, preparation of scientific reports, publications, reports, preparation of applications for inventions and discoveries.

C) research and production activities:

- independent preparation and carrying out production and scientific-production, field, laboratory and interpretation works in solving practical problems in the field of Geology and Geophysics;

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

- 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 information in order to solve scientific and production problems in the field of Geophysics and Geology;

- determination of economic efficiency of scientific and production geological and geophysical research;

- participation in the development of normative methodological documents in the field of geological and geophysical works.

d) project activities:

- design and implementation of scientific and technical projects in the field of 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 training;

- participation in the management of scientific and educational work of students in the field of Geology and Geophysics.

***The subjects of professional activity are:***

Studying the structure of the earth's crust, its physical models and physical properties of rocks; conducting scientific and applied research in the field of geoelectric, seismic, gravimagnetic, nuclear geophysical methods and borehole geophysical observations; conducting field observations, processing, interpretation and modeling of the data obtained in the study of geological objects, as well as measures to ensure safety during geophysical operations and reduce their anthropogenic impact on the environment.

***The spheres of professional activity of doctors are:***

At the profile direction: organizational and technological; settlement and design; service and operational; production and technological activity in:

- Ministry of energy and Ministry of industry and infrastructure development of the Republic of Kazakhstan;

- academic and departmental research organizations related to the solution of 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;
- the organizations connected with environmental monitoring and the solution of ecological problems.

At the scientific and pedagogical direction: organizational and administrative; research; educational (pedagogical) activity of various directions in higher, secondary special and vocational educational institutions.

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

## **2.Scope and content of the program**

The volume of the educational program (OP) of doctoral studies is 75 credits, regardless of the form of training, the educational technologies used, the implementation of programs using the network form according to the individual curriculum.

The contents OP the doctoral studies in the field of "Oil and gas and mining Geophysics" based on the development of multilevel system of training, soundness and quality of education, continuity of education and science, unity of training, education, research and innovation aimed at maximum satisfaction of inquiries of consumers should ensure:

- obtaining 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 evaluation, both in content and in volume;

- training of doctors in the direction of "oil And gas and ore Geophysics", who know the methodological basis, technology and methods of geophysical work, methods of processing, interpretation and modeling of geophysical data;

- training of highly qualified specialists in the field of oil and gas and ore Geophysics, able to apply innovative methods in the search and exploration of mineral deposits;

- development of doctors in the direction of "oil And gas and ore Geophysics" abilities: a) to apply knowledge of fundamental and technical Sciences, including mathematics, physics, chemistry; b) to acquire practical skills of working with geophysical equipment, modern software in the processing, interpretation and modeling of geological and geophysical data with the use of modern information technologies; C) to use the methods, skills and modern technical means necessary for the identification and exploration of oil and gas prospective structures and deposits of solid minerals; d) to apply the methods of system analysis in assessing the obtained geological and geophysical and field-geophysical data;

- formation of doctors in the direction of "oil And gas and ore Geophysics": a) the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve problems; b) the skills to work in a team, 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 works, as well as their results to make management decisions;



- formation at doctors in the direction "oil And gas and ore Geophysics" production and ethical responsibility, ability to understand a problem and from joint work with various experts, to find optimum variants of decisions, needs in improvement of the knowledge and skill;

- knowledge of erudition, knowledge of modern social and political problems, knowledge of state Russian and foreign languages, tools of market economy, safety and environmental protection.

### 3. Requirements for applicants

The main requirements for the applicant are established by the rules of admission to the PhD doctoral program Of the Kazakh national research University named after K. I. Satpayev for the 2018-2019 academic year.

The rules regulate the admission of an applicant for doctoral studies at KazNet on educational programs of higher education-programs of training of scientific and pedagogical personnel in doctoral studies and determine the list of entrance exams for admission to training.

The admission the Ph. D. program KazNTU carried out in the field within the control figures of admission of applicants for education at the expense of budgetary appropriations of the MES, as well as the treaties concluded with the reception for training at the expense of physical and (or) legal entities.

The previous level of education of the applicant-higher education in the direction of training of masters of geological prospecting profile, or in the direction of ore and oil and gas Geophysics.

The applicant must have a state-issued document on higher education (master's degree in Geology or Geophysics).

Admission of persons entering the Kaznita is carried out through the placement of the state educational order (educational grants), as well as payment for training at the expense of citizens ' own funds and other sources.

Admission is carried out according to the applications of the applicant who has completed higher education in full on a competitive basis in accordance with the points in the transcript.

### 4. Requirements for completion of training and obtaining a diploma of doctor of engineering and technology in the direction of " oil And gas and ore Geophysics»

As a result of the development of the doctoral program, the graduate should have formed General cultural, General professional and professional competencies.

The graduate of profile doctoral studies should have an idea about:

- current trends in the development of geophysical specialty;
- actual methodological and philosophical problems of oil and gas and ore Geophysics;
- the current state of the economic, political, legal, cultural and technological environment of the world business partnership.

PhD in "oil And gas and ore Geophysics" should have the ability to:

- to abstract thinking, analysis, synthesis of geological and geophysical information; to be ready to act in non-standard situations, to bear social and ethical responsibility for the decisions made, to show the 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 formulate goals independently.

research and establish the sequence of solving professional problems; apply knowledge of fundamental and applied sections of disciplines that determine the direction (profile) of the doctoral program;

- independently conduct scientific and methodological work and research in Geophysics, summarize and analyze experimental information, draw conclusions, formulate conclusions and recommendations.

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

A graduate of the master's program must have:

- professional competencies (PC) corresponding to the type of professional activity on which the master's program is focused.

- deep systematic knowledge in the field of geophysical methods of prospecting and exploration of mineral deposits.

Doctors in the field of "oil And gas and ore Geophysics" should have:

- skills of carrying out independent production and scientific-production field, laboratory and interpretation geophysical works;

- communication skills to present suggestions and recommendations orally and in writing.

- skills of drawing up and registration of scientific and technical documentation, scientific reports, reviews, reports and articles.

They should be able to:

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

- professionally operate modern field and laboratory equipment and devices;

- to use effective methods of processing and interpretation of complex information to solve production problems; to create and research models of the studied objects on the basis of in-depth theoretical and practical knowledge.

- create and research models of the studied objects on the basis of in-depth theoretical and practical knowledge.

PhD in the field of "Oil and gas and mining Geophysics" should be:

- competent 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

modern equipment for solving scientific and practical problems of oil and gas and ore Geophysics;

- socially mobile, be able to adapt to new situations in a professional environment.

They must have the ability to:

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

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

PhD in the field of "Oil and gas and mining Geophysics" needs:

- to appreciate the traditions of other cultures, their diversity in modern society, to have fundamental education, economic, social and legal training;

- be ready for communication in oral and written forms in Kazakh, Russian and foreign languages to solve the problems 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 the environment and, by improving skills, to serve the development of the welfare of the whole society.

## 6. Descriptors of the level and scope of knowledge, skills, skills and competencies

6.1 based on the achievement of training results in the OP "oil And gas and ore Geophysics", the main training framework descriptors based on the Dublin descriptors were adopted:

a	Knowledge and understanding – by demonstrating knowledge and understanding in the field of study formed on the basis of secondary education, including certain advanced knowledge in the field of study
B	Application of knowledge and understanding – by applying their knowledge and understanding of actions that indicate a professional approach to the profession through a set of competencies demonstrated through the formation and justification of arguments and solutions to problems in the field of study
c	Expression of judgments and analysis of actions - by accumulating, evaluating, processing and interpreting data, knowledge and skills in order to develop independent judgments based on the analysis of social, ethical and scientific considerations
d	Communication skills and it skills - by transmitting real and virtual information, problems, their solutions, ideas, and their implementations to both specialists and non-specialists in the field of study
e	Self-learning and existential skills-by developing self-learning and retraining skills with a high degree of autonomy in the field of study and related fields.

6.2 on the basis of achieving the results of training in the OP "oil And gas and ore Geophysics", the main framework competencies were adopted

a	Natural-scientific and theoretical-worldview competencies
B	Social and personal and civic competencies
c	General engineering professional competencies
d	Communication and it virtual competencies
e	Special-professional competencies, including additional ones (Minor).

6.3 on the basis of the training descriptors and the main framework competencies, the framework characteristic of the Ph. D doctor's competencies has been adopted, which guarantees the achievement of a competitive level in the professional activity market.

Based on the specified scope of competence of the doctor Ph.D teachers of the Department of Geophysics form the results of training, competencies, subcompetencies and matrix of competencies of disciplines that are part of RUP OP 8D07104 - "oil And gas and ore Geophysics" (table 7.1).

## 7. Competencies acquired by doctoral students during the development of the educational program 8D07104 - " oil And gas and ore Geophysics»

General cultural competence (OC) is aimed at forming the basic competence of the individual, ensuring entry into the world space of culture and self-determination in it, mastering the norms of speech etiquette and literary language, as well as the culture of interethnic communication				
OK-1	Ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction			
OK-2	Understanding and practical use of healthy lifestyle norms, including prevention issues, the ability to use physical culture to optimize performance			
OK-3	Ability to analyze the main stages and patterns of historical development of society for the formation of a civil position			
OK-4	Ability to use the basics of philosophical knowledge to form a worldview position			
OK-5	Ability to critically use the methods of modern science in practice			
OK-6	Awareness of the need and acquisition of the ability to independently study and improve their skills throughout their working life			
OK-7	Meaning and understanding of professional ethical standards, knowledge of professional communication techniques. Ability to work in a team, tolerant of social, ethical, religious and cultural differences			
OK-8	Ability to use the basics of economic knowledge in various fields of activity			
General professional competencies are aimed at developing skills for professional selection and creative use of modern scientific and technical tools for solving scientific and practical problems of Geophysics				
ОПК-1	The ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities			
ОПК-2	Ability to apply in practice knowledge of fundamental and applied sections of geophysical disciplines that determine the direction (profile) of the doctoral program in Geophysics			
ОПК-3	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 with the use of complex geophysical and interdisciplinary research			
ОПК-4	Understanding the essence and significance of the relationship between theoretical and practical research in Geophysics, which allows us to effectively and efficiently solve geological and geophysical problems			
Professional competencies (PC) are aimed at providing deep theoretical knowledge and practical skills in Geophysics in accordance with the requirements of industry professional standards				
ПК 1	Knowledge of promising areas of development and problems of Geophysics, the current level of elaboration of problems. Ability to participate in work on innovative projects, set specific geophysical tasks and solve them using modern equipment, software and information technologies using the latest domestic and foreign experience			
ПК 2	The ability to form diagnostic solutions to professional geophysical problems by integrating fundamental and applied sections (gravimagnetization, geoelectrics, well 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 Geophysics problems			
ПК 3	Ability to provide General technical and administrative guidance and ensure timely collection of materials for field geophysical work. General technical and administrative management and ensuring timely execution of works on preparation of geophysical equipment and observation systems for stationary and field geophysical measurements.			
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ПК 4	Ability of General technical and administrative management, planning and ensuring timely execution of field geophysical surveys using modern geophysical systems.
ПК 5	Ability to organize and manage primary field and Desk processing of field geophysical data results and transformation of the obtained data for analysis and effective interpretation. Ability to ensure timely execution of the interpretation of geophysical data, registration of results
ПК 6	Ability to organize and guide geological interpretation. Provision of geological and geophysical modeling methods for evaluating prospects and calculating mineral deposits. Creating a digital archive of reporting data
ПК 7	Ability to coordinate and manage the interaction of structural divisions in the preparation of accounting documents.
ПК 8	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.



Year of study	Full-time study								Study							
	Code	Name of the discipline	Component	Academic credits	Total hours	lect/lab/pract	IWD (including IWDI), in hours	Prerequisites	Code	Name of the discipline	Component	Academic credits	Total hours	lect/lab/pract	IWD (including IWDI), in hours	Prerequisites
1	1 semester								2 semester							
	GPH523	Research methods	BD IC	5	150	2/0/1	105		AAP345	Doctoral student research work, including internships and doctoral dissertations	DSRW	24				
	LNG305	Academic writing	BD IC	5	150	2/0/1	105		AAP350	Pedagogical practice	BD	10				
	1203	ELECTIVES	BD OC	5	150	2/0/1	105	GPH280								
	1301	ELECTIVES	PS OC	5	150	2/0/1	105	GPH272								
	1302	ELECTIVES	PS OC	5	150	2/0/1	105	GPH223								
		In total			25					In total		34				
2	3 semester								4 semester							
	AAP345	Doctoral student research work, including internships and doctoral dissertations	DSRW	24					AAP346	Doctoral including dissertations	DSRW	25				
	AAP355	Research scientific training	PS	10												
	In total			34					In total		25					
3	5 semester								6 semester							
	AAP346	Doctoral student research work, including internships and doctoral dissertations	DSRW	25					AAP346	Doctoral including dissertations	DSRW	25				
									ECA303	Writing and defending doctoral dissertation	FA	12				
	In total			25					In total		37					
									In all		180					

The decision of the Academic Council of the Institute Protocol No 5 from 24.12.2020  
 Vice-Rector for Academic Affairs *[Signature]* B.A.  
 engineering *[Signature]*  
 A.E. Abetov

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### 7.1 Competence Matrix of the educational program 8D07104 – «Oil-gas and ore Geophysics»

Index disciplines	Name of discipline	General cultural									General-professional					Professional											
		GC-1	GC-2	GC-3	GC-4	GC-5	GC-6	GC-7	GC-8	GC-9	GPC-1	GPC-2	GPC-3	GPC-4	GPC-5	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8	PC-9	PC-10	PC-11	PC-12
<b>Required component</b>																											
GPH323	Research methods					+			+		+	+	+		+												
LNG305	Academic writing	+		+	+			+	+		+	+	+														
GPH324	A systems concept to the study of oil and gas reservoirs				+						+	+	+	+		+	+		+	+							
<b>Professional component</b>																											
GPH325	A systems concept to forecasting and typing of solid mineral deposits											+	+	+	+		+	+					+	+			
GPH326	Field geophysical monitoring for hydrocarbon deposit development											+	+	+	+		+	+					+	+			
<b>State final attestation</b>																											
ECA303	Writing and defending doctoral dissertation																										
<b>Additional types of training</b>																											
AAP345	Doctoral student research work, including internships and doctoral dissertations																										
AAP346	Doctoral student research work, including internships and doctoral dissertations																										
AAP355	Research scientific training																										
AAP350	Pedagogical practice																										



### **7.5. Requirements for research / experimental research work of a doctoral student**

Research/experimentally-research work in the doctoral program must:

- to correspond to the main problems of the specialty on which the doctoral dissertation is defended;
- to be actual, to contain scientific novelty and practical significance;
- based on modern theoretical, methodological and technological achievements of science and practice;
- be carried out using modern methods of scientific research;
- contain research (methodological, practical) sections on the main protected provisions;
- based on international best practices in the relevant field of knowledge.

The research work of a doctoral student (R & D), performed by a doctoral student studying the program "oil And gas and ore Geophysics", has a theoretical, methodological or computational nature. The main form of planning and adjustment of individual research plans of students is the justification of the topic, discussion of the plan and intermediate results of research in the framework of scientific seminars.

NIRD is performed at the graduate Department of Geophysics and may include:

- study of special literature in the field of oil and gas and ore Geology and Geophysics, collection of geological and geophysical information, including achievements of domestic and foreign science and technology;
- collection, processing, analysis and systematization of geological and geophysical information on the topic of final qualifying work (dissertation);
- participation in scientific and applied research carried out at the Department of Geophysics, including the use of modern software;
- preparation of separate sections of scientific reports on the subject of geological and geophysical research carried out at the Department of Geophysics;
- preparation of reports at intra-University, regional or international scientific conferences, allowing to assess the level of acquired knowledge, skills and competencies of doctoral students;

In the process of scientific research and in the course of protection of its results should be widely discussed at scientific seminars, conferences, etc., allowing to assess the level of acquired knowledge, skills and formed competencies of students;

The volume of doctoral research is 20 credits (300 academic hours).

The program of scientific researches of the doctoral student is an individual and is reflected in his individual work plan.

### **7.6. Requirements for the organization of research practice**

Geophysical research practice takes place at the place of execution of the dissertation and strengthens the knowledge and skills acquired by doctoral students as a result of the development of theoretical disciplines, develops practical skills and contributes to the complex formation of professional and General professional competencies.

In the implementation of the educational program for doctoral studies provides for geophysical research practice in the second and third semesters in the amount of 5 credits or 75 academic hours.

The objectives of the research practice are:

- development by doctoral students of methods and principles of carrying out field and office geophysical works, studying of ways of planning of such works;
- development by doctoral students of methods and principles of carrying out field and office geophysical works, studying of ways of planning of such works; obtaining experimental (theoretical, laboratory, field) material for writing of the doctoral dissertation;
- consolidation of skills of scientific or production work of doctoral students in oil and gas and ore Geophysics; formation at them of abilities and skills of drawing up scientific and technical reports and public presentations;
- organization of practical use of the results of scientific research, including publications, promotion of the results of their own scientific activities.

Geophysical research practice is based on courses of specialized disciplines included in the variable part: a) theory and practice of interpretation and geological modeling of potential geophysical fields; b) a systematic approach to the forecast and typification of deposits of solid minerals; C) a systematic approach to the study of oil and gas reservoirs; d) field and geophysical control over the development of hydrocarbon deposits.

The objectives of the research practice are:

- ensuring the direct participation of the student in research works on oil and gas and ore Geophysics in order to obtain the necessary material to solve the scientific problem or to solve the practical geological and geophysical problem;
- obtaining practical knowledge during geophysical research in order to identify oil and gas prospective structures and ore areas, nodes and fields, deposits of solid minerals;
- familiarization with geophysical equipment and study of data collection and storage systems and methods of their processing, interpretation and modeling; development of technical means of presentation of scientific results;
- acquisition of professional competencies in accordance with the types and tasks of exploration;

Forms of conducting geophysical research practice: field, laboratory, office.

The content of the research practice of a doctoral student in the direction of "oil And gas and ore Geophysics" depends on the direction (theoretical, practical), the task and the theme of the doctoral dissertation. It is directly related to the nature and direction of scientific activities of the organization in which the doctoral student is practicing.

The plan of geophysical research practice is made individually for each doctoral student and is a program of theoretical, experimental or field work in the field of oil and gas and ore Geophysics.

### **8. Supplement to the diploma according to the standard ICES**

The application is developed according to the standards of the European Commission, the Council of Europe and UNESCO / CEPES. This document serves only for academic recognition and is not an official confirmation of the document on education. Without a higher education diploma, it is not valid.

Разработано:	Рассмотрено: заседание УС Института	Утверждено: УМС КазННТУ	Страница 18 из 33
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The purpose of filling out the European application is to provide sufficient data on the holder of the diploma, the qualification obtained, the level of this qualification, the content of the training program and the results, the functional purpose of the qualification, as well as information on the national education system. The application model on which the estimates will be translated uses the European transfer or credit transfer system (ECTS).

The European diploma Supplement provides an opportunity to continue education in foreign universities, as well as to confirm the national higher education for foreign employers. When traveling abroad for professional recognition will require additional legalization of the diploma of education. The European diploma Supplement is completed in English on individual request and is issued free of charge.

According to the sectoral framework of qualifications for doctors in the field of oil and gas and ore Geophysics, geological exploration includes regional and large-scale geophysical and other surveys, various types of prospecting, exploration, hydrogeological and engineering-geological works, the implementation of which is carried out within the framework of the Code of the Republic of Kazakhstan "on subsoil and subsoil use. Code of the Republic of Kazakhstan from December 27, 2017, No. 125 VI SAMS (as amended by the Law dated 24.05.2018 No. 156) and the decree of the government of the Republic of Kazakhstan dated 13 August 2012 No. 1042 "On the Concept respiteservices industry of the Republic of Kazakhstan till 2030".

The technological sequence of work on the implementation of this mission involves the preparation of materials and equipment for geophysical work, design, field and field geophysical work, as well as office processing and registration of the results of complex and specialized geological works, which require the involvement of geophysicists at level 8.

**PhD in oil and gas and ore Geophysics-level 8 industry qualifications framework (ORC):**

*Knowledge*-conceptual professional and / or scientific knowledge (including innovative) and experience in oil and gas and ore Geophysics and/or at the intersection of specialties. Assessment and selection of professional information on geophysical methods of prospecting and exploration of mineral deposits. Creation of new knowledge of applied nature in the field of oil and gas and ore Geophysics. Identification of sources and search for information necessary for the development of activities.

*Skills*-solving problems of technological or methodological nature in oil and gas and ore Geophysics, requiring the development of new approaches, the use of a variety of methods (including innovative). Correction of activity of division or organization. Ability and skills to scientifically justify the setting of goals and the choice of methods and means to achieve them.

*Personal and professional competences*

Independence: setting the tasks of both complex and specialized geological and geophysical research to identify promising objects and processes in demand in the domestic market. Provides a choice of methods and techniques of geophysical works, their high-quality performance and obtaining specific results.

Responsibility: for the planning, development and results of business processes that may lead to significant changes or development. Responsible for personnel safety, labor and environmental protection.

Complexity: activities involving the solution of development problems, the development of new approaches in oil and gas and ore Geophysics, the use of various geophysical methods.

Ways to achieve the qualification of the appropriate sublevel-doctoral studies and practical experience

Recommended job titles-chief geophysicist; Director of the Department.



**SATBAYEV**  
UNIVERSITY

**Satbayev Kazakh National Research Technical University**  
**Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық университеті**

**DIPLOMA SUPPLEMENT**

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*This Diploma Supplement follows the model developed by the European Commission, Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value - judgements, equivalence statements or suggestions about recognition. Information should be provided in all eight sections. Where information is not provided, a reason should be given.*

INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION		
.1	Family Name	
.2	Given Name	
.3	Date of Birth (Day/Month/Year)	
.4	Doctorate Student Identification Number	
INFORMATION IDENTIFYING QUALIFICATION		
.1	Title of Qualification and the Title Conferred	PhD in Technics and Technology. Level 8
.2	Major	«Oil and Gas and Ore Geophysics»
.4	Name and Status of Awarding University in original language	Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық зерттеу университеті
.5	Name and Status of Awarding University in English	Satbayev Kazakh National Research Technical University
.6	Language of Instruction	
INFORMATION ON THE LEVEL OF THE QUALIFICATION		
.1	Level of Qualification	PhD's level/ second-cycle degree of higher education
.2	Official Length of Program	3 years
.3	Access Requirements	
INFORMATION ON THE CONTENTS AND RESULTS GAINED		
	Mode of Study	Full-Time

.1																																														
.2	Program Requirements	The total credits for theoretical education are 75, including 3 credits for basic disciplines, 15 credits for major disciplines, 5 credits for research practice and 20 credits for research work.																																												
.3	Program Details	<i>Attached in transcript of records</i>																																												
.4	Grading Scheme	<table border="1"> <thead> <tr> <th>Eval uation</th> <th>PA</th> <th>Poin t %</th> <th>Appre ciation</th> </tr> </thead> <tbody> <tr> <td>A</td> <td></td> <td>95- 100</td> <td>"Excell ence"</td> </tr> <tr> <td>A-</td> <td>,67</td> <td>94</td> <td>"Excell ence"</td> </tr> <tr> <td>B+</td> <td>,33</td> <td>89</td> <td>"Good"</td> </tr> <tr> <td>B</td> <td></td> <td>80- 84</td> <td>"Good"</td> </tr> <tr> <td>B-</td> <td>,67</td> <td>79</td> <td>"Good"</td> </tr> <tr> <td>C+</td> <td>,33</td> <td>74</td> <td>"Pass"</td> </tr> <tr> <td>C</td> <td></td> <td>65- 69</td> <td>"Pass"</td> </tr> <tr> <td>C-</td> <td>,67</td> <td>64</td> <td>"Pass"</td> </tr> <tr> <td>D+</td> <td>,33</td> <td>55- 59</td> <td>"Pass"</td> </tr> <tr> <td>D</td> <td></td> <td>50- 54</td> <td>"Pass"</td> </tr> </tbody> </table>	Eval uation	PA	Poin t %	Appre ciation	A		95- 100	"Excell ence"	A-	,67	94	"Excell ence"	B+	,33	89	"Good"	B		80- 84	"Good"	B-	,67	79	"Good"	C+	,33	74	"Pass"	C		65- 69	"Pass"	C-	,67	64	"Pass"	D+	,33	55- 59	"Pass"	D		50- 54	"Pass"
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D+	,33	55- 59	"Pass"																																											
D		50- 54	"Pass"																																											
<b>INFORMATION ON THE FUNCTION OF THE QUALIFICATION</b>																																														
.1	Access to Further Study	Eligible for second-cycle higher education, graduate programs in master																																												
.2	Professional Status	<p>Under legislation of the Republic of Kazakhstan, a person who was taken Bachelor in Technics is qualified for posts or positions in the industrial, public and scientific sectors for which the qualification requirement is a first higher education degree in major study. In some cases, the qualification requirement also includes the completion of studies in certain specified fields of minor study.</p> <p>The degree is also satisfied and corresponded to the Article 11 of the Directive of the European Parliament on the recognition of professional qualifications under level D of The European Union.</p>																																												
<b>ADDITIONAL INFORMATION</b>																																														
.1	University Address	22 Satpayev Street, Almaty, 050013, Kazakhstan <a href="mailto:allnt@ntu.kzwww.satbayev.university">allnt@ntu.kzwww.satbayev.university</a>																																												
.2	Further information source	<a href="http://edu.gov.kz/ru">http://edu.gov.kz/ru</a>																																												
<b>CERTIFICATION OF THE SUPPLEMENT</b>																																														
.1	Place and Date	“ ___ ’ ___ 201__ Almaty, Kazakhstan																																												
<b>INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM</b>																																														
The education system of the Republic of Kazakhstan consists of basic secondary education, general upper secondary education, vocational upper secondary education, higher education and graduate education. The basic																																														

education consists of a 9-year compulsory school for all children from 6 to 15 years of age.

Post-compulsory education is given by general upper secondary schools for 2 or 3 years and vocational upper-secondary institutions. The general upper secondary school provides a 2- or 3-years, at the end of which the pupil takes the United National Test (UNT) examination for 2-year study and the Matriculation examination for 3-year study. Vocational institutions provide 3-year programs, which lead to upper secondary vocational qualifications with further the Complex Test Attestation (CTA).

General eligibility for higher education is given by the UNT for a 4-year study, the Matriculation examination or the upper secondary vocational qualification with gained CTA results for a 3-year higher education.

Higher education studies are measured in credits. Study courses are qualified according to the workload required. One year of studies is equivalent to 1600 hours of student work on the average and is defined as 36 National credits or 60 ECTS credits. The credit system after recalculation complies fully with the European Credit Transfer and Accumulation System (ECTS).

.1	Univ ersity Degree	The Government Decree on University Degrees (GOSO/2016) defines the compulsory objectives, extent and overall structure of degrees. The universities decide on the detailed contents, curricula, forms of instruction and structure of the degrees they award.
.2	Doct oral Degree (PhD in Science)	Applicants can apply for doctoral (PhD) studies after the completion of a relevant second-cycle degree. General eligibility for PhD education is given by a combination grade of the National Test of English Language unless an applicant has IELTS test results certified 6.0 overall and the Proficiency Examination, which is corresponding to GRE Subject Examination, as well as at least 3 year research experience in the relevant field required. The aim of doctoral studies is to provide student with an in-depth, profound knowledge of their field of science through their scientific research and capabilities to produce novel scientific knowledge or solution independently. The Doctor's degree takes minimum 3 years to complete. An applicant who has been admitted to complete PhD Doctor's degree must take 15 (30 ECTS) credits of interdisciplinary study, show independent and critical thinking in the field of research and write PhD dissertation to defend in public.

## RESEARCH METHODS

CODE- MET323

ACADEMIC CREDITS- 5 (2/0/1/2)

PREREQUISITES – GPH306, GPH220, GEO214

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### COURSE OBJECTIVE

The purpose of the course is to master the knowledge of doctoral students and develop their ability to form scientific theories, approaches to solving fundamental and applied problems, innovations and innovation processes.

### COURSE OBJECTIVE

Based on the analysis, systematization and generalization of the results of scientific research in the field of Geology through the use of a complex of geological and geophysical methods to develop the ability of doctoral students to apply their knowledge in the process:

- basic geological research;
- applied geological research;
- development of forecast maps;
- marketing and implementation of developments in exploration organizations.

The objectives of the discipline are determined by the content of the subject and the methods of mastering the course, based on the instrumental means of information analysis. The objectives of the course are:

- study of research methodologies and methods in the exploration process;
- study of the possibilities of modern information technologies and systems for the implementation of research in the exploration industry;
- formation of logical thinking necessary for doctoral students to use the methodological foundations of research, as well as conducting a comprehensive research project;
- development of analytical skills, and formation of a systematic vision of the processes occurring in the exploration industry.

### KNOWLEDGE, SKILLS AT THE END OF THE COURSE

At the end of the course, doctoral students must

#### **Know:**

- Regularities and trends in the development of geological Sciences.
- methodology of scientific research.
- methodology of basic scientific research

#### **Be able to:**

- apply theoretical and practical knowledge in the process of conducting independent scientific research,
- process fundamental and current scientific information in the chosen field,
- independently make generalizations and scientific conclusions.



**Own:**

In the course of mastering the discipline, doctoral students will acquire the following competencies aimed at developing:

- ability to use quantitative and qualitative methods for conducting scientific research and managing exploration processes;
- ability to independently develop new research methods, to change the scientific and scientific-industrial profile of their professional activities;
- proficiency in methods of geological scientific research and its essence;
- ability to prepare analytical materials for analysis, synthesis, systematization and classification of experimental data (geological, geophysical, geochemical, etc. observations). A systems concept to forecasting and typing of solid mineral deposits

## ACADEMIC WRITING

CODE- LNG305

ACADEMIC CREDITS- 5 (2/0/1/2)

PREREQUISITES-LNG203

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### COURSE OBJECTIVE

Development of skills and competencies in the field of research and development of skills in writing qualifying studies. The study of the discipline is based on the development and improvement of skills in the field of written scientific and methodological communication, which provides a high level of training for doctoral students, necessary for effective communication in the scientific and academic environment.

#### TASKS OF THE DISCIPLINE

The objectives of the discipline are to familiarize doctoral students with the basic requirements for writing in a scientific language;

- formation of skills for expressing reasoned ideas and opinions in writing, using professional vocabulary and terminology;
- development of text editing skills;
- teaching methods of correct and logical construction of the structure of scientific research;
- preparation for writing articles, research papers and abstracts;
- study of techniques for free and reasoned presentation of thoughts on a scientific professional problem.

#### BRIEF DESCRIPTION OF THE DISCIPLINE

The course is intended for updating and developing knowledge in the field of scientific research and writing qualification papers. The course is aimed at developing and improving competencies in the field of written scientific communication, which provides a high level of training for doctoral students, necessary for effective communication in the academic environment. The objectives of the discipline are to familiarize doctoral students with the basic requirements for writing in a scientific language; to develop the skills of written scientific communication; to develop the ability to Express ideas in writing and argue them; training in methods of structuring academic papers; preparation for writing articles, research papers and annotations; formation of skills for free and reasoned presentation of thoughts on a scientific problem, using the appropriate vocabulary in a professional language; development of text editing skills.

#### KNOWLEDGE, SKILLS AT THE END OF THE COURSE

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

##### **Know:**

- grammatical phenomena necessary for written presentation, translation and editing;
- complex syntactic constructions of scientific and business speech;
- technology for structuring academic text;

- features of the scientific style of written texts; principles of organization of scientific texts;
- vocabulary that represents a neutral scientific style and structure of business writing;
- basic terms, concepts and categories of the specialty language;
- various ways of making hypotheses and constructing proofs.

**Be able to:**

- apply the acquired knowledge when preparing and writing a research paper in a written format;
- freely read the original literature of the relevant branch of knowledge in a foreign language;
- work with the bibliography;
- formalize information extracted from foreign sources in the form of translation, abstract, and annotation;
- to compare the content of different sources of information on the problem of scientific research, to critically evaluate the opinion of the authors;
- properly organize your own ideas, clearly and convincingly justify them, and correctly Express them in writing.

**Own:**

- the language of the specialty (professional conceptual and terminological apparatus) in the amount of at least 4000-4500 units. Of these, 3000-3300 units are neutral and scientific vocabulary on a wide and narrow profile, 1200 units of vocabulary related to the chosen specialty for the development of oral speech;
- the main methods of reading original literature on the specialty of various styles and genres;
- the style of written communication related to the scientific work of the doctoral student;
- culture of thinking, ability to generalize and analyze information;
- scientific text analysis skills.

To demonstrate the ability and willingness:

- to extract and reproduce basic information in a foreign language in writing;
- use reference materials in a foreign language;
- self-development, improvement of their foreign language competence;
- establish professional contacts with native speakers, exchange information in a foreign language;
- to scientific work, using the language of the specialty.

## A SYSTEMS CONCEPT TO FORECASTING AND TYPING OF SOLID MINERAL DEPOSITS

CODE– GPH324

ACADEMIC CREDITS- GPH324

PREREQUISITES- GPH220

### PURPOSE OF DISCIPLINE

The purpose of discipline is mastering students of theoretical knowledge for the main forecasting methods in complex geological environments; the formation of knowledge in the field of industrial use of different types of solid minerals, principles of technological and industrial typing of minerals, their industrial-genetic types.

### LEARNING GOAL

The formation of doctoral students practical skills necessary for understanding from the standpoint of the system approach:

- principles and methods of regional and local forecasting of industrial ore areas, ore nodes and fields, deposits of solid minerals;
- criteria of the forecast estimation of territories on minerals for the purpose of allocation of the priority local areas perspective on searches of minerals;
- possibilities of different methods and techniques in predictive assessment and typification of ore-bearing territories and local areas, as well as methods of their rational integration;
- the need to expand and deepen the understanding of the investigated ore object, improve the methods of forecasting ore-bearing areas and deposits.

### BRIEF DESCRIPTION OF THE COURSE

Features of application of methods of the system analysis of geological and geophysical data at search, investigation and additional exploration of deposits of firm minerals are considered. The necessity of effective management of development of these deposits on the basis of the system approach of all process, from a forecast stage to an industrial assessment is proved.

The system approach allows to study more widely the most difficult geological objects, to establish their integrity and structure, to reveal the mechanism of integrity of object, to define and explain variety of communications elements of the system, to give a historical and geological analysis of the development of the system and its interaction with the environment.

Concepts of the system approach, levels of the organization of substance or its hierarchy at studying of ore areas, ore knots and fields, deposits of firm minerals, i.e. possibility of dismemberment of the big and difficult system on a number of small and simple subsystems, or in Association of a number of simple and small subsystems, in one difficult and more capacious system are considered.

It is shown that the combination of system-structural and system-historical studies not only allows us to establish the sequence of events that result in the formation of geological

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bodies, but also makes it possible to determine the Genesis, trace the evolution, as well as to obtain a complete picture of the ore-bearing region as a historically developing system.

The classification of ore-forming processes, built on the basis of the principles of the theory of systems and, along with the formation classification, forming the basis of industrial typification of deposits of solid minerals, is presented. The principles of formation typification of mineral deposits, as well as the placement of ore fields, deposits, their internal structure, scale and practical significance of the mineral resources contained therein are revealed.

### KNOWLEDGE, SKILLS AT THE END OF THE COURSE

**The doctoral student must**

**Know:**

Tasks of the system approach; search prerequisites, signs, methods, techniques of prospecting and exploration of deposits of solid minerals; methods of forecasting, prospecting and exploration, modeling and integration of search methods in specific natural conditions and at different stages of the exploration process; stage-by-stage exploration; advantages and disadvantages of geophysical methods and complex geophysical works.

**Be able to:**

To apply system-structural and system-historical researches at:

- identification of a set of criteria for localization of minerals;
- analysis of wave fields in order to predict the geological section and Genesis of mineral deposits, analysis of geological materials on the studied area and recognition of geological and industrial types of expected mineralization on a complex of forecast and search prerequisites and features;

selection of necessary geological and geophysical information, construction of optimal forecast models and solution of MPI forecast problems;

- integration of geophysical methods of prospecting and exploration of minerals, the study of ore-prospective areas and structures;
- determination of the position of mineral deposits in the genetic classification of ore-forming processes and identification of mineral deposits belonging to industrial types.

**Own:**

The main methods of systematic approach and skills:

- analysis and generalization of stock and published geological materials on the geological structure, methods of forecasting and prospecting for mineral deposits;
- the use of software to solve problems of forecasting mineral deposits, independent work, drawing conclusions about the possible origin of deposits;
- geological-genetic and geological-industrial description of mineral deposits, the use of search methods in field research;
- planning of stage study of geological object and design of exploration works of a specific stage.

**A SYSTEMS CONCEPT TO THE STUDY OF OIL AND GAS RESERVOIRS**

CODE – GPH325  
 ACADEMIC CREDITS- 5 (2/0/1/2)  
 PREREQUISITES - GPH220

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**COURSE OBJECTIVE**

Training in methods of system analysis in solving problems of organization and optimization of the exploration process on the basis of the basic principles of the system approach: integrity, structure, hierarchy, interdependence of the system and the environment. Development on their basis by rational methods of prospecting and exploration of oil and gas deposits in order to improve the efficiency of exploration.

**LEARNING GOAL** – study of oil and gas reservoirs as integral natural systems;

- establishment of structure and composition, Genesis and stages of development of these systems;
- carrying out structural and lithological typification of oil and gas bearing layers of sedimentary basins and forecasting on this basis of their oil and gas content.

**BRIEF DESCRIPTION OF THE COURSE**

Features of application of methods of the system analysis of geological and geophysical, field and technological information at search, investigation and additional exploration of oil and gas bearing layers on deposits of hydrocarbons are considered. The main directions of theoretical and applied research in Geology and Geophysics of oil and gas, the necessity of effective management of oil field development on the basis of system approach the whole process, from forecast stage to the final evaluation of hydrocarbon accumulations.

The concepts of the system approach, the levels of organization of geological formations and their hierarchy in the study of oil and gas reservoirs, i.e. the possibility of dividing a large and complex system into a number of small and simple subsystems, or combining a number of simple and small subsystems into one complex and more intensive system, are considered. The definition of system boundaries and differences from the enclosing environment, structuring the exploration process in the study of these systems involves a sequence of steps and stages of the process of exploration and structure of the methods used for solutions of exploration tasks.

**KNOWLEDGE, SKILLS AT THE END OF THE COURSE**

**The doctoral student must**

**Know:**

The main characteristics of sedimentary systems: structure (set of relations between system elements), functions (the sum of system response to changing conditions internal and external geological environment) and the history of the formation (long, as a rule, irreversible changes). These three interrelated aspects correspond to the existence, manifestation and formation of the system, characterize it as a whole.

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**Be able to:**

To solve problems of the system approach at researches of oil and gas bearing layers-the analysis, design and management of functioning of any objects which can be considered as systems.

**Own**

The main methods of studying sedimentary systems (structure, function, history) of oil and gas reservoirs, allowing a broad cognitive positions to study complex geological objects, to establish their integrity and structure, to identify the basis (mechanism) of the integrity of the object, to determine and explain the diversity of connections of elements of the system, to give a historical and geological analysis of the development of the system and its interaction with the environment.

## FIELD GEOPHYSICAL MONITORING FOR HYDROCARBON DEPOSIT DEVELOPMENT

CODE– GPH308

ACADEMIC CREDITS- 5 (2/0/1/2)

PREREQUISITES - GEO214

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### PURPOSE OF DISCIPLINE

To form in doctoral students:

- ideas about the methods of geological and field study of oil and gas deposits, regulation of their development, evaluation of geological and geophysical factors that determine the conditions of hydrocarbon recovery from reservoirs, as well as ideas about the complex of factors that determine the choice of development systems;
- the ability to apply measures to control the processes of production of reserves and manage them from the standpoint of the system-structural approach. At the same time, the fundamental issues of scientific research and the logic of scientific research and modern ideas about the problems and successes of domestic science in field Geology are revealed.

### DISCIPLINE OBJECTIVES

On the basis of the study of basic and specialized disciplines to expand the scope of knowledge and develop skills for solving geological and production problems encountered in the practice of exploration and exploitation of oil and gas deposits. To be able to solve General professional geological tasks of geophysical monitoring for the development of hydrocarbon accumulations, to have the ability to independently obtain geological information, to use the skills of field and laboratory geological studies in research activities.

### BRIEF DESCRIPTION OF THE COURSE

The bases of modern field and geophysical complex control of oil and gas fields development are given, the questions of theory, processing and application of hydrodynamic, geophysical and field-technological methods of research of operated Fund of wells are considered in detail. Methodical criteria of organization of development control system by producing companies are substantiated, reference information necessary for planning and complex interpretation of researches is given, technologies of automated analysis and application of results of system well researches at creation of digital dynamic models of deposits and preparation of project documents on development of oil and gas fields are presented.

In order to implement effective control and regulation of the development process considered in detail the development of oil and gas deposits on the date of the study, the dynamics of change of main geological-technical parameters, condition of the irrigation reservoir and the character of distribution of formation pressure isobars on the map.

The study of the main indicators of the state of development will allow to assess the completeness of reserves production for individual sections of the formation, the effectiveness



of the applied development system and to outline measures to regulate the development in order to intensify production and increase the oil recovery coefficient.

**KNOWLEDGE, SKILLS AT THE END OF THE COURSE**

**The doctoral student must**

**Know:**

Methods of process control in the development of oil and gas deposits of various types and the basic principles of methods to increase oil recovery in depleted and low-productive deposits, methods of operation and research wells.

Have an idea about hydrodynamic and filtration processes in pore and fractured formations, between wells and reservoirs, scientifically-based geophysical methods of fluid extraction control from reservoirs, protection of subsoil and the environment during the operation of hydrocarbon deposits, maintenance of necessary documentation.

**Know:**

To analyze geophysical and hydrodynamic information received during further exploration and operation of oil and gas fields, to be able to use modern information methods, information and production programs to solve the problems of field Geology in the process of developing hydrocarbon deposits.

**Own:**

Experience in operating wells (well operator), the main principles of application of methods to increase oil recovery in depleted and low-productive deposits, methods of operation and research of wells.