



**Geology and oil-gas Business Institute named after k. Turysov
Department of " Geophysics and Seismology"**

**EDUCATIONAL PROGRAM
8D05302 Seismology**

Code and classification of the field of education: **8D05 «Natural Sciences, Mathematics and Statistics»**

Code and classification of training areas: **8D053 «Physical and chemical sciences»**

Group of educational programs: **D091 «Seismology»**

The level of the NQF: 8

The level of the IQF: 8

Duration of training: 3 years

Volume of credits: 180

Almaty 2025

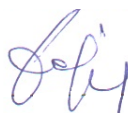
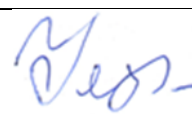
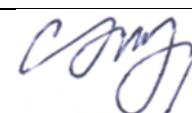
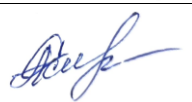
The educational program 8D05302 – "Seismology" was approved at the meeting of NJSC "Kazakh National Research Technical University named after K.I.Satpayev" Academic Council.

Protocol №10 "06". 03. 2025 y.

Was Reviewed and recommended for approval at the meeting of NJSC "Kazakh National Research Technical University named after K.I.Satpayev" Educational and Methodological Council

Protocol №3 "20".12. 2024 y.

The educational program 8D05302 – «Seismology» developed by the academic committee in the direction of 8D053 «Physical and Chemical Sciences»

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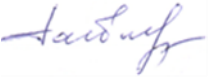
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Table of contents

	List of abbreviations and designations	5
1.	Description of the educational program	6
2.	The purpose and objectives of the educational program	9
3.	Requirements for evaluating the learning outcomes of an educational program	10
4.	Passport of the educational program	11
4.1.	General information	11
4.2.	The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines	15
5.	Curriculum of the educational program	20

List of abbreviations and designations

B – basic knowledge, skills and abilities;
HEI – higher education institution;
State – state mandatory standards of education;
ICT – information and communication technologies;
NJSC «KazNRTU named after K.I.Satpayev»– Non-profit joint stock company «Kazakh national research technical university named after K.I. Satbayev»;
NQF – National Qualifications Framework;
IQF – Industry Qualifications Framework;
O – universal, social and ethical competencies;
PC – professional competencies;
RO – learning outcomes of the educational program;
C – special and managerial competencies;
SIS- student independent study;
EP-educational program;
BD- basic discipline;
PD- profile discipline;
UC- University component;
CC-Component of choice;
FA- final assessment;
RWDS - Research work of a doctoral student.

1. Description of the educational program

Doctoral studies in the educational program - 8D05302 “Seismology” stimulates the formation of professional competencies necessary to solve complex seismogeophysical problems that require the use of in-depth fundamental knowledge; abstract thinking and originality of analysis; go beyond the issues covered by standards and practice; develop non-standard solutions in problem situations; adapt to new situations, reassess accumulated experience, create new knowledge based on seismogeophysical studies; setting innovative professional tasks in the field of research and practice; finding optimal solutions to professional tasks, taking into account their validity, cost, information, social and economic security; solving managerial tasks in the conditions of real-life production structures.

The PhD preparation program for the educational program - 8D05302 “Seismology” provides:

a) training of highly qualified specialists in the field of seismogeophysical methods for assessing seismic hazard, risk and earthquake forecasting; obtaining high-quality and professional knowledge on forecasting the places of occurrence, strength and recurrence of earthquakes;

b) formation of knowledge in the required volume for studying earthquake foci, displacements of Earth blocks along faults and other environmental transformations in foci, conducting detailed studies of earthquake preparation processes in a real physical and geological environment, performing assessments of the parameters of the focus, identifying earthquake precursors and developing long-term, medium-term and short-term earthquake forecasts, ways to control the seismic process, assessment of anthropogenic (technogenic) influence on seismicity.

c) a qualified solution of engineering and seismological problems, which consists in studying the seismic wave field caused by an earthquake near the hearth, studying strong seismic movements of the earth's surface and the interaction of soil with the structure, developing methods and conducting seismic micro-zoning, determining the impact of earthquakes on the hydrosphere and the Earth's atmosphere;

d) obtaining high-quality and professional knowledge by doctoral students on the stages and rational complexes of seismogeophysical research, processing, interpretation and modeling of the data obtained.

Doctoral studies in the educational program - 8D05302 “Seismology” includes training in working in modern computer programs for processing seismological data.

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 seismology and geophysics.

Field of professional activity:

The area of professional activity of graduates who have completed the doctoral program in the educational program - 8D05302 "Seismology", includes solving problems that require the application of fundamental and applied knowledge

in the Earth sciences within the framework of the main areas of scientific research and includes the study:

- a) the structure and material composition of the Earth's lithosphere,
- b) the seismic process, which has connections with physical geography, geology, tectonics, especially with neotectonics and seismotectonics, with the mathematical theory of random processes and cosmophysics.

The study of the earthquake source and precursors is based on the achievements of solid state physics, geomechanics, especially the theory of brittle fracture of materials, geodesy, various sections of Earth physics, hydrogeology, geochemistry.

The problem of earthquake prediction is close to the problem of predicting mountain impacts, which are studied by mining sciences. Studies near the earthquake focus take into account the achievements of engineering geology and are necessary for the development of earthquake-resistant construction.

The use of seismic waves to study the internal structure of the Earth requires the use of methods of mathematical physics and combination with data from gravimetry, geothermy, petrology, geomagnetism and other Earth sciences.

Objects of professional activity:

The objects of professional activity of doctoral graduates in the educational program - 8D05302 "Seismology" are the lithosphere and tectonosphere of the Earth, their composition, structure, evolution; rocks; geophysical fields; natural and man-made geological and hydrogeochemical processes, physico-geological models of layers of the Earth's lithosphere; earthquake foci, their monitoring and forecast; computerized and software-controlled information-measuring and processing systems and complexes.

Types of professional activity:

In accordance with the fundamental and professional training received, doctors in the educational program 8D05302 "Seismology" can perform the following types of activities:

- a) organizational and managerial activities:
 - планирование, организация и управление научно-исследовательскими и научно-industrial field, laboratory and interpretive seismogeophysical works;
 - development of operational work plans for seismological parties and detachments;
 - selection and justification of scientific, technical and organizational solutions based on seismogeophysical data and economic calculations.
- b) research activities:
 - independent selection and justification of the goals and objectives of scientific seismological and geological-geophysical research;
 - mastering the methods of solving the tasks set during monitoring, interpretation studies using modern seismogeophysical 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 seismology;

- preparation of scientific reports, publications, reports, preparation of applications for inventions and discoveries.

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

c) scientific and production activities:

- independent preparation and conduct of research, monitoring and interpretation studies in solving practical problems in the field of seismology;

- independent selection, preparation and professional operation of modern seismogeophysical equipment and instruments;

- collection, analysis and systematization of available seismological and geological information using modern information technologies;

- complex processing, interpretation and modeling of seismic and geophysical information in order to solve research and practical problems in the field of seismology;

- participation in the development of normative methodological documents in the field of seismic and geophysical research.

d) project activities:

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

- participation in the examination of projects of scientific research seismological works.

e) scientific and pedagogical activity:

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

- participation in the management of research work of students in the field of seismology.

Areas of professional activity:

In the profile direction are:

- organizational and technological; settlement and design; service and operational; production and technological activities in:

- academic and departmental research organizations related to the solution of seismogeophysical problems;

- in akimats of regions, cities, in the Ministry of Emergency Situations and departments of Emergency Situations and emergency Situations;

- in organizations related to environmental monitoring and solving environmental problems.

At 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, government agencies, educational institutions, design organizations, industrial enterprises.

2. The purpose and objectives of the educational program

EP purpose:

The aim of the educational program is to train highly qualified specialists with deep knowledge in the field of geophysics and understanding of natural seismic processes occurring in the Earth, taking into account the principles of sustainable use of natural resources and minimization of environmental risks. The program is aimed at developing the ability of doctoral students to independently solve educational, research and professional problems, promoting an innovative approach to solving global environmental and technological challenges in geophysical and related industries

EP tasks:

- formation of universal, general professional and professional competencies for doctoral students, defined by the profile "Seismology", which will allow them to navigate modern scientific concepts, competently set and solve research and practical tasks, participate in practical activities, master the basic methods of teaching and upbringing and a set of knowledge, teaching methods in higher educational institutions;
- improvement of natural science education, including those focused on professional activity in seismology;
- 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:

- acquisition and consolidation of knowledge about the fundamental laws of radiation and propagation of seismic waves in the lithosphere, theories and methods of studying its internal structure using seismic waves, modern ideas about the nature and patterns of seismicity and seismic regime of various areas, modern models of earthquake focus physics and their preparation processes, principles and methods of seismic hazard assessment, seismic zoning and earthquake prediction;
- acquisition of the ability to plan experiments to study the deep structure of the Earth by seismogeophysical methods, conduct instrumental seismic and geophysical observations, process and interpret the data obtained, determine the parameters of earthquake foci from seismic records and macroseismic manifestations, plan and carry out work on general, detailed and microseismic zoning, draw conclusions about the seismic hazard of specific territories and objects.
- formation of skills of independent research activity and the ability to expand and deepen knowledge in seismology, including the development of new theories and models, mathematical modeling of seismicity processes, etc.;
- acquisition of skills in organizing and conducting seismological research necessary to carry out scientific work in doctoral studies.

At the pedagogical direction:

- providing high-quality education 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 seismology, teach at universities, successfully carry out research and management activities;
- obtaining knowledge in the field of university pedagogy and psychology, teaching experience at the university;
- 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.

3. Requirements for evaluating the learning outcomes of an educational program

As a result of mastering the doctoral program, the graduate should have general cultural, general professional and professional competencies.

A graduate of a specialized doctoral program should: have an idea about current trends in the development of the seismological industry; about current methodological and philosophical problems of seismology; about the current state of the economic, political, legal, cultural and technological environment of the global business partnership.

A graduate of the EP "Seismology" must have the ability to:

- abstract thinking, analysis, synthesis of a seismogeophysical database; act in non-standard situations, bear social and ethical responsibility for decisions made, show a desire for self-development, self-realization, and the use of creative potential;
- independently acquire, comprehend, structure and use new knowledge and skills in professional activity, 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 focus (profile) of the doctoral program;
- possess professional competencies (PC) corresponding to the type of professional activity that the doctoral program is focused on;

Graduates of the doctoral program should have in-depth systematic knowledge in the field of seismogeophysical methods. They should be able to:

- a) to form diagnostic solutions to seismological problems by integrating fundamental sections of seismological sciences and specialized knowledge;
- b) be able to independently conduct scientific and methodological work and research in seismology;
- c) summarize and analyze experimental information;
- d) draw conclusions, formulate conclusions and recommendations.

A graduate of the OP "Seismology" must:

- be able to use effective methods of processing and interpreting complex information to solve tasks; create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge;
- be able to critically analyze, present, defend, discuss and disseminate the results of their professional activities;
- possess the skills of drawing up and processing scientific and technical documentation, scientific reports, reviews, reports and articles;
- be competent in the search and interpretation of technical information using various search engines (patent search, literary review of magazines and books, Internet), in the selection and creative use of modern equipment for solving scientific and practical problems of seismology;
- be socially mobile, be able to adapt to new situations in the professional environment, have the ability to perceive diversity and intercultural difference, appreciate diverse approaches to understanding and solving problems of society;
- be able to organize cooperation in a team, show creativity and breadth of interests to solve interdisciplinary problems;
- 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, appreciate the traditions of other cultures, their diversity in modern society, fundamental basic education, economic, social and legal training;
- maintain the rules of ethics in society, at work and in interpersonal communication, 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	Comments
1	Code and classification of the field of education	8D05 Natural sciences, mathematics and statistics
2	Code and classification of training directions	8D053 Physical and chemical sciences
3	Educational program group	D091 Seismology
4	Educational program name	8D05302 Seismology
5	Short description of educational program	The doctoral training program for the EP “Seismology” provides: a) training of highly qualified specialists in the field of seismogeophysical methods for assessing seismic hazard, risk and earthquake forecasting; obtaining high-quality and professional knowledge on forecasting the places of occurrence, strength and recurrence of earthquakes; b) formation of knowledge to the required extent for studying earthquake foci, displacements of Earth blocks and other environmental transformations in foci, conducting detailed studies of earthquake preparation processes in a real physico-geological environment,

		performing assessments of the parameters of the focus, identifying earthquake precursors and developing long-term, medium-term and short-term earthquake forecasts, methods of controlling the seismic process, assessment of anthropogenic (man-made) influence on seismicity; c) a qualified solution of engineering and seismological problems, which consists in studying the seismic wave field caused by an earthquake near the hearth, studying strong seismic movements of the Earth's surface and the interaction of soil with the structure, developing methods and conducting seismic microdistricting, determining the impact of earthquakes on the hydrosphere and the Earth's atmosphere; d) obtaining high-quality and professional knowledge by phasing and rational complexes of seismogeophysical studies, processing, interpretation and modeling of the obtained data.
6	EP purpose	The aim of the educational program is to train highly qualified specialists with deep knowledge in the field of geophysics and understanding of natural seismic processes occurring in the Earth, taking into account the principles of sustainable use of natural resources and minimization of environmental risks. The program is aimed at developing the ability of doctoral students to independently solve educational, research and professional problems, promoting an innovative approach to solving global environmental and technological challenges in geophysical and related industries
7	Type of EP	New EP
8	The level of the NQF	8
9	The level of the IQF	8
10	Distinctive features of the EP	no
11	List of competencies of the educational program	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 work; GC7 – meaning and understanding of professional ethical standards, mastery of professional communication techniques; GC8 – the ability to work in a team, tolerantly perceiving social, ethical, confessional and cultural differences; GC9 – 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 the knowledge of fundamental and applied sections of seismogeophysical disciplines that determine the orientation (profile) of the doctoral program in seismology; GPC 3 – the ability to independently design and carry out research activities in the field of seismology based on the use of modern research methods and information and communication technologies with the use of complex seismological and interdisciplinary research; GPC 4 – understanding of the essence and significance of the interrelation of theoretical and practical research in seismology, allowing to study the processes and mechanisms of seismicity efficiently and rationally; to reduce the risks of man-made impacts on industrial and civil facilities. Professional Competencies (PC): PC 1 – knowledge of promising areas of development and problems of seismology, the current level of elaboration of problems. The ability to participate in work on innovative projects, set specific seismological 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 problems of seismology by integrating fundamental and applied sections of geophysics (gravity-magnetic exploration, geoelectrics, seismology and seismic exploration) and specialized geological and geophysical knowledge (about physical processes occurring in the Earth and the internal structure of the Earth) for the analysis of seismological data and solving problems of seismology; PC 3 – the ability of general technical and administrative management and ensuring timely collection of materials for conducting seismological observations. General technical and administrative management and ensuring timely execution of work on the preparation of seismological equipment and observation systems for stationary and field seismological observations; PC 4 – ability to general technical and administrative management, planning and ensuring timely registration of seismic records at stationary and expeditionary seismic stations; PC 5 – the ability to organize, general technical and administrative management of digital processing and transformation of primary data into a form that provides analysis and effective interpretation; PC 6 – the ability to compile a database of seismological data of the research area for the development of an earthquake catalog, operational catalogs and earthquake bulletins. Analysis of seismograms, properties of seismic waves (attenuation) in seismological monitoring. Analysis
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		and modeling of strong motion processes for the development of a consolidated earthquake catalog; PC 7 – skills for developing conclusions on the level of seismic activity and the main morphological and kinematic characteristics of the identified seismogenerating structures. Preparation of complex data for the construction of a seismotectonic map, maps of seismic impacts and seismic zoning. Creating a digital archive of reporting data; PC 8 – the ability to coordinate and guide the interaction of structural units in the preparation of accounting documentation; PC 9 – the ability to identify and systematize the main ideas in scientific publications; critically evaluate the effectiveness of various approaches to solving seismological 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:	LO 1: Demonstrate advanced knowledge formed on the basis of a systematic study of fundamental and applied geophysics about natural seismic processes occurring in the Earth LO 2: Understand and professionally solve the problems of seismology by synthesizing and integrating sections of geophysics, specialized geological and structural-tectonic knowledge for system analysis, interpretation, explanation and generalization LO 3: Apply knowledge and understanding to the planning, design, implementation and analysis of complex scientific seismological research, using advanced competencies to solve seismological problems taking into account the principles of the Sustainable Development Goals LO 4: Conduct seismological field measurements, visualize the results based on comparison with complex data and develop conclusions, scientific conclusions to identify the features of the work results LO 5: Synthesize original ideas, research results in scientific publications of a national or international level in order to expand the boundaries of the scientific field and make a significant scientific contribution to the seismological industry LO 6: Use your own assessment of the latest domestic or foreign experience in the formation of an original judgment of a professional problem and the conduct of ethical written and oral communication
13	Form of training	full - time
14	Duration of training	3
15	Volume of loans	180
16	Languages of instruction	Russian/ Kazakh
17	Academic degree awarded	Doctor of Philosophy PhD
18	Developer(s) and authors:	1) Professor Abetov A.E., 2) Associate Professor Umirova G.K. 3) teacher Muzapparova A.B.

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)					
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6
Cycle of basic disciplines University component									
1	Methods of scientific research	Purpose: It consists in mastering knowledge about the laws, principles, concepts, terminology, content, specific features of the organization and management of scientific research using modern methods of scientometry. Contents: structure of technical sciences, application of general scientific, philosophical and special methods of scientific research, principles of organization of scientific research, methodological features of modern science, ways of development of science and scientific research, the role of technical sciences, computer science and engineering research in theory and practice.	5	V		V	V	V	V
2	Academic writing	Objective: to develop academic writing skills and writing strategies for doctoral students in engineering and natural sciences. Content: fundamentals and general principles of academic writing, including: writing effective sentences and paragraphs, writing an abstract, introduction, conclusion, discussion, and references; in-text citation; preventing plagiarism; and preparing a conference presentation.	5					V	V
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 pedagogical skills of conducting training sessions and preparing teaching materials in the disciplines of the educational program "Seismology". The basis for conducting pedagogical practice is the Department of Geophysics of the GOGBI NPJC KazNRTU named after K.I.Satpayev.	10	V	V		V	V	

		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	Seismic statistics	Purpose: Acquiring in-depth knowledge in the field of statistical processing of seismic data and their analysis for predicting and modeling seismic activity Contents: Features, structure, methods of collecting a database of seismic events. Time series analysis methods, cluster analysis, correlation analysis, spectral analysis. Distribution of frequency and magnitude of earthquakes, models of time intervals between earthquakes, extreme statistical methods. Application of modern statistical programs for the analysis of seismic data with the construction of three-dimensional models	5	V	V			V	V
5	Models and basic parameters of the seismic regime	Purpose: Study the parameters of the seismic regime and statistical methods for modeling the spatiotemporal patterns of the seismic regime Contents: In-depth study of the types of seismic events and methods for describing them. Mathematical and statistical models that predict seismic activity in time and space, taking into account the physical processes underlying seismic activity. Application of statistical methods to interpret data on seismic activity, identifying correlations and patterns. Modern seismic modeling tools	5	V	V			V	V
6	Intellectual property and the global market	Purpose: the goal is to train specialists in the field of intellectual property law who can analyze and predict trends in its development in the global market, develop strategies for the protection and commercialization of intellectual property. Contents: global aspects of intellectual property and its role in international trade and economics, analysis of international agreements and conventions, IP	5			V		V	

		management strategies, cases of protection and violation of intellectual property rights in various jurisdictions.							
7	Energy and magnitude characteristics of seismic sources	Purpose: Learn to use methods and tools to study the characteristics of seismic sources to improve predictability in an area of seismic activity Contents: Studies the energy and magnitude characteristics of seismic sources. Concepts of magnitude, energy class and intensity of an earthquake. Seismic effect and seismic intensity as an effect at a given point. The concept of the size of the earthquake source and its assessment (magnitude or energy class). Seismic intensity scales MSK-64. Classification of structures and damage	5	V	V			V	V
Cycle of profile disciplines University component									
8	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 comprehensive formation of professional and general professional competencies. The objectives of research practice are: - 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 Seismology; 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, 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 Seismology; 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;	10	V	V	V	V	V	V

		- 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 "Seismology" 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									
9	Modern methods of seismic hazard assessment	Purpose: Study tools, models and methodologies for predicting seismic activity to reduce risks and improve safety in seismic zones Contents: examines methods for determining the magnitude of seismic impacts from earthquakes (intensity in points) expected at a given point and the likelihood of their occurrence within a certain waiting time. The theory of methods for compiling and analyzing seismic zoning maps, the methodology of seismic risk analysis, and seismic hazard forecasting are considered	5	V	V		V	V	V
10	Seismogenic zones and methods for their identification	Purpose: Studying the methodology for identifying geodynamically active zones of the platform and geosynclinal areas of the Republic of Kazakhstan and technologies for compiling maps of seismotectonic conditions Contents: Basic principles, tasks and goals of seismic zoning of different scales and seismic hazard assessment. Using a set of maps in the design and construction of facilities, when choosing standard seismicity. Methodology for constructing a seismotectonic map of the latest geodynamic zones of the platform and geosynclinal parts of the study area for the future placement of particularly important objects	5	V	V			V	V
11	Seismic impacts in the parameters of intensity and peak accelerations	Purpose: Studying the fundamentals and methods of processing and analyzing seismological data related to the construction of mathematical and computer models for solving applied problems Contents: Seismic intensities and impacts, peak accelerations, ground displacement rates, seismic loads and the spectrum of reactions to them, methods for measuring seismic accelerations, principles of normalization of seismic loads, macroseismic effects during earthquakes are considered. Competencies related to the assessment	5	V	V			V	V

		of regulatory seismic impacts and construction rules in seismically hazardous regions							
12	Seismogeological characteristics and strategy of earthquake prediction	Purpose: to form in-depth knowledge about the regularities and physical nature of seismogeophysical precursors in order to develop an earthquake prediction strategy. Contents: The statistical and physical aspects of seismogeophysical precursors of earthquakes are studied, on the basis of which methods for detecting anomalies in variations in the parameters of geophysical fields caused by the local process of earthquake preparation are considered. Seismic, deformational, geochemical, electromagnetic and other precursors: patterns of manifestation and theoretical estimates. Parameters of seismogeophysical precursors	5	V	V		V	V	V
13	Hydrochemical and hydrodynamic precursors of earthquakes.	Purpose: Study of hydrochemical and hydrodynamic precursors of earthquakes, manifested in the groundwater regime before strong earthquakes, fast and slow precursor effects Contents: The mechanisms of formation of hydrogeochemical and hydrodynamic precursor effects are considered; correlation between relative deformations of the earth's surface and changes in effects; assessments of seismic hazard and anomalous properties of time series: average value, dispersion, vibration spectrum before the occurrence of a seismic event	5	V	V			V	V
14	Stable models of earthquake foci and stages of their formation	Objective: To study the concepts of earthquake preparation with an emphasis on SDGs to address issues related to natural disasters and their impact on ecosystems. Contents: Physics of the earthquake source and structural-mechanical modeling, man-made deformation processes. Risks associated with human activities. Deformation processes of rocks, laws and conditions for the occurrence of an unstable state. Methods of applying modern geomechanical models to describe the preparation of earthquakes, as well as the construction of consolidation and phase transformation models. Dilatant-diffusion model and avalanche-unstable crack formation model. Development of more sustainable and safe technologies.	5	V	V	V		V	V

5. Curriculum of the educational program

NON-PROFIT JOINT STOCK COMPANY
«KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATBAYEV»



«APPROVED»
Decision of the Academic Council
NPJS Co «KazNRTU»
named after K. Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year

2025-2026 (Spring, Autumn)

Group of educational programs

D109 - "Oil and ore geophysics"

Educational program

8D05302 - "Seismology"

The awarded academic degree

Doctor of Philosophy PhD

Form and duration of study

full time (scientific and pedagogical track) - 3 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters						Prerequisites	
									1 course		2 course		3 course			
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																
CYCLE OF BASIC DISCIPLINES (BD)																
M-1. Module of basic training (university component)																
MET322	Methods of scientific research		BD, UC	5	150	30/0/15	105	E		5						
LNG305	Academic writing		BD, UC	5	150	0/0/45	105	E		5						
M-1.1 Module of basic training (Component of choice)																
GPH327	Seismic statistics	1	BD, CCH	5	150	30/0/15	105	E		5						
GPH328	Models and main parameters of the seismic regime	1	BD, CCH	5	150	30/0/15	105	E		5						
GPH329	Energy and magnitude characteristics of seismic sources	1	BD, CCH	5	150	30/0/15	105	E		5						
MNG349	Intellectual property and the global market	1	BD, CCH	5	150	30/0/15	105	E		5						
M-3. Practice-oriented module																
AAP350	Pedagogical practice		BD, UC	10				R	10							
CYCLE OF PROFILE DISCIPLINES (PD)																
M-2. Module of professional activity (component of choice)																
GPH298	Modern methods of seismic hazard assessment	1	PD, CCH	5	150	30/0/15	105	E		5						
GPH330	Seismogenic zones and methods for their identification	1	PD, CCH	5	150	30/0/15	105	E		5						
GPH331	Seismic actions in terms of intensity and peak accelerations	1	PD, CCH	5	150	30/0/15	105	E		5						
GPH317	Seismogeological characteristics and strategy of earthquake prediction	2	PD, CCH	5	150	30/0/15	105	E		5						
GPH332	Hydrochemical and hydrodynamic precursors of earthquakes	2	PD, CCH	5	150	30/0/15	105	E		5						
GPH333	Earthquake source models and stages of its formation	2	PD, CCH	5	150	30/0/15	105	E		5						
M-3. Practice-oriented module																
AAP355	Research practice		PD, UC	10				R			10					
M-4. Experimental research module																
AAP347	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	20				R	20							
AAP336	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	5				R		5						
AAP347	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	20				R			20					
AAP356	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	30				R				30				
AAP356	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	30				R					30			

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NAMED AFTER K.I. SATBAYEV»**

AAP348	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	18				R						18	
M-5. Module of final attestation															
ECA325	Final examination (writing and defending a doctoral dissertation)		FA	12										12	
Total based on UNIVERSITY:									30	30	30	30	30	30	
									60	60	60	60	60	60	

Number of credits for the entire period of study						
Cycle code	Cycles of disciplines	Credits				Total
		Required component (RC)	University component (UC)	Component of choice (CCH)		
GED	Cycle of general education disciplines	0	0	0		0
BD	Cycle of basic disciplines	0	20	5		25
PD	Cycle of profile disciplines	0	10	10		20
Total for theoretical training:		0	30	15		45
RWDS	Research Work of Doctoral Student					123
ERWDS	Experimental Research Work of Doctoral Student					0
FA	Final attestation					12
TOTAL:						180

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

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

Signed:

Governing Board member - Vice-Rector for Academic Affairs

Approved:

Vice Provost on academic development

Head of Department - Department of Educational Program Management and Academic-Methodological Work

Director - Geology and Oil-gas Business Institute named after K. Turyssov

Department Chair - Geophysics and seismology

Representative of the Academic Committee from Employers

____ Acknowledged ____

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