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

EDUCATIONAL PROGRAM
7M05302 «Seismology»

Code and classification of the field of education: **7M05 «Natural Sciences, Mathematics and Statistics»**
Code and classification of training areas: **7M053 «Physical and chemical sciences»**
Group of educational programs: **M091 «Seismology»**
The level of the NQF:7
The level of the IQF:7
Duration of training: 2 years
Volume of loans: 120

Almaty 2025

The educational program 7M05302 – "Seismology" was approved at the meeting of NJSC "Kazakh National Research Technical University named after K.I.Satpayev" Academic Council.

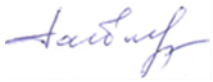
Protocol №10 "06". 03. 2025 y.

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 7M05302 "Seismology" was developed by the academic committee in the direction 7M053 "Physical and Chemical Sciences".

Full name	Academic degree/academic title	Position	Workplace	Signature
Chairman of the Academic Committee:				
Istekova Sara amanzholovna	Doctor of Geological and Mineralogical Sciences	Professor	NJSC "Kazakh National Research Technical University named after K.I.Satpayev"	
Teaching staff:				
Boranbai Tovbasarovich Ratov	Doctor of Technical Sciences, Professor	Head of the Department of Geophysics and Seismology	Kazakh National Research Technical University named after K.I.Satpayev	
Abetov Auez Egemberdievich	Doctor of Geological and Mineralogical Sciences	Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Umirova Gulzada Kubashevna	Doctor of PhD	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Temirkhanova Raushan Galimzhanovna	Doctor of PhD	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Siylkhanova Akkenje Orishanovna	Doctor of PhD	Senior Teacher	Kazakh National Research Technical University named after K.I.Satpayev	
Aliakbar Madiyar Manarbekuly	Master of Technical Sciences	Senior Teacher	Kazakh National Research Technical University named after K.I.Satpayev	
Employers:				
Mikhailova Natalia Nikolaevna	Doctor of Physical and Mathematical Sciences	Director	Kazakhstan National Data Center (KNDC)	

Uzbeks Nursarsen Bolataevich	Candidate of Physical and Mathematical Sciences	Deputy Director of Science	Institute of Seismology	
Students				
Dosymbekova Zhansaya	Master of Technical Sciences	Doctoral student 2 years of study	Institute of Seismology	
Isagali Asem	Master of Technical Sciences	Doctoral student 2 years of study	Kazakhstan National Data Center (KNDC)	
Muzapparova Akerke Bakbergenovna	Master of Technical Sciences	Doctoral student 1 years of study	Kazakh National Research Technical University named after K.I.Satpayev	

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List of abbreviations and designations

B – basic knowledge, skills and abilities;
NJSC«KazNTRU named after K.I.Satbayev" – Non-profit joint stock company «Kazakh national research technical university named after K.I. Satbayev»;
NQF – National Qualifications Framework;
U – universal, social and ethical competencies;
IQF – Industry Qualifications Framework;
PC – professional competencies;
LO – learning outcomes of the educational program;
S – special and managerial competencies;
JSC – joint stock company;
LLP - limited liability partnership;
SIS- student independent study;
EP-educational program;
BD- basic discipline;
PD- profile discipline;
UC- University component;
CC-Component of choice;
FA- final assessment.
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1. Description of the educational program

The master's educational program 7M05302 “Seismology” stimulates the formation of in-depth fundamental knowledge among graduates; abstract thinking and originality of analysis that go beyond the issues covered by standards and practice; forms the ability to make non-standard decisions in problem situations; adaptation to new situations, reassessment of accumulated experience, creation of new knowledge based on seismogeophysical research; setting innovative professional tasks in the field of research and practical activities; search for optimal solutions to professional tasks, taking into account their validity, cost, information, social and economic security; solving managerial tasks in the conditions of actual production structures.

Master's educational program 7M05302 “Seismology” ensures the formation of general cultural, general scientific, social, informational, professional and pedagogical competencies in graduates; the development of such personal qualities as responsibility, the desire for self-development and the disclosure of their creative potential, possession of a culture of thinking, awareness of the social significance of the profession of a seismologist, the ability to make organizational decisions in different situations and willingness to take responsibility for them.

The Master's program in the direction of 7M05302 «Seismology» provides:

a) training of highly qualified specialists in the field of seismogeophysical methods of seismic hazard assessment, earthquake risk and prediction;

b) they receive high-quality and professional knowledge on forecasting the places of occurrence, strength and recurrence of earthquakes; conducting detailed studies of earthquake preparation processes in a real physical and geological environment, displacements of Earth blocks and other transformations of the environment in foci, assessing the parameters of the focus, identifying earthquake precursors and those who are able to develop long-term, medium-term and short-term earthquake forecasts, ways to control the seismic process, assess the possibility of anthropogenic (man-made) influence on seismicity;

c) professional solution of engineering and seismological problems in the study of earthquake-induced seismic wave field near the hearth, the study of strong seismic movements of the Earth's surface and the interaction of soil with the structure, the development of methods and conducting seismic micro-zoning, determining the impact of earthquakes on the hydrosphere and the Earth's atmosphere.

d) qualified research away from the earthquake source when studying the wave seismic field at distances exceeding the length of the seismic wave, as well as the development and use of seismic methods of cognition of the internal structure of the Earth. Adjacent to this direction is the study of seismic noise on the Earth's surface - microseism. The applied tasks include registration and recognition of underground nuclear tests by seismic methods.

e) obtaining high-quality and professional knowledge by undergraduates on the stages and rational complex of seismological research, processing,

interpretation and modeling of the data obtained.

The program includes training 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.

Graduates receive a Master's degree in Seismology and work at the Institute of Seismology and SOM of the Ministry of Education and Science of the Republic of Kazakhstan, in the IGI of the National Research Center of the Republic of Kazakhstan, in akimats of regions, cities, in emergency situations and emergency situations in engineering positions, in research institutes as researchers.

The content of the Master's EP 7M05302 "Seismology" based on the development of a multi-level system of personnel training, fundamentality and quality of training, continuity and continuity of education and science, unity of training, education, research and innovation activities, aimed at maximizing the satisfaction of consumer demands should ensure:

- training of professional and competitive highly qualified specialists in the field of seismology, capable of applying innovative methods in assessing seismic hazard, risk and earthquake forecasting;
- preparation of masters who know the methodological basis, equipment, technology and methods of conducting seismogeophysical work, methods of processing, interpretation and modeling of the obtained seismological data;
- development of masters' abilities:

a) apply knowledge of fundamental and technical sciences, including mathematics, physics, chemistry;

b) to acquire practical skills of working with seismic and geophysical equipment, modern software for processing, interpretation and modeling of obtained seismological data using modern information technologies;

c) use the methods, skills and modern technical means necessary for assessing seismic hazard, risk and earthquake forecasting;

- formation of masters:

a) the ability to find and work with the necessary literature, computer information, databases and other sources of information to solve the tasks;

b) teamwork skills, but at the same time to show individuality, and if necessary to solve problems independently;

c) to conduct a comprehensive analysis of seismogeophysical data and monitoring of seismological work, as well as to make management decisions based on their results;

- formation of masters of industrial and ethical responsibility, the ability to understand the problem, the ability to work together with various specialists, to find optimal solutions, the need to improve their knowledge and skills;
- knowledge of modern social and political problems, proficiency in state, Russian and foreign languages, market economy tools, safety and environmental issues.

Field of professional activity:

The area of professional activity of masters in EP 7M05302 “Seismology” includes: the study of the structure and material composition of the lithosphere and tectonosphere of the Earth, the study of foci and precursors of earthquakes based on the achievements of solid-state physics, mechanics, 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. The study of the seismic process is in contact with physical geography, tectonics, especially with neotectonics and seismotectonics, with the mathematical theory of random processes, with cosmophysics.

Studies near the hearth 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:

Lithosphere and mantle of the Earth; geophysical fields; natural and man-made geological processes; computerized and software-controlled information-measuring and processing systems and complexes.

Subjects of professional activity:

- Study of the structure, physical models of the Earth's lithosphere and mantle, seismic regime;
- Conducting scientific research using seismogeophysical methods, as well as materials of monitoring observations;
- Processing, interpretation and modeling of the received data, as well as measures to ensure seismic safety and reduce the anthropogenic load on the environment.

Types of professional activity:

Masters in the educational program 7M05302 “Seismology” prepare for research and scientific-production professional activities. In accordance with the received fundamental and professional training, they can perform the following types of activities:

a) organizational and managerial activities:

- planning, organization and management of research and scientific-production field, laboratory and interpretive seismogeophysical works;
- development of operational work plans for seismological stations;
- selection and justification of scientific, technical and organizational solutions based on seismogeophysical data and economic calculations;
- planning and organization of scientific and production seminars and conferences.

b) research activities**:**

- independent selection and justification of the goals and objectives of scientific seismological 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 research results using modern achievements of science and technology, advanced domestic and foreign experience in the field of seismology;
- evaluation of the results of scientific research seismological work, preparation of scientific reports, publications, reports, preparation of applications for inventions and discoveries.

c) scientific and production activitiesность:

- independent preparation and conduct of research, monitoring and interpretation studies in solving practical problems in the field of seismology;
- collection, analysis and systematization of available seismological and geological-geophysical information using modern information technologies;
- complex processing, interpretation and modeling of seismogeophysical information in order to solve research problems in the field of seismology;
- participation in the development of normative methodological documents in the field of seismological 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 the research work of undergraduates.

Areas of professional activity:

With the profile direction: organizational and technological; settlement and design activities in:

- academic and departmental research organizations related to the solution of seismological problems;
- in akimats of regions, cities, in departments of emergency and emergency situations;
- organizations related to environmental monitoring and solving environmental problems.

At the scientific and pedagogical direction:

- educational (pedagogical) activity in various directions in higher educational institutions, scientific activity in information services of research institutions, state administration bodies, educational institutions, design organizations, industrial enterprises.

2. The purpose and objectives of the educational program

EP purpose:

Training of seismologists with a high level of theoretical and practical knowledge, capable of organizing, conducting and managing the recording, processing and complex analysis of seismological data using sustainable methods, machine learning technologies and software for research and professional activities, taking into account environmental, social and economic factors aimed at minimizing the impact on the environment and ensuring safety for people and ecosystems

EP tasks:

With the profile direction:

- Acquisition and consolidation of previously acquired knowledge about the fundamental laws of radiation and propagation of seismic waves in the Earth, theories and methods of studying its internal structure with the help of seismic waves, modern ideas about the nature and basic laws of seismicity of the Earth as a whole and the seismic regime of various fields, modern models of earthquake physics and processes of its preparation, principles and methods of assessment seismic hazard, seismic zoning and earthquake prediction.
- Acquisition of skills in processing, interpretation and modeling of geological and geophysical data, construction of geodynamic and geostatic models of the lithosphere; tectonic zoning of the foundation of platforms and orogenic areas; prediction of the internal structure of deformation-stressed zones.
- Acquisition of experience in the use of technologies for processing seismogeophysical data, skills in working with specialized systems for processing and interpreting these data, the use of engineering and economic calculations of the consequences of earthquakes; demographic and political consequences of them, the necessary forces and means for emergency rescue and other urgent work (AS and DNR), i.e. emergency response; zoning of the seismic risk of cities and settlements, building seismic models for the most typical regions, carrying out theoretical calculations of the main parameters of seismic impacts for them, predicting the degree of destruction on the MSK-64 scale. evaluate the reliability and accuracy of the results obtained.
- Acquisition of the ability to plan experiments to study the deep structure of the Earth by seismic methods, process and interpret the data obtained, conduct instrumental seismic observations, including in the epicentral zone of strong earthquakes, 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 seismic hazard specific territories and objects.
- mastering the skills of installation and maintenance of seismic recording equipment, analysis and interpretation of seismic records, isolation of seismic events, assessment of the location of the focus and determination of earthquake magnitude by seismic waves, intensity of concussions (score) by macroseismic manifestations of an earthquake, compilation and analysis of seismic zoning maps.

At the scientific and pedagogical direction:

- in-depth theoretical and practical training in seismogeophysics, as well as pedagogical activity;
- 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;
- acquisition of skills in organizing and conducting seismological research, obtaining the necessary foundation for continuing scientific work in doctoral studies;
- obtaining knowledge in the field of university pedagogy, psychology and teaching experience at the university.

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

As a result of mastering the master's degree program, the graduate should have deep theoretical knowledge and practical skills in the field of fundamental research of the causes, processes of preparation and occurrence of earthquakes, as well as the consequences associated with them. The main seismological directions include the study of processes in the earthquake focus, the wave seismic field near and far from its focus, the assessment and zoning of seismic hazard, the forecast of strong earthquakes.

The study of the seismic process includes the study of the totality of earthquakes in space and time, the identification of causal and stochastic patterns of their occurrence and connection with the general evolution of the Earth.

A graduate of the Department of Geophysics under the Master's degree program should know: the goals and objectives of seismology in the system of Earth sciences; be aware of the social significance of their future profession, have high motivation to perform professional activities; be able to assess the capabilities of each seismological method and navigate the applicability of individual methods; possess skills in working with seismogeophysical equipment, methods of processing and interpretation of monitoring data. data, including software on a computer, as a means of information management.

A master's degree graduate in EP 7M05302 “Seismology” must: have an idea of current trends in the development of the seismological industry; about its current methodological and philosophical problems; about the current state of the economic, political, legal, cultural and technological environment of global business partnerships.

Graduates of the master's program 7M05302 “Seismology” must have the ability to:

- abstract thinking, analysis, synthesis of a seismological database; be ready to 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 activities, develop their innovative abilities;
- be able to formulate research goals independently and establish a logical sequence for solving professional tasks; apply in practice knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's degree program.
- possess professional competencies (PC) corresponding to the type of professional activity that the master's degree program is focused on.

Graduates of the master's program 7M05302 “Seismology” should be able to:

- to form diagnostic solutions to seismological problems by integrating fundamental sections of seismological sciences and specialized knowledge; b) to be able to independently conduct scientific and methodological work and research in seismology, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations;
- conduct independent research and monitoring work; be able to professionally operate modern equipment and devices.

Graduates of the master's program 7M05302 “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;
- have communication skills to present their suggestions and recommendations in oral and written forms;
- be able to use effective methods of processing and interpreting complex information to solve production problems; build and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge;
- 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 with the use of various search engines (patent search, literary review of magazines and books, the Internet), in the selection and creative use of modern equipment for solving scientific and practical problems of oil and gas and ore geophysics;
- be socially mobile, be able to adapt to new situations in a 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.
- to perceive social, ethnic, confessional and cultural differences with tolerance, to appreciate the traditions of other cultures, their diversity in modern

society;

- be capable of criticism and self-criticism, have skills of interaction and cooperation, be ready to accept the role of a team leader;
- be ready to communicate orally and in writing in Kazakh, Russian and foreign languages to solve the tasks of professional activity;
- to 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	7M05 «Natural sciences and mathematics»
2	Code and classification of training directions	7M053 «Physical and chemical sciences»
3	Educational program group	M091 «Seismology»
4	Educational program name	7M05302 «Seismology»
	Short description of educational program	The master's program in EP 7M05302 “Seismology” provides: a) training of highly qualified specialists in the field of seismological methods of seismic hazard assessment, risk and earthquake forecasting; b) obtaining high-quality and professional knowledge on forecasting the places of occurrence, strength and recurrence of earthquakes; conducting detailed studies of earthquake preparation processes in a real physical and geological environment, displacements of Earth blocks and other transformations of the environment in foci, assessing the parameters of the focus, identifying earthquake precursors and those who are able to develop long-term, medium-term and short-term earthquake forecasts, methods of controlling the seismic process, to assess the possibility of anthropogenic (man-made) influence on seismicity; c) professional solution of engineering and seismological problems in the study of earthquake-induced seismic wave field near the hearth, the study of strong seismic movements of the Earth's surface and the interaction of soil with the structure, the development of methods and conducting seismic micro-zoning, determining the impact of earthquakes on the hydrosphere and the Earth's atmosphere. d) qualified research away from the earthquake source when studying the wave seismic field at distances exceeding the length of the seismic wave, as well as the development and use of seismic methods of cognition of the internal structure of the Earth. Adjacent to this direction is the study of seismic noise on the Earth's surface - microseism. The applied tasks include registration and recognition of underground nuclear tests. e) obtaining high-quality and professional knowledge by undergraduates on the stages and rational complexes of seismogeophysical research, processing, interpretation and modeling of the data obtained
6	EP Purpose	Training of seismologists with a high level of theoretical and practical knowledge, capable of organizing, conducting and managing the recording, processing and complex analysis of seismological data using sustainable methods, machine learning technologies and software for research and professional activities, taking into account

		environmental, social and economic factors aimed at minimizing the impact on the environment and ensuring safety for people and ecosystems
7	Type of EP	New EP
8	The level of the NQF	7
9	The level of the IQF	7
10	Distinctive features of the EP	no
11	List of competencies of the educational program:	Basic knowledge, skills and abilities (B) B1 –the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities; B2 – the ability to put into practice knowledge of fundamental and applied sections of seismogeophysical disciplines that determine the orientation (profile) of the Master's program in seismology; B3 – the ability to independently design and carry out research activities in the field of seismology using modern research methods and information and communication technologies and on the basis of complex geophysical and interdisciplinary research; B4 – the ability to professionally select and creatively use modern scientific and technical equipment to solve scientific and practical problems of seismology; B5 – understanding of the essence and significance of the interrelation of theoretical and practical research in seismology, allowing to effectively and rationally study the processes and mechanisms of seismicity; reduce the risks of man-made impacts on industrial and civil facilities; B6 – the ability to solve complex problems of seismology using innovative technologies; B7 – knowledge of the goals and objectives of fundamental and applied geophysical research in the areas of activity, the basic principles and methods of their organization; the main sources of information and requirements for the presentation of information materials. B8 – proficiency in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles in the areas of seismology; B9 – the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities; B10 – readiness to use modern methods and technologies of scientific communication in the state and foreign languages to solve urgent problems of seismology. **Professional Competencies (PC):** PC1 – the ability to form diagnostic solutions to professional problems of seismology by integrating fundamental and applied sections of geophysics (including gravimagnetic exploration, geoelectrics, seismology and seismic exploration) and specialized geological and geophysical knowledge (including physical processes

		occurring in the Earth and the internal structure of the Earth) to solve problems of seismology; PC2 – to know the promising directions of development and problems of seismology, the current level of elaboration of problems; PC3 – the ability to independently formulate research goals, establish the sequence of solving professional problems in the areas of seismology with the help of modern equipment and equipment, software and information technologies using the latest domestic and foreign experience; PC4 – the ability to independently conduct scientific experiments and research in seismology, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations; PC5 – the ability to freely and creatively use modern methods of processing and interpreting seismological information to solve scientific and practical problems, including those in related fields of knowledge; PC6 – the ability to create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge in the field of seismology; PC7 - be able to independently compile and submit research projects, prepare and coordinate technical specifications for the development of design solutions; PC8 - possess the skills of professional operation of modern seismological equipment and instruments; PC9 - to identify and systematize the main ideas in scientific publications; to critically evaluate the effectiveness of various approaches to solving seismological problems; to formulate an independent view of the proposed problem taking into account the latest domestic and foreign experience; PC10 - be able to manage scientific and production work in solving complex problems of seismology at the stages of design, execution (including processing, analysis and interpretation), preparation of reports and presentation of results; PC11 - own computer software packages designed to work with a complex of geological and geophysical data. PC12 – master the basic methods of collecting and analyzing, storing and processing scientific and technical information. PC13 - the ability to conduct seminars, laboratory and practical classes (within the framework of domestic and international educational programs) in the field of geophysics (in accordance with the specialization) using modern educational technologies; **Universal, social and ethical competencies (U):** U1 – understanding and practical use of the norms of a healthy lifestyle, including issues of prevention, the use of physical culture to improve performance; U2 – knowledge of the state, Russian and one of the most

		common foreign languages at a level that ensures human communication; U3 – awareness of the need to acquire the ability to study independently and improve their qualifications throughout their working life; U4 – readiness for self-development, self-realization, use of creative potential; U5 - the ability to plan and solve problems of their own professional and personal development. U6 - willingness to act in non-standard situations, to bear social and ethical responsibility for the decisions taken; U7 - готовность действовать в нестандартных ситуациях, нести социальную и этическую ответственность за принимаемые решения. U8 - possess the skills of systematic logical thinking in the analysis of scientific data and the formulation of practical tasks of seismological research. **Special and managerial competencies (S):** S1 – independent management and control of the processes of labor activity within the framework of the strategy, policy and goals of the organization, discussion of the problem, reasoning of conclusions and competent handling of information; S2 – willingness to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences; S3 – know and master the basic management functions (decision-making, organization, motivation, control) and methods of their implementation; S4 – have organizational skills, be able to create mobile working groups to fulfill their goals and be able to manage such a group, be able to protect their rights and require them to fulfill their duties. S5 – possess: methods and technologies of interpersonal communication, public speaking skills.
12	Learning outcomes of the educational program	LO 1: Understand and define a methodology for professionally solving seismological problems, based on a deep integrated geological and geophysical knowledge and the foundations of the philosophy of science LO 2: Analyze and generalize complex geological and geophysical data to determine interpretation criteria, combine and compare a priori and field information to obtain productive seismological survey materials using modern achievements in science and technology in the field of seismology LO 3: Use modern methods of teaching, education and educational technologies in teaching activities and in managing students' research work LO 4: Carry out communicative interaction in a team, apply knowledge of the philosophy of science to solve problems of professional and personal development, use knowledge, skills and abilities in professional activities

		LO 5: Apply systematic knowledge and skills to organize and perform seismological surveys, independently set research goals and select work methods, taking into account the principles of sustainable development and minimization of environmental risks based on competencies in the implementation of cognitive activities, taking into account social and ethical factors LO 6: Show deep theoretical and practical knowledge of seismology, based on the features of the cognitive process and the scientific worldview LO 7: Evaluate modern domestic and foreign scientific publications and research results to form an independent opinion in the field of seismology, critically analyze, present, defend, discuss and disseminate the results of their professional activities
13	Form of training	full - time
14	Duration of training	2
15	Volume of loans	120
16	Languages of instruction	Russian/Kazakh
17	Academic degree awarded	Master of Science
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	Amount of credits	Generated learning outcomes (codes)						
				LO1	LO2	LO3	LO4	LO5	LO6	LO7
Cycle of basic disciplines University component										
1	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	3	**V**			**V**			
2	Foreign language (professional)	The course is aimed at studying the main problems of scientific knowledge in the context of its historical development and philosophical understanding, the evolution of scientific theories, principles and methods of scientific research in the historical construction of scientific paintings of the world. The discipline will help to master the skills of developing critical and constructive scientific thinking based on research on the history and philosophy of science. At the end of the course, undergraduates will learn to analyze the ideological and methodological problems of science and engineering and technical activities in building Kazakhstan's science and the prospects for its development.	3				**V**			**V**
3	Higher school pedagogy	The course is aimed at mastering the methodological and theoretical foundations of higher education pedagogy. The discipline will help to master the skills of modern pedagogical technologies, technologies of pedagogical design, organization and control in higher education, skills of communicative competence. At the end of the course, undergraduates learn how to organize and conduct various forms of organizing training, apply active teaching methods, and select the content of training	3			**V**	**V**			

		sessions. Organize the educational process on the basis of credit technology of education.								
4	Psychology of management	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.	3			**V**	**V**			
5	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 of pedagogical practice is the Department of Geophysics of the IGNGD KazNITU named after K.I.Satpayev. The objectives of the practice are to gain experience in teaching work, as well as: - formation of a holistic view of pedagogical activity, pedagogical systems and the structure of higher education; - development of stable skills of practical application of professional and pedagogical knowledge obtained in the process of theoretical training; - development of professional and pedagogical orientation of undergraduates; familiarizing them with real problems and tasks solved in the educational process; studying methods, techniques, technologies of pedagogical activity in higher education; - development of personal and professional qualities of a teacher.	8	**V**	**V**	**V**	**V**	**V**	**V**	**V**
Cycle of basic special disciplines 1 Component of choice										

6	Basic seismology	Purpose: the study of earthquakes and related phenomena, the causes of the earthquake source and the physics of processes Contents: Explores the physical concepts of modern structural and focal seismology: elasticity theory and wave theory, rheology and fundamentals of the theory of rock fracture, modern methods for describing the mechanical properties of rocks, mechanics of geological media, fracture physics and the theory of strength of inhomogeneous media, elements of tensor analysis, deformations and stresses in a continuous medium	5	**V**				**V**	**V**	**V**
7	Intellectual property and research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.	5			**V**				**V**
8	Seismic waves in the earth's crust	Purpose: Study of the theory of seismic waves, vibration sources and observation systems, principles of processing and interpretation in seismology Contents: Modern instrumental observations and their development. Sources of fluctuations. Characteristics of seismic waves. Ray theory of wave propagation. Physical and mathematical ray. Seismic rays and their properties, ray parameter, wave front. Algorithms for calculating seismic ray traces. Inverse kinematic problem. Herglotz-Wiechert equation. Ray trajectories and hodographs	5	**V**				**V**	**V**	**V**
9	Geophysical methods for studying the earth's crust	Purpose: Study of the physical and mathematical foundations of geophysical methods; results of regional, deep, structural, prospecting and mapping geophysical studies Contents: Studies electrical, gravity, magnetic, seismic and geothermal exploration; principles of integrating geological, geophysical, geochemical methods for studying subsoil. Principles of paleomagnetology. Fundamentals of geological interpretation of gravity-magnetic anomalies. Electrical models of the earth's crust. Velocity models of large lithosphere blocks. Radio wave methods: tasks, methodology, results. Thermal models of the lithosphere	5	**V**	**V**			**V**	**V**	**V**
10	Deep structure of	Purpose: Introduction to the principles, objectives, methods and	5	**V**	**V**	**V**			**V**	

	the Earth's crust and lithosphere according to regional geophysical studies	main results of regional geophysics Contents: During the training process, problems of regional geophysics will be considered: fundamental and applied, geodynamic and forecasting. Structural seismology and DSS: methods of structural seismology, deep seismic sounding. Electromagnetic sounding. Paleomagnetology. Regional gravimetry. Integrated interpretation of GPS and gravimetry data. Spherical physical model of the Earth								
11	Sustainable development strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable development strategies are included.	5			**V**		**V**		**V**
12	Project Management	Purpose: To develop graduate students' knowledge and skills in project management for effective planning, execution, and completion of projects. Content: Graduate students will study methods and tools of project management, including project plan development, time and resource management, task execution control, risk assessment, and change management. Practical assignments include applying these methods in real project scenarios.	5		**V**		**V**	**V**		
Cycle of special profile disciplines University component										
13	The basics of seismotectonics	Purpose: Acquiring a system of knowledge about the nature of seismicity on a global and regional scale and studying the characteristics of geological structures that cause earthquakes Contents: The focus will be on studying the features of geological structures that generate earthquakes; methods and techniques of seismotectonic studies; characteristics of earthquakes and their generating forces in the bowels of the Earth; features of the distribution of seismically active zones in	5		**V**			**V**	**V**	**V**

		the territories of the world and Kazakhstan								
14	Monitoring of geodynamic processes and sustainability	Objective: to study the methodology of monitoring the geological environment for the purpose of rational and environmentally safe use of natural resources, with an emphasis on minimizing the impact on the environment and social responsibility. Contents: Theoretical foundations of geodynamic monitoring. Basic provisions of the research methodology. Evaluation of the objectivity and optimality of information. Development of recommendations for optimizing the interaction of the "engineering structure - geological environment" system. Modern methods of sustainable use of natural resources for the purpose of preserving ecosystems and long-term sustainable development.	5	**V**	**V**			**V**	**V**	**V**
15	Research practice	The objectives of the research practice are: - consolidation of skills of scientific or industrial work in seismology; collection of theoretical, laboratory and field material for writing a master's thesis; - formation of skills and abilities in the preparation of scientific and technical reports and public presentations; - 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: - direct participation in research or production work; - acquisition of professional competencies in accordance with the types and tasks of geological exploration; - involvement of a master's student in a scientific discussion in a creative team, development of public speaking skills; - mastering the technical means of presenting a scientific result. Forms of research practice: field, laboratory, desk. The content of a master's research practice depends on the focus of the task and the topic of the master's thesis. It is directly related to the nature and direction of the scientific activity of the organization in which the undergraduate is practicing. The research practice plan is drawn up individually for each undergraduate and is a program of theoretical, experimental or field work in the field of oil and gas or rune geophysics. This plan provides for: collection of seismological information on the object of research; analysis of data on the seismicity of the	4	**V**	**V**	**V**	**V**	**V**	**V**	**V**

		studied area; formulation and justification of specific research works; conducting field, experimental or computational work; processing and interpretation of the obtained materials.								
Cycle of special profile disciplines Component of choice										
16	Quantitative seismology	Purpose: Study of the deep structure of the Earth based on calculations of seismological characteristics Contents: Propagation of seismic waves in the Earth. Global and regional seismicity. Theory of elasticity in seismology. Fundamentals of the dynamic theory of elasticity. Stress and strain tensors. The relationship of stresses and deformations. Elastic energy. Description of seismic sources. Seismic moment. The tensor of the seismic moment. Elastic waves from a point source. A wave field in an infinite homogeneous medium.	5	**V**	**V**			**V**	**V**	
17	Engineering seismology fundamentals	Purpose: Studying the fundamentals of engineering seismology, the theory of seismic resistance and dynamics of structures Contents: The following issues are considered: methods for calculating reinforced concrete structures for seismic impacts. Seismic codes of some countries. Forms of seismic destruction of buildings and structures after strong earthquakes, causes of seismic destruction of buildings. Theory and calculation of seismic resistance of buildings and structures based on the results of severe earthquakes. Features of restoration and strengthening of buildings and structures damaged by earthquakes	5	**V**				**V**	**V**	**V**
18	Seismic statistics	Purpose: Study of the modern ideas about the patterns of seismic statistics in the energy, spatial and temporal domains Contents: Study of the Gutenberg-Richter law, Sadovsky hierarchy, fractal geometry of seismicity, temporal grouping of earthquakes. Particular attention is paid to the seismic cycle and the recurrence of earthquakes; the problem of comparing the results of seismic statistics with the conclusions of physical theories of destruction. Problems of spatial-temporal connectivity and self-similarity of the seismic process, etc.	5	**V**	**V**				**V**	**V**
19	Fundamental foundations of tectonosphere research	Purpose: Study of the tectonosphere using geophysical methods to determine its structure, age of formation and history of development Contents: Studies the structure and types of the tectonosphere; interaction of the lithosphere and asthenosphere.	5	**V**				**V**	**V**	**V**

		Geophysical methods for studying the tectonosphere. Gravity-magnetic prospecting. Geothermal method. Magnetotelluric sounding. Deep seismic sounding. Tectonic structure and connection of structures of different tectonic types, age of formation and history of development with structures of gravitational, magnetic, electric, thermal and seismic anomalous fields								
20	Deep structure of the Earth according to seismological data	Purpose: Study of the fundamental laws of propagation of seismic waves in the Earth Contents: Types of seismic waves, their main characteristics. General ideas about the use of seismic waves in the study of the internal structure of the Earth. Seismic tomography. Methods of processing digital seismic data. Seismic recording equipment. The place of seismology in Earth sciences. Seismology and earthquake damage reduction. Seismic properties of soils. Seismological zoning and prediction of seismic impacts	5	**V**				**V**	**V**	**V**
21	Theoretical foundations, registration, processing and interpretation of seismic data	Purpose: Study of physical and geological fundamentals, equipment and technologies, registration and processing complexes of seismic exploration Contents: Studies the physical and geological foundations of seismic exploration; theory of elasticity; principles of geometric seismic; initial and boundary conditions; waves in absorbing media; types of real environments; elastic waves in homogeneous media; seismic models environments and seismic boundaries; seismic waves and hodographs in multilayer, gradient and layered-gradient media. Digital signal recording; telemetric seismic recording systems	5		**V**		**V**	**V**	**V**	**V**
22	Software-processing complexes and technology of computer processing of seismology data	Purpose: Study of modern technologies for digital processing of geophysical data, integrated systems for interpreting seismic geophysical measurements, information base of seismological methods Contents: The principles and modern methods of analysis and mathematical processing of seismological information are studied. Attention is paid to the practical development of processing and interpretation programs. Modern processing computer systems, their functions, capabilities, technical characteristics are considered.	5		**V**			**V**		
23	The damage from	Purpose: Study of the scientific and methodological foundations	5	**V**	**V**		**V**	**V**	**V**	**V**

	the earthquake. Methods of assessment of the situation	of calculating earthquakes and their consequences. Contents: Classification of buildings and structures. Calculation of the degree of damage to buildings and structures using the seismic scale MSK-64. Forecasting population losses in densely populated cities. Forecasting damage and destruction of buildings, strengthening administrative structures. Calculation of equipment and special medicines for emergency rescue operations after earthquake damage; organizing financing for restoration work								
24	Manmade seismicity	Purpose: Study of the factors of man-made seismic phenomena in mineral deposits and the possible consequences of strong man-made earthquakes Contents: The types of man-made earthquakes and their causes are considered; seismic waves excited during earthquakes and recorded at seismic stations; methodological principles and schematic diagram of the analysis of seismological and seismotectonic materials for assessing man-made seismic hazard; the essence of geodynamic organization monitoring at deposits of solid minerals, oil and gas	5	**V**	**V**				**V**	**V**
25	Technogenic geophysical phenomena	Purpose: Acquiring knowledge about the main elements of man-made geophysical phenomena, the factors that determine them, and possible consequences on the environment Contents: Causes and nature of man-made geophysical phenomena. Classification of man-made geophysical phenomena. Seismic phenomena. Man-made changes in the Earth's gravitational field. Changes in the magnetic field as a result of industrial processes. Geophysical phenomena associated with technical engineering processes. Monitoring and management of man-made geophysical phenomena	5		**V**			**V**	**V**	**V**
26	Technology of computer processing of seismic data	Purpose: Study new approaches to improving the existing seismic service and creating new optimal and authorized production systems Contents: Collection, processing and storage of seismometric information. Transition from analog to digital information; creation of a flexible and reliable system with complex mathematical support; state of research and prospects for automation of seismometric studies; automated seismic analysis system; processing of instrumental	5		**V**			**V**		**V**

		observations; programs for determining the coordinates of epicenters								
27	Seismic regime	Purpose: Study of the seismic regime as a set of earthquakes manifested in space, time and energy Contents: Studies the following issues: aspects of seismicity and their use; assessment of the degree of seismic hazard of territories and forecast of the possibility of strong earthquakes; development of the seismic regime in the preparation of strong seismic events on the depth of earthquake foci, recurrence, energy and methods for studying the seismic regime on the law of earthquake recurrence; methods for identifying anomalies in variations in seismic regime parameters	5	**V**	**V**			**V**	**V**	**V**
28	Seismic regime and prediction of seismic hazard in Kazakhstan	Purpose: Study of methods for calculating seismic risks, assessing the degree of damage and destruction of structures, population losses in densely populated cities during strong earthquakes Contents: Seismic regime. Methods for calculating seismic risks. Processing and interpretation of information on the degree of destruction of construction projects. Stages of work on zoning seismic hazard, studying the seismic regime and the current level of seismicity of the territory, identifying seismically active areas and assessing their seismic potential	5		**V**			**V**	**V**	**V**
29	Engineering seismology and seismic resistance	Purpose: Study of seismic data necessary for the design of stable (earthquake-resistant) structures against earthquakes Contents: Engineering seismology, basic concepts of engineering seismology. Estimation of earthquake strength. Earthquake intensity. Equipment for recording earthquakes. Seismograms, velocigrams and accelerograms. Seismic zoning and microzoning. Identification of earthquake-prone areas and preliminary forecasts of the likely seismic impact of a strong earthquake, etc.	5	**V**	**V**			**V**	**V**	**V**
30	Information-measuring and software-processing complexes for modeling seismic events	Purpose: Study information-measuring and software-processing complexes for determining the parameters of earthquakes Contents: Studies the types of seismic stations for stationary operational seismic observations; types of modern meters; digital registration systems. Determination of the coordinates of hypocenters based on the analytical solution of the equations of direct waves. A method for quickly determining the position of	5		**V**	**V**				**V**

		the epicenter with a minimum of initial information and in a group manner. Software-processing complexes and examples of automatic computer determination of earthquake epicenters in Kazakhstan								
31	Concepts and models of earthquake preparation	Purpose: Study of changes in the stress-strain state of the earth's crust caused by various physical and mechanical processes in rocks accompanied by tectonic earthquakes Contents: Aimed at studying the following issues: mechanisms and rates of geodynamic processes; various models of preparation and implementation of earthquakes; dilatant-diffuse (DD) model, avalanche-unstable cracking (ALC) model, stick-slip model: consolidation model, phase transformation model	5		**V**	**V**		**V**	**V**	**V**
32	Earthquake damage assessment methods	Purpose: Determination of the volume, nature and degree of destruction of objects during earthquakes by analyzing the influence of destruction and negative impacts on the population and the stability of the functioning of elements of objects Contents: Methods for assessing damage during earthquakes based on historical and modern seismic observations are being studied; methods for calculating the consequences of an earthquake and damage to administrative structures and residential buildings after earthquakes; methods for calculating the demographic and political consequences and means for carrying out work to eliminate emergencies.	5	**V**	**V**			**V**	**V**	**V**
33	Models and parameters of earthquake foci	Purpose: Study of parameters and models of earthquake preparation at different levels of the Earth's lithosphere, its structure, patterns of deformation and destruction, physics of the earthquake source and structural-mechanical models of the environment Contents: The issues of processing and interpreting the observed parameters of earthquake sources with the construction of modern geomechanical models, determining the parameters of earthquake sources, deformation processes in rock masses, physical laws and conditions for the emergence of an unstable state of various geospheres of the Earth are studied.	5	**V**	**V**				**V**	**V**
34	Modeling of geological environments	Purpose: Mastering the theoretical and methodological foundations for constructing three-dimensional geological models based on geophysical data to study geodynamic processes to ensure industrial and environmental safety	4		**V**			**V**	**V**	**V**

		Contents: Studies: methods for creating a database of geological, geophysical and geodetic materials for compiling a volumetric 5-layer 3D model of elastic-plastic parameters; methodology for preparing the tectonophysical and seismological basis for geodynamic zoning of the newest stage of development; calculation of regional stresses and deformations, assessment of seismicity based on geodynamic models								
35	Monitoring of natural and man-made seismicity	Purpose: Study a set of works aimed at recording, processing and analyzing seismic signals of natural and man-made origin Contents: In the course of training, the following will be considered: high-tech solutions in the field of hardware and software, methods of registering ground movement and methods of processing recorded information; interpretation of the results of studying natural and induced seismicity. Possible risks associated with the consequences of seismic impacts. Results of seismic monitoring, etc.	5	**V**	**V**			**V**	**V**	
36	Monitoring of the seismic hazard of the subsurface based on the study of geological processes	Purpose: Studying the methodology for constructing three-dimensional geological and geophysical models of the geological environment and four-dimensional modeling of neotectonic processes affecting the formation of seismic zones Contents: Monitoring objects: licensed subsoil areas; mining areas affecting the development of hazardous geological processes. Types of monitoring: groundwater monitoring; monitoring of dangerous exo-endogenous geological processes; monitoring of mineral deposits. Methods of numerical modeling and mapping. Geological-geophysical, hydrogeological and engineering-geological characteristics of monitoring the seismic hazard of subsoil	4	**V**	**V**			**V**	**V**	
37	Physics and prediction of earthquakes	Purpose: Studying the physics of earthquake preparation and the phases of their prediction algorithms Contents: The following issues are considered: seismic, deformation, electromagnetic, geochemical and other precursors; nature and concept of earthquake source and seismic source model; physical parameters of earthquakes; energy, geometric and dynamic characteristics of the earthquake source; errors and uncertainties of estimates. Goals, objectives and types of earthquake	5	**V**	**V**		**V**	**V**	**V**	**V**

		forecasting, physical prerequisites for earthquake forecasting. Identification of the stages of earthquake preparation. Forecast algorithms: long-term, medium-term and short-term								
38	Harbingers of earthquakes	Purpose: Study of patterns, physical nature, parameters and methods for identifying tectonic and geophysical precursors in assessing seismic hazard and seismic risk Contents: Studies: statistical and physical aspects of tectonic and geophysical precursors of earthquakes; methods for identifying anomalies in variations of geophysical fields and anomalies in tectonic tension caused by the process of earthquake preparation. Forecast and algorithms for earthquake forecasts, their application. Using precursors to develop a forecast by duration and spatial location	5	**V**	**V**			**V**	**V**	
39	Zoning of seismic risks and preliminary assessment of the impact of strong earthquakes	Purpose: Study of theoretical and practical aspects of seismic risk assessment in specific regions Contents: Concepts of seismology, mechanisms of occurrence and classification of earthquakes. The impact of waves on structures, assessing the stability of buildings under various seismic activity, designing earthquake-resistant structures. Analysis of the vulnerability of buildings to seismic shocks. Methods for assessing the impact of earthquakes on the environment, developing plans to reduce the consequences. Analysis of data on earthquakes of various sizes. Construction of seismic risk and vulnerability maps	5	**V**	**V**			**V**	**V**	**V**
40	Seismological monitoring of underground nuclear and industrial explosions. Technogenic geophysical phenomena.	Purpose: Study the system of scientific knowledge and research methods in the field of underground nuclear and industrial explosions to ensure seismic safety in the mining industry. Contents: The following issues are considered: methodology for seismological monitoring of underground nuclear and industrial explosions, methods for their detection and recognition; factors determining man-made seismic impacts and possible consequences of strong man-made earthquakes; main elements of man-made geophysical phenomena and their factors. methodology for analyzing seismological and seismotectonic materials to assess technogenic seismic hazard	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"

SATBAYEV UNIVERSITY

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

WORKING CURRICULUM

Academic year	**2025-2026 (Autumn, Spring)**
Group of educational programs	**M091 - "Seismology"**
Educational program	**7M05302 - "Seismology"**
The awarded academic degree	**Master of Technical Sciences**
Form and duration of study	**full time (scientific and pedagogical track) - 2 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		
									1 sem	2 sem	3 sem	4 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)													
CYCLE OF BASIC DISCIPLINES (BD)													
M-1. Module of basic training (university component)													
LNG213	Foreign language (professional)		BD, UC	3	90	0/0/30	60	E	3				
HUM214	Psychology of management		BD, UC	3	90	15/0/15	60	E	3				
HUM212	History and philosophy of science		BD, UC	3	90	15/0/15	60	E		3			
HUM213	Higher school pedagogy		BD, UC	3	90	15/0/15	60	E		3			
M-2. Module of special seismological 1													
GPH261	Basic seismology	1	BD, CCH	5	150	30/0/15	105	E	5				
GPH749	Engineering seismology fundamentals	1	BD, CCH	5	150	30/0/15	105	E	5				
MNG781	Intellectual property and research	1	BD, CCH	5	150	30/0/15	105	E	5				
GPH286	Geophysical methods for studying the earth's crust	2	BD, CCH	5	150	30/0/15	105	E	5				
GPH762	Fundamental foundations of tectonosphere research	2	BD, CCH	5	150	30/0/15	105	E	5				
GPH700	Deep structure of the Earth's crust and lithosphere according to regional geophysical studies	2	BD, CCH	5	150	30/0/15	105	E	5				
MNG782	Sustainable development strategies	2	BD, CCH	5	150	30/0/15	105	E	5				
GPH750	Quantitative seismology	1	BD, CCH	5	150	30/0/15	105	E		5			
GPH751	Seismic statistics	1	BD, CCH	5	150	30/0/15	105	E		5			
MNG704	Project Management	1	BD, CCH	5	150	30/0/15	105	E		5			
M-5. Practice-oriented module													
AAP273	Pedagogical practice		BD, UC	8				R			8		
CYCLE OF PROFILE DISCIPLINES (PD)													
M-3. Module of professional activity (university component)													
GPH285	The basics of seismotectonics		PD, UC	5	150	30/0/15	105	E	5				
M-4. Module of special seismological 2													
GPH761	Concepts and models of earthquake preparation	1	PD, CCH	5	150	30/0/15	105	E	5				
GPH713	Models and parameters of earthquake foci	1	PD, CCH	5	150	30/0/15	105	E	5				
GPH753	Seismic waves in the earth's crust	1	PD, CCH	5	150	30/0/15	105	E		5			

GPH754	Deep structure of the Earth according to seismological data	1	PD, CCH	5	150	30/0/15	105	E		5			
GPH755	Theoretical foundations, registration, processing and interpretation of seismic data	1	PD, CCH	5	150	30/0/15	105	E		5			
GPH289	Seismic regime	2	PD, CCH	5	150	30/0/15	105	E		5			
GPH703	Seismic regime and prediction of seismic hazard in Kazakhstan	2	PD, CCH	5	150	30/0/15	105	E		5			
GPH714	Engineering seismology and seismic resistance	3	PD, CCH	5	150	30/0/15	105	E		5			
GPH718	Zoning of seismic risks and preliminary assessment of the impact of strong earthquakes	3	PD, CCH	5	150	30/0/15	105	E		5			
GPH288	Software-processing complexes and technology of computer processing of seismology data	1	PD, CCH	5	150	30/0/15	105	E			5		
GPH269	Technology of computer processing of seismic data	1	PD, CCH	5	150	30/0/15	105	E			5		
GPH763	Information-measuring and software-processing complexes for modeling seismic events	1	PD, CCH	5	150	30/0/15	105	E			5		
GPH275	The damage from the earthquake. Methods of assessment of the situation	2	PD, CCH	5	150	30/0/15	105	E			5		GPH113
GPH720	Manmade seismicity	2	PD, CCH	5	150	30/0/15	105	E			5		
GPH242	Technogenic geophysical phenomena	2	PD, CCH	5	150	30/0/15	105	E			5		GPH216
GPH287	Physics and prediction of earthquakes	3	PD, CCH	5	150	30/0/15	105	E			5		
GPH722	Harbingers of earthquakes	3	PD, CCH	5	150	30/0/15	105	E			5		
GPH721	Earthquake damage assessment methods	3	PD, CCH	5	150	30/0/15	105	E			5		
GPH267	Seismological monitoring of underground nuclear and industrial explosions. Technogenic geophysical phenomena.	4	PD, CCH	5	150	30/0/15	105	E			5		
GPH724	Monitoring of natural and man-made seismicity	4	PD, CCH	5	150	30/0/15	105	E			5		
GIS226	Monitoring of geodynamic processes and sustainability	4	PD, CCH	5	150	30/0/15	105	E			5		
GPH759	Modeling of geological environments	1	PD, CCH	4	120	30/0/15	75	E				4	
GPH760	Monitoring of the seismic hazard of the subsurface based on the study of geological processes	1	PD, CCH	4	120	30/0/15	75	E				4	
M-5. Practice-oriented module													
AAP256	Research practice		PD, UC	4				R				4	
M-6. Experimental research module													
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R	4				
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R		4			
AAP251	Research work of a master's student, including internship and completion of a master's thesis		RWMS	2				R			2		
AAP255	Research work of a master's student, including internship and completion of a master's thesis		RWMS	14				R				14	
M-7. Module of final attestation													
ECA212	Registration and protection of the master thesis		FA	8								8	
Total based on UNIVERSITY:									30	30	30	30	
									60		**60**		

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	0	0	0	0
BD	Cycle of basic disciplines	0	20	15	35
PD	Cycle of profile disciplines	0	9	44	53
Total for theoretical training:		**0**	**29**	**59**	**88**
RWMS	Research Work of Master's Student				24
ERWMS	Experimental Research Work of Master's Student				0
FA	Final attestation				8
TOTAL:					**120**

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	Uskenbayeva R. K.
Approved:	
Vice Provost on academic development	Kalpeyeva Z. Б.
Head of Department - Department of Educational Program Management and Academic-Methodological Work	Zhumagaliyeva A. S.
Director - Geology and Oil-gas Business Institute named after K. Turyssov	Auyelkhan Y. .
Department Chair - Geophysics and seismology	Ratov B. T.
Representative of the Academic Committee from Employers ____Acknowledged____	Khitrov D. M.