



SATBAYEV
UNIVERSITY

**K. Turysov Institute of Geology and Oil and Gas Engineering
Department of Hydrogeology, Engineering and Oil and Gas Geology**

EDUCATIONAL PROGRAM
8D05204 Hydrogeology and geoecology"
code and name of the educational program

Code and classification of the field of education: 8D05 Natural Sciences

Mathematics and Statistics

Code and classification of training directions::8D052 Environment

Group of educational programs: D088 Hydrogeology and Engineering Geology

NRC level:7

ORC Level:7

Duration of training: 3 g

Amount of credits: 180

Almaty 2025

Educational program 8D05204 Hydrogeology and geoecology"
was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 10 dated «06 » 03 2025.

was reviewed and recommended for approval at the meeting of K.I. Satbayev
KazNRTU Educational and Methodological Council

Minutes # 3 dated «20 » 12 2025 .

Educational program 8D05204 «Hydrogeology and geoecology» was developed by
the Academic Committee in the field of "Environment"

Full name	Academic degree academic title	Position	Place of work	Signature
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Teaching staff:				
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Zapparov M. R.	Candidate of Geological and Mineralogical Technical Sciences	Associate Professor	NCJS «Kazakh national research technical university named after K.I.Satbayev», mobile phone: +7 777 297 08 98, m.zapparov@satbaye v.university	
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Students				

Nurgalimova Zhansaya Sabyrovna	Doctoral student of 1 year of study 8D05202- <u>Hydrogeology</u> and <u>engineering Geology</u>		NCJS «Kazakh national research technical university named after K.I.Satbayev», mobile phone: +77083971064	
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List of abbreviations and symbols

DB – basic disciplines
SSO – the state mandatory standard of education
DP – documented procedure
DOT – distance learning technologies
UNT – Unified national testing
IEP – Individual curriculum
KTO-credit training technology
QED-catalog of elective subjects
Ministry of Education and Science of the Republic of Kazakhstan – Ministry of Education and Science of the Republic of Kazakhstan
MOE-modular educational program
R & D – research work
R & D and publishing - research and innovation activities
Research and Development Center – research work of students
OOD – General education subjects
OP-educational program
PD-profile disciplines
PC – personal computer
Teaching staff – faculty members
Republic of Kazakhstan – Republic of Kazakhstan
RUP – working curriculum
QMS-Quality management system
SRS – independent work of students
SRSP– independent work of students under the guidance of a teacher
TUPl – standard curriculum
ATC – Training and support staff
UMKD – educational and methodical complex of disciplines
UMS-educational and methodical Council
UMR – educational and methodical work
EUM – electronic learning materials

1. Description of the educational program

Educational program – hereinafter, OP) is a set of documents developed by the Kazakh National Research Technical University named after K. I. Satpayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan. The EP takes into account the needs of the regional labor market, the requirements of state bodies and relevant industry requirements and is based on the state educational standard for higher professional education in the relevant field.

The OP defines program educational goals, the results of doctoral students' training, the necessary conditions, content and technologies for the implementation of the educational process, assessment and analysis of the quality of students during training and after graduation. The EP includes the curriculum, the content of disciplines and learning outcomes, and other materials to ensure quality education for doctoral students.

The purpose of developing the OP "Hydrogeology and Geoecology" is to help doctoral students, teachers and industry experts understand the structure of the educational process and demonstrate how the curriculum and course content contribute to the formation of the necessary core competencies after doctoral students finish their studies.

Last but not least, the goal of the EP is to establish a common framework for the feasibility and necessity of a Hydrogeology and Geoecology training program for all stakeholders, including government, public authorities, the hydrogeological industry, universities, parents and doctoral students, and the community. It is intended for specialized training of doctoral students in the educational program of the specialty "Hydrogeology and Geoecology" at Satbayev University and was developed within the framework of the direction "Hydrogeology and Engineering Geology".

This document meets the requirements of the following legislative acts of the Republic of Kazakhstan and regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan:

- * The Law of the Republic of Kazakhstan "On Education" with amendments and additions in the framework of legislative changes to increase the independence and autonomy of universities dated 04.07.18 No. 171-VI.

- * Law of the Republic of Kazakhstan "On Amendments and additions to certain Legislative Acts of the Republic of Kazakhstan on expanding the academic and managerial independence of higher educational Institutions" dated 04.07.18 No. 171-VI.

- * Order of the Minister of Education and Science of the Republic of Kazakhstan No. 595 dated 30.10.18 "On approval of Standard Rules for the activities of relevant types of educational organizations".

- * State mandatory Standard of Higher Education (Appendix 7 to the Order of the Minister of Education and Science of the Republic of Kazakhstan No. 604 dated 31.10.18.

- * Resolution of the Government of the Republic of Kazakhstan dated 19.01.12 № 111 "On approval of Standard rules for admission to study in educational

organizations implementing educational programs of higher education" with amendments and additions dated 14.07.16 № 405.

* Resolution of the Government of the Republic of Kazakhstan dated 13.08.12 № 1042 "On approval of the Concept of development of the geological industry until 2030".

* The Law on Subsurface Resources and Subsurface Use and the draft Code on Subsurface Resources and Subsurface Use.

* Code of Public Reporting on Exploration Results, Mineral Resources and Reserves of KAZRC.

* Concept of the State Geological Exploration Program for 2021-2025, January 31, 2020

• "National Qualifications Framework", approved by the protocol of March 16, 2016 of the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.

2. Purpose and objectives of the educational program

Цель ОП: The purpose of the Educational program is to prepare doctoral students in a specialized field with an in-depth level of professional training in the field of hydrogeology and geoecology, capable of formulating and practically solving modern scientific and practical problems, developing in them modern environmental thinking, having a knowledge base, acquiring research skills, participating in scientific events at various levels, mastering the methodology of conducting scientific research, successfully carrying out research and management activities.

Training in the doctoral program is aimed at training specialists in the field of hydrogeology and geoecology, engineering geology, with an emphasis on theoretical and applied research in the construction of engineering structures in various conditions, assessment of groundwater resources and quality, as well as the study of the formation of seasonal and permafrost rocks, in solving problems of ecological geology.

Types of employment:

production and technological infrastructure;

organizational and managerial support.

experimental and research activities;

calculation and design and analytical work.

Doctoral studies in the specialty "Hydrogeology and Geoecology" prepare you to solve professional problems depending on the type of professional activity, including:

a) Production and technological activities:

- performing hydrogeological, geoecological and engineering geological observations;

- use of specialized equipment and equipment for hydrogeological and geoecological research;

- compliance with standards, norms and rules of operation of hydrogeological equipment;

- ensuring compliance with field observation methods and techniques;

- preparation and analysis of documentation on hydrogeological and geological engineering works;
- solving production problems during field, field and laboratory hydrogeological and geoecological studies;
- use of modern field and laboratory equipment;
- keeping records of work performed and evaluating its economic efficiency;
- processing, analysis and systematization of hydrogeological and geoecological research data using modern technologies;
- development of methodological documents for carrying out hydrogeological, engineering-geological and geoecological works;
- ensuring safety during research and environmental protection.

b) Organizational and managerial activities:

- organization of work of research groups and project teams;
- planning and organization of hydrogeological and engineering geological surveys;
- selection of optimal solutions when designing work in difficult or extreme conditions;
- organization of interpretation and analysis of geoecological, hydrogeological and engineering geological data;
- compliance with legislation on rational use and protection of water resources.

c) Experimental and research activities:

- collection and analysis of scientific and technical information for solving hydrogeological and geoecological problems;
- mathematical modeling of hydrogeological processes using specialized programs;
- conducting experiments using pre-defined methods, as well as mathematical processing and interpretation of the obtained data.

d) Calculation, design and analytical activities:

- formation of goals and objectives of projects that ensure high standards of hydrogeological, geoecological, and geotechnical engineering work;
- collection and analysis of source data for the design and development of solutions;
- carrying out a feasibility study of project calculations;
- author's supervision of projects and their implementation in production;
- technical design in the field of hydrogeological and geoecological research, development, and environmental assessment of natural objects;
- preparation of methodological sections of projects and production of design and technical documents in the field of geoecology and hydrogeology.

Objects of professional activity of the graduate:

- Earth, earth's crust, lithosphere, rocks, ground and artesian waters, underground water deposits;
- Physical and chemical properties of rocks, their filtration capacity;
- Natural mineral resources (metallic and nonmetallic, liquids and gases) , methods of their search and exploration;
- Geoecological research and mapping technologies using geoinformation

systems;

- Ecological functions of the lithosphere and the state of mining areas.

Objectives of the educational program (OOP):

- Study of general education subjects that provide social and humanitarian education based on the laws of socio-economic development, history, modern information technologies, as well as state and foreign languages;
- Study of basic disciplines necessary for obtaining knowledge in the field of natural sciences, general technical and economic disciplines, as the foundation of professional education;
- A cycle of specialized disciplines focused on key theoretical aspects of geology, hydrogeology and engineering geology, including search and exploration of underground waters, rational use of natural resources;
- Study of disciplines that form the skills of planning and organizing research, designing hydrogeological and engineering geological works;
- Familiarization with the technologies and equipment of enterprises during practical training;
- Acquisition of skills in laboratory research, technological calculations, equipment selection and design using modern computer technologies.

3. Requirements for evaluating the learning outcomes of an educational organization programs

The results of mastering the OOP of doctoral studies are determined by the competencies acquired by the graduate and his ability to apply the formed general cultural, general professional and professional competencies in accordance with the tasks of professional activity.

As a result of mastering OOP, a doctoral student should have the following competencies:

- Independently understand and apply appropriate analytical methods, collect and integrate information in the best possible way in accordance with the standards of the geological, hydrogeological and geoecological industry;
- Defend your own point of view on the professional problem, argue original ideas when solving problems of monitoring, forecasting and managing risks associated with it;
- Able to conduct independent research that promotes development;
- Able to demonstrate high professional qualities and ethics when interacting with various stakeholders;
- Demonstrate the skills of scientific writing, high professional qualities and ethics of a researcher in scientific communication in the state, Russian and foreign languages with various interested parties;
- Demonstrate knowledge of modern research methods and the ability to apply them in the implementation of scientific projects and research in the field of

environmental protection;

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	8D05 Natural Sciences, mathematics and Statistics
2	Code and classification of training	areas 8D052 Environment
3	Group of educational programs	D088 Hydrogeology and engineering Geology
4	Name of the educational program	8D05204 Hydrogeology and geoecology
5	Brief description of the educational program	Hydrogeology -a science that studies the origin, conditions of occurrence, composition and patterns of underground water movement. The interaction of groundwater with rocks, surface water, and the atmosphere is also being studied. Geoecology is an interdisciplinary scientific field that combines studies of the composition, structure, properties, processes, physical and geochemical fields of the Earth's geospheres as a habitat for humans and other organisms.
6	Purpose of the OP	The purpose of the Educational program is to prepare doctoral students in a specialized field with an in-depth level of professional training in the field of hydrogeology and geoecology, capable of formulating and practically solving modern scientific and practical problems, developing in them modern environmental thinking, having a knowledge base, acquiring research skills, participating in scientific events at various levels, mastering the methodology of conducting scientific research, successfully carrying out research and management activities.
7	Type of OP	production and technological; organizational and managerial; experimentalresearch;
8	Level according to NRC	8
9	Level according to ORC	8
11	List of competences of the educational program:	Natural-scientific andtheoretical-ideological competencies; Social-personal and civic competencies; General engineering professional competencies; Communication and IT virtual competencies;
12	Learning outcomes of the educational program:	1 Independently understand and apply appropriate analysis methods, collect and integrate information in the best possible way according to the standards of the geological, hydrogeological and geoecological industry; 2 Protect your own point of view 3 3 are able to conduct independent research that promotes development; 4 Are able to demonstrate high professional qualities and ethics when interacting with various stakeholders; 5 are able to conduct independent research that contributes to development; 4 are able to demonstrate high professional qualities and ethics when interacting with various

		stakeholders; 5 Demonstrate scientific writing skills, high professional qualities and researcher ethics when conducting scientific research. communication in the state, Russian and foreign languages with various interested parties; 6 Demonstrate knowledge of modern research methods and the ability to apply them in the implementation of scientific projects and research in the field of environmental protection;
13	Form of study	Full -time
14	Duration of study	3 years
15	Amount of credits	180
16	Languages of study	Kazakh, Russian, English
17	Academic degree awarded	Doctor of Industry
18	Developer(s) and authors:	Absametov M. K., Auelkhan Y. S.

4.2. The relationship between the achievability of the generated learning outcomes in the educational program and academic disciplines

#	Name of the discipline	Short description of the discipline	Number of credits	Generated learning outcomes (codes)								
				RO1	RO2	RO3	RO4	RO5	RO6	RO7		
Cycle of basic disciplines University component												
	Academic writing	Objective: To develop the system competencies of doctoral students and young researchers in the field of academic writing as a key tool for scientific communication and publication activities. Content: Scientific discourse and academic communication; Typology of scientific texts: from dissertation to publication; Creation of original scientific content; Scientific text: structure and logic of construction; Comparative analysis of sources and preparation of a literature review; Work with metadata and scientometric tools; Preparation of articles for international peer-reviewed journals; Work with reviews and the scientific community; Academic work with the scientific community. mobility and grant support for research; Abstracts, patents, reports: science outside the article; Planning a publication strategy and research career; English for Scientific Communication.	5	/								
	. Methods of scientific research	The goal: is to master 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				/					
Цикл Cycle of basic disciplines Elective component												

НАО «КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
ИМЕНИ К.И. САТПАЕВА»

Geophysical methods for assessing groundwater resources.	Objective: To provide students with basic knowledge about underground water resources and reserves, methods of their assessment, deposits (subsurface areas), as well as about forecasting the quality of underground water and its protection at water intake sites. Contents: Basic concepts and general provisions of the assessment of groundwater reserves. Classification of reserves and forecast resources of potable, industrial, and mineral groundwaters and their categorization principles. Content of the assessment of operational groundwater reserves. Methods for estimating groundwater reserves and resources. General characteristics. GIS methods. Solving typical problems using the geophysical method in various hydrogeological conditions.	5			/						
. Hydrogeological, geocological research and modeling of groundwaters	Purpose: analysis and evaluation of hydrogeological and engineering-geological and geocological processes. research of soil and frozen rock properties, study of the hydrodynamic and hydrogeochemical regime of underground waters, as well as modern methods of processing and analyzing various types of spatial information, a number of software packages used for processing hydrogeodynamic and hydrogeochemical information and modeling (Excel, Statistica, Surfer, Ansdimat, Modflow). Contents: Main types, structure and stages of hydrogeological and engineering geological research. Hydrogeological survey and mapping. Field experimental filtration works Geophysical research methods. Geophysical methods of well research. Assessment of natural resources	5		/	/						
v v Intellectual property and the global market	Objective: to train specialists in the field of intellectual property law who are able to 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 economy, analysis of international agreements and conventions, IP management strategies, cases on protection and infringement of	5		/							

		intellectual property rights in various jurisdictions.										
v Cycle of profile disciplines University component												
	Burial of industrial effluents in the subsurface	The purpose of the discipline: to provide hydrogeological information to solve the problem of burial of industrial effluents in deep aquifers, to teach methodically correct and purposeful implementation of the complex of necessary hydrogeological studies. Disposal and neutralization of liquid industrial effluents of various origins is a major environmental challenge. A landfill is a complex of underground (wells for various purposes, including injection) and surface structures designed to accommodate specially prepared liquid (or solid, having the ability to dissolve in water) waste in an absorbing horizon that ensures their safe storage for the foreseeable future.	5		/							
	. Applied research in hydrogeology	Scientific and methodological aspects of implementing the tasks of applied areas of hydrogeology are considered. When describing exploration activities as one of the main applied areas of hydrogeology, a theoretical justification is given for the method of choosing the most optimal method for estimating operational reserves separately for drinking, as well as heat-power, industrial, and mineral underground waters during exploration work at underground water deposits. The main emphasis is placed on the use of modern methods and software products in interpreting the results of experimental filtration works, assessing the parameters of aquifers, estimating reserves, and determining the zones of sanitary protection of deposits.	6 v						/			

5. Curriculum of educational programs

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



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

WORKING CURRICULUM

Academic year 2025-2026 (Autumn, Spring)
Group of educational programs D088 - "Hydrogeology and geology engineering"
Educational program ED08204 - "Hydrogeology and geocology"
The awarded academic degree Doctor of Engineering (Industry)
Form and duration of study full time (professional track) - 3 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	Lk/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							
GEO345	Hydrogeological, geocological research and modeling of groundwater	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							
GEO346	Geophysical methods for groundwater resource assessment.	1	BD, CCH	5	150	30/0/15	105	E	5							
CYCLE OF PROFILE DISCIPLINES (PD)																
M-2. Module of professional activity (university component)																
GEO321	Burial of industrial wastewater into the subsoil		PD, UC	5	150	30/0/15	105	E	5							
GEO336	Applied studies in hydrogeology		PD, UC	5	150	30/0/15	105	E	5							
M-3. Practice-oriented module																
AAP371	Industrial internship		PD, UC	20				R		20						
M-4. Experimental research module																
AAP372	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	5				R	5							
AAP376	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	10				R		10						
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R			30					
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R				30				
AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	30				R					30			
AAP375	Experimental research work of doctoral student, including internships and doctoral dissertations		ERWDS	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			

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	10	5	15
PD	Cycle of profile disciplines	0	30	0	30
Total for theoretical training:		0	40	5	45
RWDS	Research Work of Doctoral Student				0
ERWDS	Experimental Research Work of Doctoral Student				123

НАО «КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
ИМЕНИ К.И. САТПАЕВА»

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. Turysov
Acting Department Chair - Hydrogeology, Engineering and
Oil and Gas Geology
Representative of the Academic Committee from Employers

Acknowledged _____

Uskenbayeva R. K.
Kulpeyeva Z. B.
Zhurmagaliyeva A. S.
Auzelkhan Y. .
Akparbayev R. C.
Abusamatov M. K.



Note:

1. Module of basic training and professional activity departments themselves prescribe the names of modules and their number
2. * - Division into types of work at the discretion of the department
3. If necessary, the disciplines: Physics II, Mathematics III, General Chemistry of the department include at the expense of credits of the department component DB, VC from the basic training module
4. The full academic load of one academic year should be 60 academic credits
5. The application of the catalog of elective subjects is the same as the Curriculum is divided into modules, with the inclusion of the Module "R&D"