



**Institute of Geology and Oil and Gas Business named after K.Turysov**

**Department of Petroleum Engineering**

## **EDUCATIONAL PROGRAM**

### **8D07210 «Innovative Technologies of the Oil & Gas Industry»**

Code and classification of the field of education: 8D07 «Engineering, Manufacturing and Civil engineering»

Code and classification of training areas: 8D072 «Manufacturing and processing»

Group of educational programs: D115 «Petroleum engineering»

Level on NQF: 8

Level on SQF: 8

Period of study: 3

Volume of the credits: 180




Educational program 8D07210 «Innovative Technologies of the Oil & Gas Industry» approved at the meeting of the Academic Council of KazNRTU named after K.Satbayev.

Protocol no. 12 from 2024 y. " 22 " 04 .

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of KazNRTU named after K.Satbayev.

Protocol no. 6 from 2024 y. " 19 " 04 .

Educational program 8D07210 «Innovative Technologies of the Oil & Gas Industry» developed by the academic committee in the direction of 8D072 «Manufacturing and processing»

Full name	Academic degree/ academic title	Position, course	Place of work, contact.	Note
<b>Chairperson of Academic Committee:</b>				
Yeligbayeva Gulzhakhan	Doctor of Chemical Sciences, Professor	Head of the Department	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
<b>Teaching staff:</b>				
Gulnaz Moldabayeva	Doctor of Technical Sciences, prof.	Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Baimukhametov Murat	Candidate of Physical and Mathematical Sciences, docent	Associate Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
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Imansakipova Nurgul	PhD	Senior Lecturer	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Yskak Ardak	PhD	Senior Lecturer	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
<b>Employers:</b>				
Nysangaliyev Amangali	Doctor of Technical Sciences, Professor, Academician of the National Engineering Academy of the Republic of Kazakhstan	Director of the Center for Ground Design	JSC «Kazakh Institute of Oil and Gas»	
Bekbau Bakbergen	PhD	Leading Researcher, Modeling Service	«KMG Engineering» LLP	
Nurkas Zhasulan		Director	LLP «Manul»	
<b>Students:</b>				
Sadvakasov Mukan	Doctoral student in the educational program 8D07202 – "Petroleum Engineering"	2nd year	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	

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## 1. Description of the educational program

The main postgraduate education program (hereafter, the EP) for Ph.D. studies, administered by the Kazakh National Technical Research University, named after the K.I. Satpayev, approved by the Ministry of Education and Science of the Republic of Kazakhstan in the direction of "Petroleum Engineering," is a system of documents produced and approved taking into account the requirements of the labor market on the basis of the national higher education level.

The EP shall govern the priorities, expected outcomes, content, requirements and technology for the implementation of the educational process, the evaluation of the standard of graduate training in this field of training and shall include the curriculum, the work programs of the modules/disciplines, the practice programs and other materials to ensure quality education.

The curriculum of the 8D07210 "Innovative Technologies of the Oil and Gas Industry" educational program has been developed taking into account the curricula of the doctoral degree program of well-known research and engineering universities of the world, such as Colorado Schools of Mines, University of Lorraine. The curriculum is fully consistent with current trends in the development of science and technology used in the modern oil and gas industry. The educational program is based on the state educational standard for higher professional education; the professional standard. The professional standard for this educational program:

1) Production management oil and gas production

2) Technical design of innovative products/services

Doctoral students undergo research internships at leading universities in the world: University of Pennsylvania, University of Texas, Colorado Schools of Mines, University of Lorraine, Universiti Teknologi Petronas.

At all levels of training, teaching is conducted by highly qualified teaching staff, including graduates from universities around the world and the Bolashak program.

Graduates can choose different career paths. They can start working directly at enterprises in leadership positions, or in research and higher education institutions.

The doctoral program in Petroleum Engineering is the second level of qualification in the three-tier higher education system, and it provides the basis for doctoral programs. The educational program 8D07210 "Innovative technologies of the oil and gas industry" was reviewed at a meeting of the Educational and Methodological Council of KazNTU named after K.I. Satpayev and approved at a meeting of the Academic Council of KazNTU named after K.I. Satpayev.

## 2. The purpose and objectives of the educational program

**Purpose of the EP:** Training of highly qualified specialists with fundamental educational, methodological and research skills; having basic competencies in the

field of solving scientific and organizational and production tasks in the implementation of innovative projects in the field of petroleum engineering; having the skills of project activity, the use of modern computer technologies, entrepreneurship and social responsibility in solving problems of the oil and gas industry; owning the technology of communicative communication and leadership in scientific, industrial and educational spheres.

### **The EP Objectives**

1. To train specialists who will be able to apply the knowledge of mathematics, science and technology, as well as identify, formulate and solve engineering problems to improve the technological processes of the oil and gas industry.

2. To impart knowledge of research methodology to doctoral students (setting research goals, collecting data, processing and transforming data, examining data, building models and selecting methods, presenting and visualizing results)

3. Develop the ability to extract the necessary information from various sources, including information flows in real time, analyze it for further decision-making and see logical connections in the system of collected information.

4. Train doctoral students to effectively communicate information and thoughts to other people.

5. To instill in doctoral students the desire for independent learning and the manifestation of a high level of competence in engineering principles and practice.

6. To teach doctoral students the skills of working in different industry and multicultural teams.

7. To develop the graduates' need to live and practice ethical, social and environmental standards in their professions in a responsible manner.

### **3. Requirements for the evaluation of learning outcomes of the educational program**

1. The ability to apply advanced skills and knowledge to systematically study, evaluate and synthesize new complex concepts in order to answer important scientific questions in the field of petroleum engineering and improve existing knowledge or professional practice

2. To have an ability to study, develop/or transfer new knowledge and adapt best practices for the Kazakh oil and gas industry

3. To be able to dismantle the constant interest in creating new concepts /oil and gas technologies for a higher level of understanding of the teaching and learning process

4. Ability to conceptualize, design and execute independent research for the generation of new knowledge and applications and to make informed judgments on complex issues

5. Ability to participate in an oral and written form in professional discussions and oil and gas organizations, as well as publish original research results in

international scientific journals

6. To be able to show personal involvement in the development of skills and career goals, independent initiative and ethical decision-making in professional work in the oil and gas industry

## 4. Passport of the educational program

### 4.1. General information

№	Field name	Note
1	Code and classification of the field of education:	8D07 «Engineering, Manufacturing and Civil engineering»
2	Code and classification of training areas:	8D072 «Manufacturing and processing»
3	Group of educational programs:	D115 «Petroleum Engineering»
4	Name of the educational program	8D07210 «Innovative Technologies of the Oil & Gas Industry»
5	Brief description of the educational program	The educational program «Innovative Technologies of the Oil & Gas Industry» is devoted to the formation of knowledge and skills of management activities, involving the creation of a strategy for the functioning and development of large institutional structures of the state-scale industry in the oil and gas industry. Develops planning ability, responsibility for the development and results of the processes of extraction, processing and sale of finished (final) petroleum products. The subjects of professional activity of the OP are deposits and enterprises engaged in the development and operation of oil and gas fields.
6	Purpose of the EP	To provide training for highly qualified specialized specialists in the field of the oil and gas industry, capable of solving complex engineering and scientific tasks, with in-depth knowledge and practical skills in the development and implementation of innovative technologies in the oil and gas sector. The program is aimed at developing the ability to conduct independent research, create new technologies and adapt them to modern industry requirements
7	EP type	Innovative EP
8	Level on NQF	8
9	Level on SQF	8
10	Distinctive features of the EP	no
11	List of competencies of the educational program:	1. Apply advanced knowledge of geology and exploration of MPI in your professional and academic career. 2. Apply appropriate methods of analysis, both qualitative and quantitative, collect and integrate information in the best way and according to the standards of the geological and

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		mining industry. 3. Demonstrate the skills of teaching in the bachelor's degree program, working with students, and leading them. 4. Conduct independent original research that contributes to the development of geological science and the industry, according to the best practices and standards of the industry. 5. Have written and oral communication skills, in a professional and ethical manner. 6. Demonstrate high professional qualities and ethics when interacting with various stakeholders.
12	Learning outcomes of the educational program:	<ol style="list-style-type: none"> <li>1. Apply new techniques and technologies, improve production processes and labor organization</li> <li>2. Develop and control design preparation of production, methods and technologies for creating innovative products/services in the industry</li> <li>3. Integrate knowledge from various fields of science and technology to solve complex problems of the oil and gas industry</li> <li>4. Apply modern methods of mathematical modeling, big data analysis and simulations to solve complex engineering problems in the oil and gas industry</li> <li>5. Be able to track new trends and achievements in the field of oil and gas science and technology, adapt them to specific conditions and requirements</li> </ol>
13	Form of training	Full -time
14	Period of study	3
15	Volume of the credits	180
16	Language of education	Kazakh, Russian
17	Degree to be conferred	PhD
18	Developer and author:	Doctor of Chemical Sciences, Professor, Yeligbayeva Gulzhakhan and Academic Committee



### 4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	PO1	PO2	PO3	PO4	PO5
<b>Cycle of basic disciplines University component</b>								
1	Academic writing	Objective: to develop academic writing skills and writing strategies for doctoral students in engineering and natural sciences. Content: fundamentals and general principles of academic writing, including: writing effective sentences and paragraphs, writing an abstract, introduction, conclusion, discussion, and references; in-text citation; preventing plagiarism; and preparing a conference presentation.	5	v		v		
2	Methods of scientific research	Purpose: It consists in mastering knowledge about the laws, principles, concepts, terminology, content, specific features of the organization and management of scientific research using modern methods of scientometry. Contents: structure of technical sciences, application of general scientific, philosophical and special methods of scientific research, principles of organization of scientific research, methodological features of modern science, ways of development of science and scientific research, the role of technical sciences, computer science and engineering research in theory and practice.	5	v		v		

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<b>Cycle of basic disciplines</b>							
<b>Component of choice</b>							
1	Engineering design and operation of tank structures	Purpose: training in methods and technologies for designing various types of tank structures, including calculations for strength, stability and safety. Mastering skills in the operation of tank structures, including monitoring the condition and maintenance, monitoring the level and quality of the contents Contents: fundamentals of the design of tanks of various types, including steel, concrete and plastic structures, methods for calculating strength and stability, selection of materials considering chemical resistance and durability. The study of modern technologies in the operation of tanks, including maintenance, condition monitoring and compliance with industry regulations.	5		v	v	v
	Sustainability Science	Objective: to develop a deep understanding among doctoral students of the interactions between natural and social systems, as well as to develop skills for identifying and developing strategies for sustainable development that promote long-term human well-being and environmental preservation. Content: complex interconnections between ecosystems and societies, as well as an in-depth analysis of sustainability issues at local, national, and international levels.	5	v		v	
<b>Cycle of profile disciplines</b>							
<b>University component</b>							

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1	Anticorrosion defence of oil and gas equipment	Purpose: To master the key principles of designing anticorrosive materials and methods of studying their properties. Content: as a result of studying the subject, doctoral students must master the methods and apply the principles of the corrosion process, materials science and engineering, surface analysis of materials for practical use; the ability to understand and apply basic concepts in the field of protecting materials from corrosion and preventing them from destruction, based on an integrated analysis of modern knowledge about corrosion, solve applied problems, understand the basic technical concepts in this application area.	5			v	v	v
2	Applied geoengineering and technologies of secondary hydrocarbon production	Purpose: to study and master the specialized knowledge and skills necessary for the effective use of geoengineering methods and technologies in the process of secondary hydrocarbon production. Contents: fundamentals of geophysics, hydrodynamic processes in the reservoir, technologies for increasing well productivity, geoengineering methods for improving hydrocarbon extraction, as well as solving linear and radial diffusion equations.	5			v	v	v
	Production practice	The Production practice is conducted in order to consolidate the theoretical knowledge gained in the learning process, acquire practical skills, competencies and professional experience in the Master's degree program being taught, as well as to master best practices.	20	v				v

### 5. Curriculum of the educational program

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**CURRICULUM**  
of Educational Program on enrollment for 2024-2025 academic year

Educational program 8D07210 - "Innovative Technologies of the Oil & Gas Industry"  
Group of educational programs D115 - "Petroleum Engineering"

Form of study: | Duration of study: 3 year

Academic degree: Doctor by profile

Discipline code	Name of discipline	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and						
								1 course			2 course			
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	
<b>CYCLE OF BASIC DISCIPLINES (BD)</b>														
<b>M-1. Module of basic training (university component)</b>														
MET322	Scientific research methods	BD UC	5	150	2/0/1	105	E	5						
LNG305	Academic writing	BD UC	5	150	0/0/3	105	E	5						
<b>component of choice</b>														
PET309	Engineering design and operation of tank structures	BD CCH	5	150	2/0/1	105	E	5						
MNG350	Sustainability science													
<b>CYCLE OF PROFILE DISCIPLINES (PD)</b>														
<b>M-2. Module of professional activity (component of choice)</b>														
PET308	Applied geoen지니어ing and technologies of secondary hydrocarbon production	PD UC	5	150	2/0/1	105	E	5						
PET310	Anticorrosion defence of oil and gas equipment	PD UC	5	150	2/0/1	105	E	5						
<b>M-3. Practice-oriented module</b>														
AAP371	Industrial internship	PD UC	20						20					
<b>M-4. Experimental research module</b>														
AAP372	Experimental research work of doctoral student, including internships and doctoral dissertations	ERWDS UC	5					5						
AAP376	Experimental research work of doctoral student, including internships and doctoral dissertations	ERWDS UC	10					10						

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AAP374	Experimental research work of doctoral student, including internships and doctoral dissertations	ERWDS UC	90							30	30	30			
AAP375	Experimental research work of doctoral student, including internships and doctoral dissertations	ERWDS UC	18										18		
<b>M-5. Module of final attestation</b>															
ECA303	Writing and defending a doctoral dissertation	FA	12										12		
<b>Total based on UNIVERSITY:</b>										30	30	30	30	30	30
										60	60	60	60	60	60

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		university component (UC)	component of choice (CCH)	Total	
BD	Cycle of basic disciplines	10	0	10	
PD	Cycle of profile disciplines	20	10	30	
	<b>Total for theoretical</b>	<b>0</b>	<b>30</b>	<b>10</b>	<b>40</b>
	ERWDS			123	
FA	Final attestation	12		12	
	<b>TOTAL:</b>	<b>12</b>	<b>30</b>	<b>10</b>	<b>175</b>

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 12 от "22" "04" 2024.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 от "19" "04" 2024.

Decision of the Academic Council of the Institute \_\_\_\_\_, Protocol № 12 от "08" "04" 2024.

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