



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

Petroleum Engineering Department

EDUCATIONAL PROGRAM

7M07146 Gas Engineering

Code and classification of field of education: 7M07 Engineering, Manufacturing and Civil engineering

Code and classification of direction of personnel training : 7M071 Engineering and engineering trades

Group of educational programs: M210 Transmission system and infrastructure

Level on NQF: 7

Level on SQF: 7

Period of study: 2






Volume of the credits: 120

Алматы 2023

Educational program 7M07146 Gas Engineering was approved at a meeting of the
code and name of the educational program
Academic Council of KazNRTU named after K.I. Satpayev.
Protocol № 15 « 04 » 05 2022.

Considered and recommended for approval at a meeting of the Educational and
Methodological Council of KazNRTU named after K.I. Satpayev.
Protocol № 6 « 20 » 04 2022.

Educational program 7M07146 Gas Engineering was developed by the academic
code and name of the educational program
committee in the field of Petroleum Engineering.

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НЕКОММЕРЧЕСКОЕ АКЦИОНЕРНОЕ ОБЩЕСТВО «КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ
ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
имени К.И. САТПАЕВА»




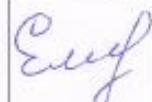
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1. Description of the educational program

The main professional educational program (EP) of the magistracy, implemented 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 in the field of training "Gas Engineering" is a system of documents developed and approved taking into account the requirements of the labor market on the basis of the state educational standard of higher education.

EP regulates the goals, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of the graduate's training in this area of training and includes the curriculum, work programs of modules / disciplines, internship programs, state final certification and other materials to ensure quality education.

The development and management of the educational program of postgraduate education "Gas Engineering" is carried out in accordance with the standard and working curriculum, developed by the Kazakh National Research Technical University named after. KI Satpaev and approved in the prescribed manner.

2. Purpose and objectives of the educational program

EP purpose: The aim of the Gas Engineering program is to form highly qualified specialists for the gas industry with a high level of competence, comprehensively developed, with broad technical knowledge and skills in the field of engineering and technology for the design and operation of oil and gas storage facilities and pipelines.

EP objectives:

- the formation of general cultural competencies of graduates (competencies of social interaction, self-organization and self-government, of a systemic activity nature), the implementation of a competent approach in the formation of general cultural competencies of graduates should be ensured by a combination of educational and extracurricular work; the socio-cultural environment necessary for the all-round development of the individual;

- formation of general professional and professional competencies of graduates.

3. Requirements for assessing learning outcomes of an educational program

1. To apply knowledge of gas engineering and skills of critical analysis, evaluation and synthesis of new ideas in professional activities
2. To apply qualitative and quantitative analysis methods to solve technological problems, collect, integrate and interpret data according to gas industry

standards

3. To design technological processes of gas pumping and storage in tanks, including with the use of modern computer technology
4. To conduct independent research based on their own skills and abilities to obtain scientific results that contribute to the development of the gas industry and hydrocarbon gas processing products
5. To demonstrate a developed ability to conduct professional written and oral communication with all stakeholders in the gas industry and transfer knowledge
6. To Identify, formulate and solve technical problems during the operation of gas storage facilities, as well as pipelines during the transportation of gas and hydrocarbon processing products
7. To have the ability to demonstrate high professional qualities and ethics during the performance of production and/or scientific tasks of the oil and gas industry

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of field of education:	<u>7M07 Engineering, Manufacturing and Civil engineering</u>
2	Code and classification of direction of personnel training :	<u>7M071 Engineering and engineering trades</u>
3	Group of educational programs:	<u>M210 Transmission system and infrastructure</u>
4	Name of educational program	<u>7M07146 Gas Engineering</u>
5	Brief description of the educational program	The main professional educational program (EP) of the magistracy, implemented 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 in the field of training "Gas Engineering" is a system of documents developed and approved taking into account the requirements of the labor market on the basis of the state educational standard of higher education. EP regulates the goals, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of the graduate's training in this area of training and includes the curriculum, work programs of modules / disciplines, internship programs, state final certification and other materials to ensure quality education. The development and management of the

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ИМЕНИ К.И. САТПАЕВА»

		educational program of postgraduate education "Gas Engineering" is carried out in accordance with the standard and working curriculum, developed by the Kazakh National Research Technical University named after. KI Satpaev and approved in the prescribed manner.
6	EP purpose	The aim of the Gas Engineering program is to form highly qualified specialists for the gas industry with a high level of competence, comprehensively developed, with broad technical knowledge and skills in the field of engineering and technology for the design and operation of oil and gas storage facilities and pipelines.
7	EP type	New EP
8	Level on NQF	7
9	Level on SQF	7
10	Distinctive features of the EP	The EP was developed in partnership with the Industrial Advisory Council, which includes global energy companies - Chevron, Eni and Shell, as well as together with the academic partner Colorado School of Mines (USA) for training highly qualified personnel for the oil and gas industry.
11	List of competencies of the educational program:	1. Apply knowledge of oil and gas engineering and skills of critical analysis, evaluation and synthesis of new ideas in professional activities; 2. Apply qualitative and quantitative methods of analysis, collection, integration and interpretation of data in accordance with the standards of the oil and gas industry; 3. Have a steady desire to constantly improve their professional knowledge and self-development; 4. Conduct independent research based on their own skills and abilities to obtain scientific results that contribute to the development of the oil and gas industry; 5. Have a developed ability to conduct professional written and oral communication with all stakeholders in the oil and gas industry; 6. Have the ability to demonstrate high professional qualities, ethics, and environmental culture while performing production and/or scientific tasks in the oil and gas industry; 7. To evaluate the commercial principles of business activities, satisfaction of production and public needs in the activities of the oil and gas industry
12	Educational program learning outcomes:	1. Apply knowledge of oil and gas engineering and skills of critical analysis, evaluation and synthesis of new ideas in professional activities; 2. Apply qualitative and quantitative methods of analysis, collection, integration and interpretation of data in accordance with the standards of the oil and gas industry; 3. Have a steady desire to constantly improve their professional knowledge and self-development; 4. Conduct independent research based on their own skills and abilities to

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имени К.И. САТПАЕВА»

		obtain scientific results that contribute to the development of the oil and gas industry; 5. Have a developed ability to conduct professional written and oral communication with all stakeholders in the oil and gas industry; 6. Have the ability to demonstrate high professional qualities, ethics, and environmental culture while performing production and/or scientific tasks in the oil and gas industry; 7.To evaluate the commercial principles of business activities, satisfaction of production and public needs in the activities of the oil and gas industry
13	Form of training	Full time
14	Period of study	2
15	Volume of the credits	120
16	Language of education	Kazakh, Russian
17	Academic degree awarded:	Master of Technical Sciences
18	Developer(s) and authors:	G.Zh.Yeligbayeva

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

№	Name of discipline	Short description of discipline	Amount of credits	The formed educational outcomes						
				PO1	PO2	PO3	PO4	PO5	PO6	PO7
Cycle of basic disciplines University component										
1	Foreign language (professional)	The course is designed for undergraduates of technical specialties to improve and develop foreign language communication skills in professional and academic fields. The course introduces students to the general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies.	5					v		v
2	Higher school pedagogy	Undergraduates will master the methodological and theoretical foundations of higher school pedagogy, plan and organize the processes of teaching and upbringing, master the communicative technologies of subject-subject interaction between a teacher and a master in the educational process of a university.	3					v		v
3	History and philosophy of science	The subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical 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		

4	Psychology of management	The discipline studies the modern role and content of psychological aspects in managerial activity. The improvement of the psychological literacy of the student in the process of implementing professional activities is considered. Self-improvement in the field of psychology and studying the composition and structure of management activities, both at the local level and abroad. The psychological feature of modern managers is considered.	3					v		v
Cycle of basic disciplines Election Component										
1	Automation of design of pipeline transport systems	Automation tasks and the relevance of the problem of computer-aided design of technological processes; a systematic approach to design; top-down, bottom-up and mixed design; principles of computer-aided design; components of a complex of design automation tools. The study of the discipline makes it possible to significantly improve the quality of master's training for subsequent practical work in the field of design and operation of technical systems, as an important component of gas and gas products trunk transport systems.	5		v	v				
2	Control of corrosion processes in the gas transmission system	The main causes of corrosion effects on metal structures used in the production of energy resources, their qualitative and quantitative characteristics, methods and methods for assessing the reliability of equipment under conditions of corrosion; basic methods of analysis, assessment and control of corrosion, corrosion rate, selection of structural materials depending on operating conditions; methods of protection against corrosion during mining, transport natural gas.	5			v			v	

3	Design of systems for the development of hydrocarbon deposits	Introduction to project activities, project documents, the basics of the legislative framework for the design of the development of hydrocarbon deposits. The design stages of the development of hydrocarbon deposits. The main design tasks. Analysis of the hydrocarbon field development system. The volume, quality of the initial information and the sources of its receipt for solving design problems. Initial information and methods for calculating hydrocarbon reserves. Solving the problem of choosing a development object for a multi-layer deposit. Assessment of the energy potential of the deposit.	5			v				v
4	Innovative technologies for the construction and repair of gas storage facilities	The main technological equipment used in the construction, repair, reconstruction and restoration of tank farms, terminals and gas storage facilities; methods of construction of tank farms, terminals and gas storage facilities included in their complexes and equipment; modern methods of repair of tank farms, terminals and gas storage facilities the main provisions of the guidelines for the design of tank farms, terminals and gas storage facilities; standard software to perform calculations of tank elements, various gas storage facilities.	5		v	v				
5	Strength and stability of inclined-horizontal multi-barrel wells	Methods and technologies of drilling inclined, horizontal and multi-hole wells using modern technical means of measuring and controlling directional drilling; basic laws and regulations of the disciplines of the engineering and mechanical module; methods of designing directional and horizontal wells; laws of hydraulics, hydromechanics, thermodynamics; methods of static, kinematic and dynamic calculation of mechanisms and machines; types of drilling solutions and complications	5	v	v					

		arising from drilling horizontal and obliquely directed wells.									
6	Technological modes of operation of gas transmission systems	The composition of gas pumping, shut-off and regulating equipment, aggregate and general shop protections, equipment of the linear part of MG, field and inter-field gas collection and treatment systems; technology of operation of gas supply systems; basic methods and technologies that ensure regular (planned) regime-technological processes of operation of gas supply systems; basic methods and technologies that ensure localization, elimination of non-standard situations and restoration of normal operation of gas supply systems.	5			v				v	
Cycle of profiled disciplines University component											
1	Calculation of strength, stability and displacement of underground pipelines	Master students acquire knowledge on various calculation methods, including analytical, numerical, finite element, and more, to determine loads, stresses, deformations in pipelines. They gain familiarity with the operation and maintenance of underground pipelines and analyze possible causes of damage and accidents. This discipline equips master students with the skills and knowledge needed to work in pipeline system design and operation for transportation.	5		v	v					

2	Computer technologies for solving problems of pipeline transport	This course teaches master students about software products used in modeling pipeline systems, including AutoCAD, MATLAB, Simulink, ANSYS, and more. Laboratory work provides practical experience in modeling and analyzing pipeline systems. Master students gain the knowledge and skills necessary to work in the design and operation of pipelines. The discipline prepares master students to analyze and evaluate pipeline system performance using computer-aided tools.	5		v	v				
3	Information technologies in the gas transmission system	An important part of the course is the study of methods of mathematical modeling and optimization of gas transportation processes, as well as the development and application of information systems for analyzing and predicting the operation of the gas transmission system. As a result, master students receive the necessary knowledge and skills to work in the field of gas transportation, including in various companies involved in the design, operation and management of gas pipelines and gas storage facilities.	5		v	v				
4	Monitoring of pipeline transport equipment	This course covers forecasting damages and accidents on pipelines and preventive measures. Master students learn to use monitoring data to assess equipment condition, analyze hazards, and ensure pipeline safety. The discipline equips master students with necessary knowledge and skills for pipeline system design and operation in transportation and energy.	5			v	v			

5	Reliability and safety of main pipelines	<p>Master students learn methods for assessing the reliability of pipelines, such as statistical, mathematical modeling, and others, and learn how to apply them to determine the probability of accidents and assess their consequences. They familiarize themselves with the peculiarities of operation and maintenance of main pipelines and learn to identify and analyze possible causes of damage and accidents. The discipline allows master students to acquire the necessary knowledge and skills to work in the field of design and operation of pipeline transport systems.</p>	5	v					v	
<p>Cycle of profiled disciplines Election Component</p>										
1	Chemistry and technology of organic substances (based on gas raw materials)	<p>The main types of raw materials in the gas chemical industry. Gas compositions, the main direction of their processing and use. Production of sulfur and other commercial products from gases. Production of commercial fuels, lubricants and special products; requirements for commercial products; compounding; liquefied gases; liquid fuels and additives to them; oils, scope of application; plastic lubricants, their main types. Features of efficient processing of hydrocarbon gases into multi-tonnage products, construction of technological and energy schemes of large-tonnage energy-intensive chemical industries.</p>	5			v			v	

2	Dispatch Decision Support Systems in Gas Pipeline Transport Management	Master students get acquainted with methods and means of analysis and forecasting of technological processes of gas transportation, including methods of statistical data analysis and modeling, as well as modern technologies. Upon graduation, master students acquire the necessary knowledge and skills to work in the field of gas pipeline transport management, including the development and implementation of dispatcher decision support systems, as well as real-time control of technological processes of gas transportation	5		v				v	
3	Economics and management of pipeline transportation of hydrocarbons	Knowledge of various pipeline transport management and control systems, monitoring and control systems, telecommunications and communications, and others. They study the principles of design and development of pipeline systems, including planning and optimization of resource allocation, development of technologies and safety systems. Acquire knowledge and skills for work in the field of management and economics of pipeline transport, including leadership and coordination of work on the design, operation and management of pipelines.	5	v					v	
4	Management of gas transmission systems	Master students learn about automation and control systems: gas flow control, monitoring and control, telecommunications and communications, and others. They study the principles of designing and developing gas transportation systems, including planning and optimizing resource allocation, developing technologies and security systems. They acquire knowledge and skills to work in the field of gas transportation system management, including directing and coordinating work on	5	v					v	

		the design, operation, and management of gas pipelines and storage facilities.								
5	Methods and algorithms for solving applied problems of pipeline transportation of oil and gas.	Methods for solving problems of designing, reconstruction and development of pipeline systems; fundamentals of constructing computational algorithms for solving applied problems of pipeline gas transportation, fundamentals of hydro-gas dynamics, numerical modeling of technological modes of objects and systems of gas pipelines under various operating conditions; planning modes of technological objects and pipeline systems, taking into account various operational factors and performance indicators, design methodology; methodology of scientific research in professional activity.	5		v					v
6	Modern concepts of risk assessment and management in the gas industry	Theoretical and practical foundations in the field of risk management, which can subsequently be applied both to a separate investment project in the oil and gas industry and within the company as a whole; the main forms of strategy, policy and tactics used to develop risk management programs; risk management methods; basic concepts of risk management, risk management technologies at all stages of the implementation of investment projects; methods of assessment and analysis of project risks.	5	v			v			
7	Perspective processes of hydrocarbon gas	Characteristics of primary hydrocarbon gases and final products of their processing. General schemes of preparation and processing of hydrocarbon gases. Preparation of gas for processing. Purification of gases from harmful impurities. Characteristics of harmful impurities. Purification of gases from mercaptans. Utilization of hydrogen sulfide. Deep drying of natural gas. Extraction of	5				v			v

		heavy hydrocarbons from gas. Extraction of helium from purified gas. Stabilization and processing of gas condensates.								
8	Technological reliability of pipeline systems	As part of the course, master students also get acquainted with modern methods and technologies used to improve the reliability and safety of pipeline systems, including automated control and monitoring systems, mathematical modeling methods, etc. Upon graduation, master students acquire the necessary knowledge and skills to work in the design, operation and maintenance of pipeline systems, as well as to solve problems related to ensuring their reliability and safety.	5	v					v	

5. Curriculum of the educational program



KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.SATBAYEV



CURRICULUM
of Educational Program on enrollment for 2023-2024 academic year

Educational program 7M07146 - "Gas engineering"
Group of educational programs M210 - "Transmission networks and infrastructure"

Discipline code	Name of disciplines	Cycle	Duration of study: 2 year			Academic degree: master of technical sciences					
			Total annual in credits	Total hours	Classroom amount (lect/lab/pr)	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on			
								1 course		2 course	
						1 semester	3 semester	2 semester	4 semester		
CYCLE OF BASIC DISCIPLINES (BD)											
M-0. Module of basic training (pre-credits compulsory)											
LNG210	English (professional)	EDUC	5	150	0/0/3	180	E	5			
HUM214	Management Psychology	EDUC	2	60	1/0/1	60	E		2		
HUM212	History and philosophy of science	EDUC	2	60	1/0/1	60	E		2		
HUM213	Higher school pedagogy	EDUC	2	60	1/0/1	60	E		2		
M-2. Petroleum Engineering Basic Training Module											
PET200	Strength and stability of inclined-horizontal multi-barrel wells	EDUCR	5	150	2/0/1	180	E	5			
PET201	Design of systems for the development of hydrocarbon deposits	EDUCR	5	150	2/0/1	180	E	5			
PET203	Technological modes of operation of gas transmission systems	EDUCR	5	150	2/0/1	180	E	5			
PET205	Automation of design of pipeline transport systems	EDUCR	5	150	2/0/1	180	E	5			
PET287	Innovative technologies for the construction and repair of gas storage facilities	EDUCR	5	150	2/0/1	180	E		5		
PET288	Control of corrosion processes in the gas transmission system	EDUCR	5	150	2/0/1	180	E		5		
CYCLE OF PROFILE DISCIPLINES (PD)											
M-3. Petroleum Engineering Professional Activity Module											
PET270	Computer technologies for solving problems of pipeline transport	PDUC	5	150	2/0/1	180	E	5			
PET280	Calculation of strength, stability and displacement of underground pipelines	PDUC	5	150	1/0/2	180	E	5			
PET281	Reliability and safety of main pipelines	PDUC	5	150	2/0/1	180	E		5		
PET282	Modern concepts of risk assessment and management in the gas industry	PDUCR	5	150	2/0/1	180	E		5		
PET283	Methods and algorithms for solving applied problems of pipeline transportation of oil and gas	PDUCR	5	150	2/0/1	180	E		5		
PET284	Management of gas transmission systems	PDUCR	5	150	2/0/1	180	E		5		
PET285	Economics and management of pipeline transportation of hydrocarbons	PDUCR	5	150	2/0/1	180	E		5		
PET286	Information technologies in the gas transmission system	PDUC	5	150	2/0/1	180	E		5		
PET278	Monitoring of pipeline transport equipment	PDUC	5	150	2/0/1	180	E		5		
PET289	Technological reliability of pipeline systems	PDUC	5	150	2/0/1	180	E		5		
PET 290	Dispatch Decision Support Systems in Gas Pipeline Transport Management	PDUCR	5	150	2/0/1	180	E		5		
PET291	Perspective processes of hydrocarbon gas	PDUCR	5	150	2/0/1	180	E		5		
PET292	Chemistry and technology of organic substances (based on gas raw materials)	PDUCR	5	150	2/0/1	180	E		5		
M-4. Practice-oriented module											
AAP229	Pedagogical practice	EDUC	6						6		
AAP269	Research practice	PDUC	8							8	
M-5. Educational research module											
AAP251	Research work of a master's student, including internship and completion of a master's thesis	EDUCR UC	2						2		
AAP241	Research work of a master's student, including internship and completion of a master's thesis	EDUCR UC	2						2		
AAP254	Research work of a master's student, including internship and completion of a master's thesis	EDUCR UC	3						3		
AAP255	Research work of a master's student, including internship and completion of a master's thesis	EDUCR UC	14							14	
M-6. Module of final attestation											
ECA212	Preparation and defense of a master's thesis	PA	8							8	
Total based on UNIVERSITY:											
							30	30	30	30	
							60			60	

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имени К.И. САТПАЕВА»

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	20	15	35
PD	Cycle of profile disciplines	33	20	53
	<i>Total for theoretical training:</i>	9	33	35
	RWMS			24
FA	Final attestation	8		8
	TOTAL:	8	53	35
				120

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 15 от "04" 05 2023.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 от "20" 04 2023.

Decision of the Academic Council of the Institute. Protocol № 7 от "24" 03 2023г.

Vice-Rector for Academic Affairs

Institute Director

Department Head

Specialty Council from employers

B.A. Zhautikov

A.Kh. Syzdykov

G.Zh. Yelighayeva

A.N. Nysangaliyev

НЕКОММЕРЧЕСКОЕ АКЦИОНЕРНОЕ ОБЩЕСТВО «КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ
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имени К.И. САТПАЕВА»