



Institute of Geology and Oil and Gas Business named after K.Turyssov

Department of Petroleum Engineering

EDUCATIONAL PROGRAM

7M07213 «Petroleum Engineering»

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

Code and classification of training areas: 7M072 «Manufacturing and processing»

Group of educational programs: M115 «Petroleum Engineering»

Level on NQF: 7

Level on SQF: 7

Period of study: 1

Volume of the credits: 60

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Educational program 7M07213 – «Petroleum Engineering» approved at the meeting of the Academic Council of KazNRTU named after K.I.Satpayev.

Protocol no. 3 from 2022 y. " 27 " 10 .

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

Protocol no. 2 from 2022 y. " 21 " 10 .

Educational program 7M07213 - «Petroleum Engineering» developed by the academic committee in the direction of 7M072 – «Manufacturing and pricessing»

Full name	Academic degree/ academic title	Position, course	Place of work, contact.	Note
Chairperson of Academic Committee:				
Yeligbaeva Gulzhakhan	Doctor of Chemical Sciences, Professor	Head of the Department	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Teaching staff:				
Abdeli Dairabay	Doctor of Technical Sciences, Professor	Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Gulnaz Moldabayeva	Doctor of Technical Sciences, prof.	Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Baymukhametov Murat	Candidate of Physical and Mathematical Sciences, docent	Associate Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
Moldabekov Murat	PhD	Associate Professor	NCJS «Kazakh National Research	

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			Technical University named after K.I.Satbayev»	
Smashov Nurlan	Candidate of Technical Sciences, docent	Associate Professor	NCJS «Kazakh National Research Technical University named after K.I.Satbayev»	
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»	
Employers:				
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»	
Bekbauov Bakbergen	PhD	Leading Researcher, Modeling Service	«KMG Engineering» LLP	
Nurkas Zhasulan		Director	LLP «Manul»	

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1. Description of the educational program

The educational program 7M07213 «Petroleum Engineering» is designed to train specialists in the field of development and operation of oil and gas fields, well drilling, transportation and storage of hydrocarbons.

The curriculum of the 7M07213 «Petroleum Engineering» educational program has been developed taking into account the curricula of the master's degree program of famous 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.

Undergraduates practice in such companies as «KazMunayGas» JSC, «KMG Engineering» LLP, «QazaqGaz» NC JSC, «Volkovgeologiya» JSC, «SNPS - Ai Dan Munai» JSC, «Kazakh Institute of Oil and Gas» JSC. Under the academic mobility program, undergraduates have the opportunity to complete internships at leading engineering universities in the world.

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

Graduates can choose a different career path. They can start working directly as practicing engineers in industry, or they can continue their doctoral studies in petroleum engineering.

The Master's degree program «Petroleum Engineering» is the second level of qualification of the three-level higher education system, it lays the foundation for doctoral programs. The educational program 7M07213 «Petroleum Engineering» was reviewed at a meeting of the Educational and Methodological Council of KazNRTU named after K.I. Satbayev and approved at a meeting of the Academic Council of KazNRTU named after K.I. Satbayev.

2. The purpose and objectives of the educational program

Purpose of the EP: The purpose of the educational program is the formation of general professional and professional competencies of graduates, instilling general cultural values (competencies of social interaction, self-organization and self-government, system-activity character) necessary for the comprehensive development of personality.

Objectives of the EP: Training of highly qualified competent specialists in the oil, gas and transport sectors of the economy of the Republic of Kazakhstan, capable of quickly adapting to rapidly changing socio-economic conditions.

The objectives of the preparation for the program are to master the basic educational programs of the master's program, which includes the study of the following educational cycles:

- general scientific cycle;
- professional cycle; and sections:

- practice and research work;
- final state certification.

Each educational cycle has a basic (compulsory) part and a variable (profile) part set by the university. The variable (profile) part makes it possible to expand and (or) deepen knowledge, skills, skills and competencies determined by the content of the basic (compulsory) disciplines, allows students to acquire in-depth knowledge and skills for successful professional activity and (or) continuing professional education in doctoral studies.

3. Requirements for the evaluation of learning outcomes 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, collect, integrate and interpret data according to oil and gas industry standards
3. demonstrate a steady desire for continuous improvement of 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 a developed ability to conduct professional written and oral communication with all stakeholders 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:	7M07 «Engineering, Manufacturing and Civil engineering»
2	Code and classification of training areas:	7M072 «Manufacturing and processing»
3	Group of educational programs:	M115 «Petroleum Engineering»
4	Name of the educational program	7M07213 «Petroleum Engineering»
5	Brief description of the educational program	The educational program «Petroleum Engineering» is devoted to the formation of a knowledge base on the methodology of building concepts, strategies, functional models of activity and interaction, ways of setting and systematically solving tasks and problems in monitoring and managing natural and man-made systems during extraction from the subsoil and transportation of hydrocarbons (oil, associated and natural gas) and other components. It instills management skills, which involves the creation of a strategy for the functioning and

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		development of structures in the oil and gas industry. 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	The purpose of the educational program is the formation of general professional and professional competencies of graduates, instilling general cultural values (competencies of social interaction, self-organization and self-government, system-activity character) necessary for the comprehensive development of personality.
7	EP type	New EP
8	Level on NQF	7
9	Level on SQF	7
10	Distinctive features of the EP	no
11	List of competencies of the educational program:	<ol style="list-style-type: none"> 1. Apply modern knowledge of geology and exploration of MPI in your professional and academic career, design exploration work and provide guidance 2. Apply appropriate analysis methods, both qualitative and quantitative, collect and integrate information in the best way and according to the standards of the geological and 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 communication skills, speak both written and oral language in Russian, Kazakh and foreign languages, professionally and ethically. 6. Have professional knowledge in the field of geological disciplines that contribute to the formation of a highly educated person with a broad outlook and culture; be able to combine theory and practice to solve geological problems
12	Learning outcomes of the educational program:	<ol style="list-style-type: none"> 1. Be able to conduct independent original research that contributes to the development of oil and gas science and industry, according to the best practices and standards of the industry. 2. To have an ability apply advanced knowledge in oil and gas engineering in their professional and academic careers. 3. To have the skills of professional and ethical communication, both written and oral 4. Be able to demonstrate high professional qualities and ethics when interacting with various stakeholders 5. To have the skills to apply appropriate methods of analysis, both qualitative and quantitative, to collect and integrate information in the best way and according to the standards of the oil and gas industry 6. To have the skills to work with technical

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		documentation and create technical assignments for specific production tasks
13	Form of training	Full -time
14	Period of study	1
15	Volume of the credits	60
16	Language of education	Kazakh, Russian
17	Degree to be conferred	Master of Engineering and Technology
18	Developer and author:	Yeligbayeva Gulzhakhan.

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	PO6
Cycle of general education disciplines									
Required component									
Cycle of basic disciplines									
University component									
1	English (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. The course ends with a final exam. Undergraduates also need to study independently (MIS).	2		v	v			v
2	Management	The purpose of the discipline is the formation of a scientific understanding of management as a form of professional activity; mastering the general theoretical provisions of the management of socio-economic systems by students; mastering the skills and abilities of practical solution of managerial problems; studying the world experience of management, as well as the peculiarities of Kazakhstani management, training in solving practical issues related to the management of various	2			v			v

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		aspects of the activities of organizations.							
3	Management psychology	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.	2			v			v
Cycle of basic disciplines									
Component of choice									
1	Principles of designing oil and gas storages	The course focuses on six areas: 1) terminal codes and siting constraints, 2) terminal design and equipment layout, 3) types of storage and selection criteria, 4) design considerations for loading racks, fire protection, vapor recovery, blending equipment, and water treatment, 5) detailed design of storage tanks, vessels, and caverns, and 6) operations and maintenance. Safety, quality control, system reliability, availability, and regulatory compliance are integrated throughout the course. Case studies and team exercises are used to reinforce key	4				v	v	

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		points.							
2	Principles of Reservoir engineering	Solution of production and reservoir engineering problems using state-of-the-art commercial reservoir simulation software, using data commonly available in industry; emphasis on reservoir description, reservoir model design and calibration, production forecasting and optimization, economic analysis and decision making under uncertainty.	4		v				v
3	Advanced Thermodynamics and Phase Behavior of Reservoir Fluids	Essentials of thermodynamics for understanding the phase behavior of petroleum fluids such as natural gas and oil. Modeling of phase behavior of single and multi-component systems with equations of states with a brief introduction to PVT laboratory studies, commercial PVT software, asphaltenes, gas hydrates, mineral deposition, and statistical thermodynamics.	4	v	v				
Cycle of profile disciplines									
University component									

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1	Research seminar for petroleum graduates	The purpose of this course is to study the general methodology of scientific research, methods of performing theoretical and experimental research and development work in the oil and gas industry. Course content: sections: 1. The main directions of development of oil and gas engineering. 2. General methodology of scientific research, as well as methods of performing theoretical and experimental research and development work in the oil and gas industry. 3. Analysis, synthesis and design of effective technological processes for drilling wells, development and operation of oil and gas fields and transportation of oil and gas, as well as calculations of economic benefits and costs of applying the results of scientific and technical work. 4 Legal protection of intellectual and industrial property, preparation of an application for a patent of an invention and utility model, registration of the results of scientific work, as well as the basics of effective business communication in business. The relations of oil and gas engineering with the oil and gas industry, the stages of research and development work, as well as methods of developing scientific recommendations for the creation of new technology and equipment are considered.	5	v		v			v
2	Theory of motion of gas-liquid mixtures	The purpose of this course is to study the distinctive features of gas-liquid mixtures, structures and forms of movement of gas-	5	v			v	v	

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		liquid mixtures, criteria for the allocation of structures and forms of gas-liquid flows, energy balance in the well. Course content: sections: 1. Investigation of the constrained movement of gas bubbles in a stationary liquid. 2. Structures, forms of movement of gas-liquid mixtures and criteria for their isolation. 3. The physical essence of the liquid lifting process. 4. Equation of motion of the mixture in long lifts. Methods are considered that allow analyzing, synthesizing and designing the operation of ideal and semi-ideal lifts; the operation of the lift in various modes, as well as calculating costs.							
3	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.	9			v			v
Cycle of profile disciplines Component of choice									
1	Methods to improve the efficiency of oil and gas pipelines	During the course of the discipline, undergraduates will get acquainted with the methods of improving the efficiency of gas and oil pipelines, such as proper hydraulic calculation when using gas and oil pipelines, cleaning the inner cavity of the pipeline, calculation of the bearing capacity of the gas and oil pipeline. The discipline examines the main issues of pipeline	5	v				v	

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		transport of liquid and gaseous hydrocarbons, provides a classification of pipelines and its main facilities, the essence of technological processes associated with pumping oil and gas through trunk pipelines, as well as the sequence of technological calculations of trunk pipelines. During the course of the discipline, undergraduates will get acquainted with the methods of improving the efficiency of gas and oil pipelines, such as proper hydraulic calculation when using gas and oil pipelines, cleaning the inner cavity of the pipeline, calculation of the bearing capacity of the gas and oil pipeline.							
2	Petroleum Reservoir Simulation: Black -oil model	The aim of the course is to form students' knowledge of the basics of mathematical and numerical modeling of single-phase, two-phase, three-phase and composite hydrodynamic processes of chemical flooding in oil deposits. Course content. Sections: 1. Methods of numerical implementation of partial differential equations of mathematical models of filtration of liquids in a porous medium; 2. Methods of setting initial and boundary conditions for modeling; 3. Algorithm for numerical solution of basic differential equations of filtration of non-volatile oil; 4. Creation of computer programs for calculating filtration flows; 5. Fundamentals of modeling of single-phase, two-phase and three-phase currents in a porous medium.	5	v			v	v	

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3	Petroleum Reservoir Simulation: Compositional model	This course examines numerical modeling of an oil and gas reservoir using state equations such as Peng-Robinson, Redlich-Kwong, and multi-component flow equations for secondary and tertiary oil and gas production. Topics include: viscosity and density models, relative permeability graphs, capillary pressure, and examples of gas and chemical injection for enhanced oil recovery.	5		v		v		
4	Design of pumping and compressor stations	This course gives an overview of the purpose of pumping and compressor stations on the main pipeline, determining the main technical indicators of pumping and compressor units, regulating the operating mode of pumping and compressor units in different situations. The skills of regulating the operating mode of pumps and compressors, taking into account their characteristics, control and operation of main and supplier equipment are considered.	5		v		v	v	
5	Advanced Drilling Fluids	This course covers advanced knowledge of the functions and properties of drilling fluids on various bases and reservoir drill-in fluids, as well as circulation loss and sticking problems and their solutions, well cleaning, hydraulic calculations, measurements of mud properties in the laboratory and in the real time on the rigs. In addition, the course will enable trainees to design, control and adjust mud parameters to achieve drilling goals in a safe and efficient manner.	5	v				v	

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6	Advanced Production Engineering	This course covers inflow performance relationships (IPR) and multiphase pipe flow and constraints analysis using flow correlations. Prediction of the flow structure for vertical, horizontal, and inclined pipes is considered. Analysis and optimization of all oil production systems using conventional and nodal analysis.	5	v	v				
7	Project Management	The discipline studies the components of project management based on modern behavioral models of project-oriented business development management. The program is based on the international standards PMI PMBOK, IPMA ICB and the standards of the Republic of Kazakhstan in the field of project management. The features of organizational management of business development through the interaction of strategic, project and operational management are studied.	5			v			v



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

Educational program 7M07213 - "Petroleum engineering"
Group of educational programs M115 - "Petroleum engineering"

Form of study: full-time		Duration of study: 1 year			Academic degree: master of engineering and technologies				
Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in	Form of control	Allocation of face-to-face training based on course	
								1 semester	2 semester
CYCLE OF BASIC DISCIPLINES (BD)									
M-1. Module of basic training (university component)									
LNG212	English (professional)	BD, UC	2	60	0/0/2	30	E	2	
MNG726	Management	BD, UC	2	60	1/0/1	30	E	2	
HUM211	Management Psychology	BD, UC	2	60	1/0/1	30	E	2	
M-2. Petroleum Engineering Basic Training Module									
PET274	Advanced Thermodynamics and Phase Behavior of Reservoir Fluids	BD, CCH	4	120	2/0/1	75	E	4	
PET275	Principles of designing oil and gas storages			120	2/0/0	75	E		
PET276	Principles of Reservoir engineering			120	2/0/1	75	E		
CYCLE OF PROFILE DISCIPLINES (PD)									
M-3. Petroleum Engineering Professional Activity Module									
PET266	Theory of motion of gas-liquid mixtures	PD, UC	5	150	2/0/1	105	E	5	
PET263	Research seminar for petroleum graduates	PD, UC	5	150	2/0/1	105	E	5	
PET222	Advanced Production Engineering	PD, CCH	5	150	2/0/1	105	E	5	
PET216	Petroleum Reservoir Simulation: Black-Oil Model			150	2/0/1	105			
PET265	Methods to improve the efficiency of oil and gas pipelines			150	2/0/1	105			
PET211	Petroleum Reservoir Simulation: Compositional model	PD, CCH	5	150	2/0/1	105	E	5	
PET248	Advanced Drilling Fluids			150	2/0/1	105			
PET224	Design of pumping and compressor stations			150	2/0/1	105			
MNG705	Project Management			150	2/0/1	105			
M-4. Practice-oriented module									
AAP210	Production practice	PD, UC	9						9
M-5. Experimental research module									
AAP257	Experimental research work of a master's student, including internship and implementation of a master's project	ERWM UC	13						13
M-6. Module of final attestation									
ECA213	Registration and protection of the master's project (RaPMP)	FA	8						8
Total based on UNIVERSITY:								30	30
								60	

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			Total
		university component (UC)	component of choice (CCH)		
BD	Cycle of basic disciplines	6	4		10
PD	Cycle of profile disciplines	19	10		29
	Total for theoretical training:	0	25	14	39
	ERWM				13
FA	Final attestation	8			8
	TOTAL:	8	25	14	60

Decision of the Academic Council of Kazntu named after K.Satbayev. Protocol № 3 27.10.2022y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satbayev. Protocol № 2 21.10.2022 y.

Decision of the Academic Council of the Institute _____, Protocol № 2 от "14" 10 20 22.

Vice-Rector for Academic Affairs

Institute Director

Department Head

Specialty Council from employers

B.A. Zhautikov

A.Kh. Syzdykov

G.Zh. Yeligbayeva

A.N. Nysangaliyev