



SATBAYEV
UNIVERSITY

Institute of «Geology and Oil and Gas Business»

Department of «Petroleum Engineering»

EDUCATIONAL PROGRAM

6B07204 «Petroleum engineering»

Code and classification of the field of education: 6B07 «Engineering, Manufacturing and Civil engineering»

Code and classification of training areas: 6B072 «Manufacturing and processing»

Group of educational programs: B071 «Mining and mineral extraction»

Level on NQF: 6

Level on SQF: 6

Period of study: 4

Volume of credits: 240

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Educational program 6B07204 «Petroleum engineering» approved at the meeting of the Academic Council of KazNRTU named after K.I.Satpayev.

Protocol no. 5 from 2022 y. "24" "11"

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Protocol no. 3 from 2022 y. "17" "11"

Educational program 6B07204 «Petroleum engineering» developed by the academic committee in the direction of 6B072 «Manufacturing and processing».

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List of abbreviations and designations

EP – Educational program

NQF – National Qualifications Framework

IQF – Industry Qualifications Framework

KC – Key competencies

PC – Professional competencies

MIOR – Methods of increasing oil recovery

1. Description of the educational program

The educational program "Petroleum Engineering" is devoted to the study, monitoring and management of natural and man-made systems for the extraction of hydrocarbons (oil, associated and natural gas) and other components from the subsurface on the basis of rational subsurface use, including resource-saving, environmentally safe and cost-effective geotechnologies for the development of subsurface resources, systems for the preparation of well products and geological and technical systems for long-term and trouble-free functioning. The program provides for the study of a wide range of subjects from fundamental sciences (mathematics, physics, geology, chemistry) to special disciplines on the development and operation of oil and gas fields, methods of enhanced oil recovery, modeling of technological processes. The subjects of professional activity of the OP are deposits and enterprises engaged in the development and operation of oil and gas fields.

2. Purpose and objectives of the educational program

EP purpose: The purpose of the educational program is to train highly qualified and competitive specialists in the oil and gas industry, competent in the field of development, operation of oil and gas fields, transportation of hydrocarbons and petroleum products.

EP objectives:

1. To train specialists who will be able to apply 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 instill in students knowledge of research methodology (setting research goals, data collection, data processing and transformation, data examination, model building and method selection, presentation and visualization of 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 students to effectively convey information and thoughts to other people.
5. To instill in students the desire for independent learning and the manifestation of a high level of competence in engineering principles and in practice.
6. To instill in 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 assessing learning outcomes of an educational program

The educational program has been developed in accordance with the State Mandatory Standards of Higher and Postgraduate Education, approved by Order No. 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 (registered in the Register of State Registration of Normative Legal Acts under No. 28916) and reflects the learning outcomes on the basis of which curricula are developed (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses).

The assessment of learning outcomes is carried out according to the developed test tasks within the framework of the educational program in accordance with the requirements of the state mandatory standard of higher and postgraduate education.

When evaluating learning outcomes, uniform conditions and equal opportunities are created for students to demonstrate their knowledge, skills and abilities.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of field of education	6B07 «Engineering, Manufacturing and Civil engineering»
2	Code and classification of direction of personnel training	6B072 «Manufacturing and processing»
3	Group of educational programs	B071 «Mining and mineral extraction»
4	Name of educational program	6B07204 «Petroleum engineering»
5	Brief description of the educational program	The educational program is harmonized with the 6th level of the National Qualifications Framework of the Republic of Kazakhstan, the Dublin Descriptors and contains a wide range of disciplines of fundamental sciences and special disciplines on the development and operation of oil and gas fields, methods of enhanced oil recovery, modeling of technological processes.
6	EP purpose	The purpose of the educational program is to train highly qualified and competitive specialists in the oil and gas industry, competent in the field of development, operation of oil and gas fields, transportation of hydrocarbons and petroleum products.
7	EP type	New EP
8	Level on NQF	6
9	Level on SQF	6
10	Distinctive features of EP	No
11	List of competencies of the educational program:	1. Apply knowledge of mathematics, science and technology 2.Design and conduct experiments, as well as analyze and interpret data 3.Develop systems, components, or processes to meet desired needs under specific constraints such as economic, environmental, social, political, ethical, health, and safety, production and stability 4.Work effectively in interdisciplinary teams 5.Identify, formulate and solve technical problems 6.Understand professional and ethical responsibility 7.Communicate effectively, be able to formulate thoughts and present projects in public 8.Understand the impact of technical solutions in a global, economic, environmental and social context 9.Understand the need for lifelong learning and self-study 10.Know the current problems of the geological and mining industry, be able to analyze and make decisions 11.Use the methods, skills and modern

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		engineering tools necessary for engineering practice
12	Educational program learning outcomes:	<p>ON1. Understand the consequences of technical solutions in the development, operation of oil and gas fields and transportation of hydrocarbons in a global, economic, environmental and social context;</p> <p>ON2. Be able to analyze modern problems and determine the principles of improving the technological processes of the oil and gas industry;</p> <p>ON3. To have understanding of professional and ethical responsibility in the process of working in labor communities;</p> <p>ON4. To have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;</p> <p>ON5. To have an ability to effectively communicate;</p> <p>ON6. To have the skills of designing technological processes for the development of oil and gas fields to achieve the tasks set within realistic constraints;</p> <p>ON7. To have apply knowledge of mathematics, science and technology to solve professional problems;</p> <p>ON8. Have lifelong self-learning skills;</p> <p>ON 9. Be able to design and conduct experiments, as well as analyze and interpret experimental data to develop optimal solutions;</p> <p>ON 10. Be able to identify, formulate and solve technical problems in the operation of oil and gas fields;</p> <p>ON11. To have the skills to work in interdisciplinary teams.</p>
13	Form of study	Full-time
14	Period of study	4
15	Volume of the credits	240
16	Language of education	Kazakh, Russian, English
17	Academic degree awarded:	Bachelor of Engineering and Technology
18	Developer and author:	G.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												
				ON1	ON 2	ON3	ON 4	ON5	ON6	ON7	ON8	ON9	ON10	ON11		
Cycle of general education disciplines																
Required component																
1	Foreign language	English is a compulsory subject. According to the results of placement test or IELTS score, students are placed into groups and disciplines. The name of the discipline corresponds to the level of English. When passing from level to level, prerequisites and postrequisites are respected.	10				v			v		v		v		
2	Kazakh (Russian) language	Kazakh (Russian) language In this course author considers socio-political, socio-cultural spheres of communication and functional styles of the modern kazakh (russian) language. The course covers the specifics of the scientific style to develop and activate professional communication skills and abilities of students. Also it allows students to learn the basics of scientific style practically and develop the ability of production structural and semantic text analysis.	10				v			v		v		v		

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3	Physical Culture	The purpose of the discipline is to master the forms and methods of forming a healthy lifestyle within the framework of the professional education system. Familiarization with the natural-scientific basics of physical education, knowledge of modern health-improving technologies, basic methods of independent physical education and sports. As part of the course, the student will master the rules of judging in all sports.	8				v		v		v		v		v
4	Information and Communication technology	The aim of the course is to gain theoretical knowledge in information processing, the latest information technologies, local and global networks, the methods of information protection; Getting the right use of text editor editors and tabulators; creation of base and different categories of applications.	5				v		v	v	v				
5	History of Kazakhstan	The purpose of the discipline is to provide objective historical knowledge about the main stages of the history of Kazakhstan from ancient times to the present day; introduce students to the problems of the formation and development of statehood and historical and cultural processes; contribute to the formation of humanistic values and patriotic feelings in the student; teach the student to use the acquired	5				v		v	v	v				

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		historical knowledge in educational, professional and everyday life; evaluate the role of Kazakhstan in world history.												
6	Philosophy	The purpose of the discipline is to teach students the theoretical foundations of philosophy as a way of knowing and spiritually mastering the world; developing their interest in fundamental knowledge, stimulating the need for philosophical assessments of historical events and facts of reality, assimilating the idea of the unity of the world historical and cultural process while recognizing the diversity of their skills in applying philosophical and general scientific methods in professional activities.	5				v		v		v			v
7	Module of socio-political knowledge (sociology, political science)	The objectives of the disciplines are to provide students with explanations on the sociological analysis of society, about social communities and personality, factors and patterns of social development, forms of interaction, types and directions of social processes, forms of regulation of social behavior, as well as primary political knowledge that will serve as a theoretical basis for understanding social -political processes, for the formation of political culture, development of a personal position and a clearer	3			v				v	v			

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		understanding of the extent of one's responsibility; help to master the political, legal, moral, ethical and socio-cultural norms necessary to act in the interests of society, form personal responsibility and achieve personal success.												
8	Module of socio-political knowledge (cultural studies, psychology)	The purpose of the disciplines is to study the real processes of cultural creative activity of people who create material and spiritual values, identify the main trends and patterns of cultural development, changes in cultural eras, methods and styles, their role in the formation of man and the development of society, as well as master psychological knowledge for the effective organization of interpersonal interaction, social adaptation in the field of their professional activities.	5							v	v	v	v	
Cycle of general education disciplines Election Component														
1	Fundamentals of anti-corruption culture and law	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various spheres. The purpose of studying the	5	v		v		v						v

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		discipline «Fundamentals of anti-corruption culture and law» is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in everyday practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption.												
2	Fundamentals of scientific research methods	Introduction. Science and scientific thinking. Basic concepts. The main categories of science. Science as a system of knowledge. Fact, hypothesis, theory, concept. Methodology, method, methodology. Scientific research. Technology of research work. Stages of scientific research. Technology of working with scientific literature. Presentation of research results. System approach, system thinking, system analysis. General logical methods of research. Organization of scientific activity and scientific research. Implementation of the results of scientific research. Economic efficiency of scientific research.	5			v								v

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3	Fundamentals of economics and entrepreneurship	Discipline studies the foundations of economics and entrepreneurial activity from the point of view of science and law; features, problematic aspects and development prospects; the theory and practice of entrepreneurship as a system of economic and organizational relations of business structures; The readiness of entrepreneurs for innovative susceptibility. The discipline reveals the content of entrepreneurial activity, the stages of career, qualities, competencies and responsibility of the entrepreneur, theoretical and practical business planning and economic examination of business ideas, as well as the analysis of the risks of innovative development, the introduction of new technologies and technological solutions.	5	v		v		v						v
4	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity. Monitoring of the environment and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems;	5	v	v	v	v							v

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		life safety in the technosphere; natural and man-made emergencies												
Cycle of basic disciplines University component														
1	Oil and gas well drilling	It outlines about the modern methods of drilling oil and gas wells, drilling regimes, methods of their design, select the layout of the drill string and its calculations about the influence of parameters of drilling mode and drilling fluid on the performance of drill bits and operational costs per 1 m of penetration, about the complications while drilling and methods of their prevention and liquidation, pan directional drilling of wells, the specifics of offshore well drilling and construction offshore floating and fixed installations, of technical-economic indicators of well construction, safety measures, labor protection and environment, performed in the course of drilling.	5	v	v						v			v
2	Introduction to major	Introduction to basic concepts of petroleum engineering, including drilling and completion of wells, petroleum reservoir engineering, production engineering, surface gathering and treatment, and transportation and storage.	4			v		v						v
3	Oil and gas geology	Oil and gas, and their physical properties. Genesis of petroleum.	5	v	v			v				v		

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		Migration of petroleum. Collection of oil and gas. Porosity. Permeability. Natural reservoirs of oil and gas. Deposits of oil and gas. Fields of oil and gas. Geophysical and geochemical methods of search for oil and gas geological structure and petroliferous of sedimentary basins of Kazakhstan. Distribution of oil and gas reserves in earth core. Characteristic of zone of oil And gas resources.												
4	Well log analysis	This class covers basic well logging methods to evaluate important reservoir properties. Among the topics to be discussed are: fundamental rock physics principles, introduction to well logging measurement tools, analysis of open hole logs, porosity determination, formation evaluation of clay-free and shaly sand formations, determination of water saturation, Archie's equation, net pay thickness, hydrocarbon saturation and recoverable reserves, mud logging principles, density, neutron and sonic logs, resistivity logs, and lithology cross plots.	5		v		v		v		v		v	
5	Engineering and computer graphics	The discipline is aimed at the study of methods for the image of objects and the general rules of drawing, using computer	5				v			v	v	v		

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		graphics; the study of the basic principles and geometric modeling approach and methodology for developing applications with a graphical interface; the formation of skills in the use of graphic systems for the development of drawings, using 2D and 3D modeling methods											
6	Mathematics I	The course is devoted to the study of the basic concepts of higher mathematics and its applications. The main provisions of the discipline are applied in the teaching of all general education engineering and special disciplines taught by graduate departments. The course sections include elements of linear algebra and analytical geometry, an introduction to analysis, differential calculation of functions of one and several variables. Methods for solving systems of equations, problems of using vector calculations in solving problems of geometry, mechanics, and physics are considered. Analytical geometry on a plane and space, differential calculation of functions of one variable, derivatives and differentials, study of the behavior of functions, derivative and gradient in direction,	5							v		v	

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		extremum of a function of several variables.												
7	Mathematics II	The discipline is a continuation of Mathematics I. sections of the course include integral calculus of a function of one variable and several variables, series theory. Indefinite integrals, their properties and methods of their calculation. Certain integrals and their application. Incorrect integrals. Numerical series theory, functional series theory, Taylor and Macloren Series, application of series to approximate calculations.	5								v			v
8	Mathematics III	The discipline is a continuation of Mathematics II. The course includes sections: ordinary differential equations and elements of probability theory and mathematical statistics. Differential equations with separable variables, homogeneous, in full differentials, linear inhomogeneous differential equations with constant coefficients, systems of linear differential equations with constant coefficients, finding the probability of events, calculating the numerical characteristics of random variables, using statistical methods for processing experimental data are studied.	5								v			v

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9	Fluid mechanics	This fundamental course introduces students to fluid flow in pipes, surface facilities and in oil and gas wells. Topics to be covered are compressible and incompressible flow, fluid statics, dimensional analysis, laminar and turbulent flows, Newtonian and non-Newtonian fluids and two-phase flow.	5				v					v		
10	Chemistry	Purpose: formation of knowledge on fundamental issues of general chemistry and skills of their application in professional activity. Summary Laws, theoretical propositions and conclusions that underlie chemical disciplines; properties and relationships of chemical elements based on the periodic law of D.I.Mendeleev and on modern ideas about the structure of matter; fundamentals of chemical thermodynamics and kinetics; processes in solutions; structure of complex compounds.	5	v								v		v
11	Revervoir engineering I: Primary recovery	This class covers material balance calculations for normal gas, retrograde condensate, black and volatile oil systems with and without gas-cap, water drive. Students are also exposed to analytical methods of forecasting future reservoir performance using material balance and decline curve analyses.	5	v	v		v		v					

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12	Reservoir Engineering II: Secondary and tertiary recovery	This class covers waterflooding and gas injection schemes for increasing oil recovery. Furthermore, tertiary recovery methods, such as, chemical, thermal, and miscible EOR are discussed. Students learn to use analytical and numerical tools to predict incremental oil recovery.	5	v	v	v	v							
13	Solving the problems of oil and gas engineering	The discipline considers case studies with industry and their solutions, which include topics of machinery and technology in drilling, mining, development and transportation; safety equipment, labor protection, management.	4		v	v	v							v
14	Reservoir rock properties	The main objective of teaching this discipline is to provide students with sufficient knowledge of the main physical properties of rocks and mineral resources, objective laws of their alterations depending on various geological-mineralogical factors, pressure and temperature, as well as defining interrelation of the properties under consideration. Modern rock properties uses a wide range of physical methods for substance analysis allowing to measure loads of various physical parameters of rocks with high expressivity, accuracy and reproducibility. Over the last	5			v	v							v

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		decades this discipline has evolved into an independent discipline with a rich and branchy arsenal of contemporary techniques and individual scientific trends.											
15	Revervoir Fluid properties	This class covers basics of petroleum fluids encountered in reservoir, during drilling and completion operations, and oilfield waters. For example, phase behavior, fluid density and viscosity, interfacial tension, and fluid compositions are discussed. Interpreting lab data for engineering applications. Calculations with k-values and equation of state. Introduction to fluid properties software.	5						v			v	
16	Petroleum Engineering seminar	Professional communication and research skills are essential qualities for future researchers. This course is aimed at developing the skills of oral and written communication, critical analysis of information and their processing, presentation and giving/receiving feedback from colleagues, as well as the preparation of scientific theses and articles	6			v	v	v					
17	Strength of materials	Stretching and compression. Pressure in sections and deformations of a direct core. Mechanical properties of	6							v			v

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		<p>materials at a stretching and compression. Calculation on durability and rigidity at a stretching-compression. Geometrical characteristics of flat sections. Shift and torsion. Calculation on durability and rigidity at torsion. A bend. Normal and tangents of a pressure at a bend. Calculation on durability at a bend. The theory of the intense and deformed conditions. A hypothesis of a limiting condition. Complex resistance. Stability of balance of deformable systems. Dynamic loading.</p>											
18	Thermodynamics and heat engineering	<p>The discipline studies the basic concepts and definitions of heat. The first and the second law of thermodynamics. Thermodynamic processes of ideal gases. A discharge throttling gases and vapors. The process of vaporization, P,V; T, S; h, s – diagram of water vapor. Thermodynamic cycles of thermal engines and plants. Heat transfer. The thermal conductivity. Convective heat transfer. The heat transfer during forced and free motion of the fluid. Fundamentals of thermal calculation of heat exchangers.</p>	5							v			v

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19	Physics I	Objectives: to study the basic physical phenomena and laws of classical, modern physics; methods of physical research; the relationship of physics with other sciences. The following topics are considered: mechanics, dynamics of rotational motion of a solid body, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, transport phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell equations.	5							v		v		v	
20	Physics II	The course studies the laws of physics and their practical application in professional activity. Solving theoretical and experimental-practical educational problems of physics for the formation of the foundations in solving professional problems. Assessment of the degree of accuracy of the results of experimental or theoretical research methods, modeling of physical condition using a computer, study of modern measuring equipment, development of skills for conducting test studies and processing their results, distribution of the physical	5							v		v		v	

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		content of applied tasks of the future specialty.												
21	Petroleum and gas chemistry	Chemistry of oil and gas. The course examines the theoretical foundations of the chemistry of oil and gas, the physico-chemical properties of hydrocarbon raw materials. The main technological methods of crude oil preparation. Methods and technology of separation of multicomponent systems. Chemical transformations of hydrocarbons. Methods of oil and gas refining necessary for practical solutions of physico-chemical problems arising at various stages of the oil chain. Economically feasible and environmentally friendly technologies for the preparation of crude oil for transportation and processing. Engineering calculation skills.	5							v		v		v
Cycle of basic disciplines Election Component														
1	Drilling fluids	Discipline "Drilling solutions and grouting mixtures" plays an important role in the formation of specialists in the drilling of oil and gas. Knowledge of this discipline allow you to choose wisely the type of drilling and cement slurries for specific geological conditions in the drilling and completion of wells, to determine the scope of	5		v					v			v	

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		different types of drilling and cement slurries, the method of operating properties, to develop a formulation of a solution experiment to find the composition of a solution with given properties, to calculate the required amount of materials for the preparation of solutions, to select the equipment for preparation, processing, purification, degassing of drilling muds, as well as to properly hold the technology of grouting works.												
2	Design and operation of oil and gas pipelines	The course considers the main issues of pipeline transport of liquid and gaseous hydrocarbons, provides a classification of pipelines and its main objects, the essence of the technological processes associated with the transfer of oil and gas through pipelines, as well as the sequence of technological calculations of pipelines. The main topics of the course are the hydraulic calculation of the pipeline, calculation of complex pipelines, determination of the optimal frequency of pipeline cleaning, peculiarities of pumping high-viscosity and high-boiling oils, determination of conditions for the removal of gas and water from trunk pipelines, calculation of the carrying capacity of	5	v	v				v		v			

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		pipelines, internal cavity cleaning and testing of main oil pipelines for durability and tightness, underwater crossings of oil pipelines, stability of lifting pipelines, calculations of longitudinal movements of underground pipelines.												
3	Natural gas engineering	This class is about producing gas and condensate from such fields. Specifically, this class covers: composition and main physico-chemical properties of natural gases. Classification of deposits on the composition of the hydrocarbon phase structure. Methods of determining the accumulation type. The distribution of pressure fields and gas wells. Modes of operation of gas wells. Gas-hydrodynamic methods of research of gas and gas condensate wells.	5			v	v		v		v			
Cycle of profiled disciplines University component														
1	Well completion	The purpose of the discipline consists in studying technological operations ranging from well construction finishing to putting it into production. The list of jobs includes opening up the productive formation in the	4	v		v								v

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		course of drilling, sampling promising horizons, fulfilling the casing program, permeable horizons isolating, secondary opening up of the production formation by perforating, testing the well and obtaining its planned production. Depending on geological log conditions, permeable and productive horizons characteristics, reservoirs physical properties the mode of cementing job is selected as well as the plugging materials' properties. The ratings of casing and their cementing are performed, their hydraulic program is assigned.												
2	Multidisciplinary petroleum project	This class provides multidisciplinary setting for students to integrate knowledge of geology, geophysics, and petroleum engineering to solve real tasks of the oil and gas industry. Students work in teams, and in the end present results of their work in oral and written forms.	5	v		v	v	v						v
3	Oil and gas facilities design and operation	This course covers the oil and gas surface facilities. The following topics are considered: a gathering system under pressure, taking into account the size and configuration of the area of an oil field; oil and gas separation; main purposes and types of oil and gas separators; calculation of	6		v				v					v

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		separators taking into account the gas and liquid throughput; piping classification; prevention of pollution and clogging of pipelines and methods for their cleaning; oil processing; oil emulsions and their properties; main methods of destruction of oil emulsions; purpose and types of reservoir tanks.												
4	Corrosion protection of oil and gas equipment	Basic concepts and definitions of corrosion processes. Chemical corrosion of metals. Electrochemical corrosion of metals. Corrosive surveys. Insulation coating metal structures. Cathodic protection of underground metal structures. Protector protection of pipelines and tanks. Electro drainage protection of underground pipelines. Inhibitor corrosion.	5		v					v	v	v		
5	Petroleum production engineering	This class covers fundamental principles of production engineering, empirical models for production decline curve analysis, and the future performance of natural oil and gas wells. Some topics include: well completion, artificial lift methods design, sucker rod pumps, gas lift, progressing cavity pumps, electrical submersible pumps, nodal analysis.	4	v	v									
6	Economic evaluation of oil and gas projects	The standard analysis of cash flow for oil projects and the	6		v	v								v

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		determination of acceptability of proposed projects in terms of their attractiveness and feasibility.												
Cycle of profiled disciplines Election Component														
1	Reservoir geomechanics	This module expands on existing knowledge in the field of rock mechanics, in particular with regard to the systematic design of excavation work and support systems in rock formations. It examines the strength and stress variability of rock mass at different scales and describes methods that engineers can use for long term planning and risk mitigation during drilling, production and reservoir engineering.	5		v				v				v	
2	Geostatistics	The course aims at increasing the understanding of applied geostatistics and focus on concepts and methods important for modelling heterogeneity and uncertainty in reservoir models. Emphasis is put on work processes for 3D reservoir modelling rather than mathematics and algorithms.	5		v		v		v					
3	Well testing	This class covers physical principles, execution technology, and methods of interpreting results of modern comprehensive well testing. This course is designed to improve students' self-study skills. Therefore,	5					v					v	v

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		students must consciously devote sufficient time and effort to learning, understanding, and applying knowledge and skills in the classroom. Lectures are held in the form of discussions based on what students have learned and missed while working on problems.												
4	Well workover	This discipline covers the basic technology of well workover, introduces students to tools and equipment, gives an idea of the rational and efficient methods of carrying out repairs, as well as an introduction to the appointment of units, equipment and tools work over, operating conditions and repair, and basic requirements to them and their principles of operation and equipment; the foundations of their theory of analysis, design and operation.	5				v			v			v	
5	Well Stimulation	This practical course is designed for those involved in all aspects of well stimulation. To be better able to make decisions it is important to have a basic understanding of the types of formations and basic reservoir properties with which we deal. For this reason, time is spent in the early portion of the course setting the geological and reservoir property stage for vertical, horizontal, and	5		v		v			v			v	

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		5multilateral wells prior to d5developing the basic formation damage, acidizing, and hydraulic fracturing concepts. The course includes acidizing and fracturing quality control, conducting the treatment, monitoring pressures, and other critical parameters during and after the treatment.												
6	Directional drilling	The study of the discipline gives the ability to cross the layers of rocks and mineral deposits in the most favorable direction, to avoid shallow directional wells and drill vertically-inclined bore for the sound profile, gives the opportunity to reel in deposits of the mineral at several points from the barrel, i.e. to drill multilateral wells.	5	v					v			v		
7	Petroleum regulations and practices	This course covers major aspects of law governing oil and gas business. It introduces such topics as scientific and engineering background of oil and gas law, energy policy, and oil and gas lease. This course focuses on the legal rules that govern the development of privately owned mineral rights, which often also apply to governmentally owned resources. It covers topics such as the nature, protection, and conveying of oil and gas rights, leasing, and taxation.	5	v	v				v					

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8	Flow assurance	<p>There are many problems in the transportation of oil and gas through pipelines. These problems require a real understanding of the fundamentals of fluid mechanics, heat transfer, phase changes, sedimentation and/or obstruction, erosion, and new technologies to ensure reliable and cost-effective supply of oil and gas. Deepwater production, heavy oils, high water quality, heavy clogging, hydrates, acid gases, asphaltenes, and waxes make this task even more difficult. This course will provide a detailed explanation of topics, a well-balanced set of tutorials with real-life examples, invites a lecture from experienced engineers and training in specific software flow.</p>	5					v		v		v			
9	Development of offshore fields	<p>The principles of the development of offshore fields, taking into account the geological and industrial, technical and technological, transport, environmental and regulatory components. The study of the discipline will make it possible to familiarize bachelors with the stages of development of shelf fields, with the peculiarities of drafting project documents and the regulatory framework used in</p>	5		v				v				v		v

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		this case, with the peculiarities of technologies for operating offshore wells and increasing their potential production capacity, with the peculiarities of transporting products of offshore fields and environmental aspects of the development of offshore fields, with taking into account foreign and domestic experience.												
10	Fundamentals of Data Analytics and Programming for Petroleum Engineers	The main goal of the discipline is to acquire basic skills in assessing the reliability and predicting complications during the operation of equipment in the oil and gas industry, selecting methods for increasing oil recovery, optimizing transport routes, and predicting the effectiveness of developing new fields. The discipline covers topics such as probability theory, regression, correlation, creation of scripts and modules for calculating data during reservoir assessment, development and drilling.	5	v						v	v			
11	Design and operation of oil and gas storages	Underground and above ground reservoirs. The foundation and base of the tanks. When choosing sites for the placement of tanks, take into account: the quality and condition of the soil lying at the base of the site; climatic and seismic conditions of the area; the groundwater flow regime, their chemical composition, as	5	v						v	v			v

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		well as the permissible loads on the soils and the type of base that must be established for each case after careful analysis. Classification of tank farms. The main facilities tank farms. The nomenclature of domestic steel tanks. Technical characteristics of tanks Vertical isothermal tanks. Axisymmetric drop-shaped tanks. Horizontal tanks. Technical and economic indicators. Loss of oil and petroleum products in the operation of tank farms. The general procedure for repairing tanks at tank farms. Determination of the volume of the tank farm and the choice of types of tanks.												
12	Design and operation of pump and compressor stations	The course is to teach future specialists about technology and organization of the construction of the linear part of trunk pipelines and the development of process diagrams for the installation of structures of pump and compressor stations, as well as the main and auxiliary process equipment, engineering networks and process pipelines, ensuring their safe operation and reliability over a standard service life and during construction and reconstruction	5	v					v		v			v
13	Reservoir Engineering III: reservoir simulation	This course covers the fundamental principles of oil and	5				v	v		v		v		

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		gas reservoir modeling, starting with the continuity equation, the Darcy equation, ending with a two-phase, two-dimensional reservoir model. Students learn not only to use commercial software for reservoir modeling, but also create their own simple models.												
14	Computer - aided design	This discipline deals with the methodology of computer-aided design, the decompositions of technical systems, efficiency of technical systems, impact of environment on technical systems as well as fundamental concepts of analysis machines. Concepts of modern design technologies with application of CAD/CAE/CAM systems. Widely regarded methods of geometric modeling used in modern CAD systems. Discusses the integration and modularity of CAD/CAE/CAM systems. Also concepts of contemporary approaches to design with the use of CALS - technologies, when collectively considered the entire life cycle of designed object from conceptual design to disposal. Examines the current direction of CALS - technologies and international standards (ISO and STEP standards). During the course, students solve problems on geometric constructions with	5					v		v		v		

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		the use of AutoCAD, mastering the methods of automation of engineering calculations using Visual Basic programming language, composed of MS Excel.												
15	Artificial lift systems	This class covers the following topics: overview of artificial lift technology; criteria for selection of artificial lift system; reservoir performance: inflow and outflow relationships; artificial lift screening; introduction to rod-pumping, gas lift, and ESP systems, design.	5				v		v		v			v
16	Multiphase flow systems	The course covers the formation of multiphase flows in horizontal, inclined and vertical wells, and pipelines, methods of dynamic calculations, the definition of technological parameters. General conservation laws, interfacial conditions, and constitutive relationships. Multiphase flows in pipes, maps of flow regimes, distribution of concentrations, pressure drop.	5				v			v				v
17	Theory and practice of project management	The discipline is aimed at studying the general trends of project management in market conditions in order to increase productivity in the professional industry. The essence, concept, composition, tasks and problems of management. Study of the scientific methodology of project	5			v	v							v

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		management. The concept of organization, the external and internal environment of the team, communication. Requirements for project management. The role of decision-making in project management. The concept of anti-crisis programs in the performance of managerial functions. The concept of management culture and professional etiquette												
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5. Curriculum of the educational program



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

Educational program: 6007204 - "Petroleum Engineering"
Group of Educational programs 600711 - Mining and extraction of minerals"

Discipline code	Name of disciplines	Cycle	Duration of study: 4 years				SIS (including TSHS) in hours	Form of control	Academic degree: Bachelor of Engineering and Technology							
			Total amount in credits	Total hours	Classroom amount (lect/lab/pr)	Allocation of face-to-face training based on courses and semesters										
						I course			II course		III course		IV course			
						I semester		2 semester		3 semester		4 semester				
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																
M-1. Module of language training																
LANG 108	English language	GED, RC	10	300	00/0/0	210	E	5	5							
LANG 104	Kazakh (Russian) language	GED, RC	10	300	00/0/0	210	E	5	5							
M-2. Module of physical training																
KFK 101-104	Physical Culture	GED, RC	8	240	00/0/0	120	Discards	2	2	2	2					
M-3. Module of information technology																
CSE 677	Information and communication technologies (in English)	GED, RC	5	150	2/0/0	105	E			5						
M-4. Module of socio-cultural development																
HUM 117	History of Kazakhstan	GED, RC	5	150	10/0/2	105	SE	3								
HUM 112	Philosophy	GED, RC	5	150	10/0/2	105	E			5						
HUM 120	Socio-political knowledge module (sociology, politicalology)	GED, RC	3	90	10/0/1	60	E			3						
HUM 134	Socio-political knowledge module (journalism, psychology)		5	150	20/0/1	150	E				5					
M-5. Module of anti-corruption culture, ecology and life safety base																
HUM 136	The basic of anti-corruption culture and law	GED, CCH	5	150	20/0/1	150	E								5	
MNG 489	Fundamentals of economics and entrepreneurship															
PET319	Fundamentals of scientific research methods															
CHE 686	Ecology and life safety															
CYCLE OF BASIC DISCIPLINES (BD)																
M-6. Module of physical and mathematical training																
MAT 301	Mathematics I	BD, UC	5	150	10/0/2	105	E	5								
PHY 101	Physics I	BD, UC	4	120	1/0/1	105	E	5								
PHY 112	Physics II	BD, UC	5	150	1/1/1*	105	E		5							
MAT 302	Mathematics II	BD, UC	5	150	10/0/2	105	E		5							
MAT 305	Mathematics III	BD, UC	5	150	10/2*	105	E			5						
M-7. Basic general technical training module																
GEN 429	Engineering and computer graphics	BD, UC	5	150	10/0/2	105	E		5							
PET 404	Introduction to Major	BD, UC	4	120	1/1/1*	75	E	4								
GEN406	Oil and gas geology	BD, UC	5	150	2/1/0*	105	E				5					
GEN443	Strength of materials	BD, UC	6	180	2/1/1*	120	E			6						
CHEE405	Chemistry	BD, UC	5	150	1/1/1*	105	E			5						
PET 409	Thermodynamics and heat engineering	BD, UC	5	150	2/1/0*	105	E			5						
PET 410	Fluid mechanics	BD, UC	5	150	2/1/0*	105	E				5					
CHE558	Chemistry of oil and gas	BD, UC	5	150	2/1/0*	105	E			5						
PET 415	Reservoir fluid properties	BD, UC	5	150	2/1/0*	105	E				5					
PET 416	Daguerstein composition	BD, UC	5	150	2/1/0*	105	E				5					
PET 411	Reservoir rock properties	BD, UC	5	150	2/1/0*	105	E				5					
PET 424	Well log analysis	BD, UC	5	150	2/1/0*	105	E					5				
PET 485	Solving the problems of oil and gas engineering	BD, UC	5	150	10/2*	75	E					4				
PET 486	Petroleum Engineering seminar	BD, UC	6	180	2/1/1*	120	E							6		
PET 507	Educational practice	BD, UC	2						2							
M-8. Petroleum Engineering Basic Training Module																
PET 412	Oil and gas well drilling	BD, UC	5	150	2/1/0*	105	E					5				
PET 422	Reservoir engineering II: Secondary and tertiary recovery	BD, UC	4	120	10/2*	75	E						5			
EL15	Elective	BD, CCH	5	150	2/1/0*	105	E				5					
CYCLE OF PROFILE DISCIPLINES (PD)																
M-9. Petroleum Engineering Professional Activity Module																
PET 487	Well completion	PD, UC	4	120	20/1*	75	E							4		
PET 488	Petroleum Production Engineering	PD, UC	5	120	1/0/1*	75	E							4		
3303	Elective	PD, CCH	5	150	2/1/0*	105	E					5				
PET 489	Economic evaluation of oil and gas projects	PD, UC	6	180	2/1/1*	120	E								6	
PET 500	Oil and gas facilities design and operation	PD, UC	6	180	2/1/1*	120	E								6	
4306	Elective	PD, CCH	5	120	2/1/0*	105	E								5	
4307	Elective	PD, CCH	5	150	2/1/1*	120	E								5	
4308	Elective	PD, CCH	5	150	2/1/0*	105	E								5	
PET 441	Multi-disciplinary petroleum project	PD, UC	5	150	2/1/0*	105	E								5	
PET 419	Current production of oil and gas equipment	PD, UC	5	150	20/1*	105	E								5	
4111	Elective	PD, CCH	5	150	2/1/0*	105	E								5	
PET 516	Production practice I	PD, UC	2	150							2					
PET 516	Production practice II	PD, UC	3	150								3				

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AAP195	Productible Practice	PD, UC	4																4						
M-10. Module of final attestation																									
ECA188	Final attestation	FA	8																8						
M-11. Module of additional types of training																									
AAP980	Miscary affairs	ATT	0																						
Total based on UNIVERSITY:																									
												21	20	31	20	20	33	22							
												99		88		60		69							

Number of credits for the entire period of study						
Cycle code	Cycles of disciplines	Credits				Total
		required component (RC)	university component (UC)	component of choice (CC)	CC/D	
GED	Cycle of general education disciplines	51		3		56
BD	Cycle of basic disciplines		107	5		112
PD	Cycle of profile disciplines		39	25		64
	Total for theoretical training:	32	146	35		213
PA	final attestation				8	8
TOTAL:		83	146	38		267

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № 5 24 november 2022 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 3 17 november 2022 y.

Decision of the Academic Council of the Institute. Protocol № 2 for " 14. 10. 2022 y.

- Vice-Rector for Academic Affairs
Institute Director
Department Head
Specialty Council from employers






- B.A. Zhautikov
A.H. Syzdykov
G. Zh. Yelighayeva
N.A. Nysangaliyev



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KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY after K. SATBAYEV



MAJOR ELECTIVE DISCIPLINES educational program for the 2023-2024 academic year admission
Educational program 6B07204 - "Petroleum engineering"
Group of educational programs 6B071 - "Mining and mining"

Year of study	Code of elective	Code of discipline	Name of discipline	Semestr	Cycle	Credits	Total hours	lect/lab/pr	SIW (including SIWT) in hours	Prerequisites
Petroleum Engineering Basic Training Module										
3	3215	PET509	Drilling solutions	5	B	5	150	2/0/1		PET112
		PET511	Natural gas engineering					2/0/1		PET133
		PET510	Design and operation of oil and gas pipelines					1/0/2		no
Petroleum Engineering Professional Activity Module										
3	3303	PET437	Well stimulation	6	S	5	150	2/0/1		PET124
		PET428	Design and operation of pump and compressor stations					1/0/2		PET125
4	4306	PET451	Reservoir engineering III: reservoir simulation	7	S	5	150	2/0/1		PET126
		PET432	Directional drilling					2/0/1		PET127
	4306	PET434	Design and operation of oil and gas storages	7	S	5	150	1/0/2		PET128
		PET439	Artificial lift systems					1/1/1		PET129
	4307	PET442	Well testing	7	S	5	150	2/1/0		PET130
		PET440	Well workover					2/0/1		PET131
		PET430	Computer - aided design					3/0/1		PET132
		PET438	Development of offshore fields					1/0/2		PET133
	4308	PET423	Geostatistics	7	S	5	150	2/0/1		PET134
		PET433	Flow assurance					1/0/2		PET135
PET429		Multiphase flow systems	1/0/2					PET136		
Module "R&D"										
4311		PET417	Petroleum regulations and practices	8	S	5	150	2/0/1		no
		PET421	Reservoir geomechanics					2/0/1		PET101
		PET512	Fundamentals of Data Analytics and Programming for Petroleum Engineers					1/1/1		
		NSE185	Theory and practice of project management					2/0/1		

Credits numbers of elective disciplines over the entire period of study	
Cycle of disciplines	Credits
Cycle of basic disciplines (B)	5
Cycle of special disciplines (S)	25
Overall:	30

By the decision of the Academic Council of the Institute Minutes № 2, dated 14-10-2023

Head of the "Petroleum Engineering" department *[Signature]*

Representative of Speciality council *[Signature]*

G. Velibayeva
N.A. Nysangaliev

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