



**Geology and Oil-gas Business Institute named after K. Turyssov
Department of Chemical and Biochemical Engineering**

EDUCATION PROGRAM

6B07117 – CHEMICAL TECHNOLOGY OF PETROLEUM AND GAS CHEMICAL PRODUCTS

Code and classification of the field of education: **6B07** Engineering,
manufacturing and construction industries

Code and classification of areas of study: **6B071** Engineering and Engineering
(0710)

Group of educational programs: **6B060** Chemical engineering and processes

Уровень по НРК: 6

Уровень по ОРК: 6

Year of study: 4

Credits: 240

Almaty 2025

The educational program 6B07117 «Chemical technology of Petroleum and gas chemical products» was approved at the meeting of the Scientific Council of KAZNTU named after K.I.Satpayev

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

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The educational program 6B07117 «Chemical technology of Petroleum and gas chemical products» was developed by the academic committee in the direction 6B071 «Engineering and Engineering»

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Table of contents

1.	Description of educational program	4
2.	Purpose and objectives of educational program	4
3.	Requirements for the evaluation of educational program learning outcomes	5
4.	Passport of educational program	5
4.1.	General information	5
4.2.	Relationship between the achievability of the formed learning outcomes according to educational program and academic disciplines	8
5.	Curriculum of educational program	52

1. Description of educational program

The educational program (hereinafter EP) is a set of documents developed by the Kazakh National Research Technical University named after K.I. Satpayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan. The EP takes into account the needs of the regional labor market, the requirements of state bodies and the corresponding industry requirements. The oil and gas industry is one of the foundations of the economy of Kazakhstan. It includes a set of

interrelated processes and industries from geological exploration to oil and gas refining and sales. In this chain, the process of oil and gas processing stands apart, since as we move along the technological chain, there is a rapid increase in added value (petrochemical products of high conversions).

EP is based on the state educational standard for higher professional education in the relevant field.

The EP determines the programmatic educational goals, student learning outcomes, the necessary conditions, content and technologies for the implementation of the educational process, assessment and analysis of the quality of students during training and after graduation.

EP includes the curriculum, discipline content and learning outcomes and other materials to ensure quality education for students.

2. Purpose and objectives of the educational program

The purpose of the educational program: Training highly qualified and in-demand specialists in modern technologies for oil and gas processing, organic synthesis, and petrochemistry, capable of developing and implementing innovative, resource-efficient, and environmentally responsible solutions for the sustainable development of the petrochemical and oil refining industries.

The mission of the educational program "Chemical technology of petrochemical products" of the first cycle of the direction "6B071 Engineering and optimization and modernization of oil and gas processing, oil and gas chemical industries and enterprises for the production and processing of polymers, materials and devices, which determine the innovative development of scientific and technological progress and an increase in the standard of living of society.

Objectives of the educational program:

- Studying the cycle of general education disciplines to ensure social and humanitarian education based on the laws of the socio-economic development of society, history, modern information technologies, the state language, foreign and Russian languages.

- Studying the cycle of basic disciplines to provide knowledge of natural science, general technical and economic disciplines, as the foundation of professional education.

- Studying a cycle of major disciplines for the formation of theoretical knowledge, practical skills and abilities in the field of chemical engineering and engineering.

- Study of disciplines that form knowledge, skills and abilities of planning and organizing research, designing technological schemes, equipment and apparatus, including using modern computer technologies and programs.

- Acquaintance with chemical-technological processes and equipment of oil and gas chemical complexes during the period of production practices.

- Acquisition of skills and abilities of modern analytical quality control of raw materials and commercial products.

3. Requirements for evaluating the 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 the Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 (registered in the Register of State Registration of Regulatory 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).

Formed learning outcomes: applies knowledge of natural science, socio-economic and profile disciplines of chemical technology to solve practical and professional tasks of the technological industry.

Evaluation of learning outcomes is carried out according to the developed test tasks within 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. To use modern information technologies for the collection, processing and dissemination of scientific information in the field of technology for the production and processing of oil, gas, mineral and bio-raw materials, their relationship with related industries.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	6B07 «Engineering, manufacturing and construction industries»
1	Code and classification of areas of study	6B071 «Engineering and Engineering (0710)»
3	Group of educational programs	6V060 Chemical Engineering and Processes"
4	Name of the educational program	6B07117 Chemical technology of petroleum and chemical products
5	Brief description of the educational program	The educational program (hereinafter EP) is a set of documents developed by the Kazakh National Research Technical University named after K.I. Satpayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan. The EP takes into account the needs of the regional labor market, the requirements of government agencies and relevant industry requirements.
6	Purpose of the OP	Training of highly qualified specialists who are most in demand in the field of modern technologies for oil and gas processing, the synthesis of organic substances, petrochemistry, focused on solving the problems of innovative development of the most important areas of the petrochemical and oil refining industries
7	OP type	new
8	NQF level	6
9	ORC level	6

10	Distinctive features of the OP	The EP was developed considering the Atlas of new professions and competencies of Kazakhstan in the field of chemical technology of organic substances.
11	List of competencies of the educational program:	KK1.Communication - Fluent monolingual oral, written and communication skills - The ability to use communicative communication in various situations KK 2. Basic literacy in natural science disciplines - basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science KK3.General engineering competencies - basic general engineering skills and knowledge, the ability to solve general engineering tasks and problems KK4.Professional competencies - a wide range of theoretical and practical knowledge in the professional field; - the ability to carry out the technological process in accordance with the regulations and use technical means to measure the main parameters of the technological process, the composition and properties of raw materials and finished products; KK5. Engineering and computer competencies - basic skills of using computer programs and software systems to solve general engineering tasks KK6.Engineering and working competencies - skills and abilities of using technical means and experimental devices to solve general engineering tasks KK7. Socio-economic competencies - Critical understanding and cognitive ability to reason on contemporary social and economic issues KK8. Specially-professional competencies for the perception of information, setting goals and choosing ways to achieve it; - the ability to independently organize the work of performers, find and make management decisions in the field of labor organization and implementation of environmental measures; - knowledge of the principles of management, control and correction of activities in the context of teamwork, improving managerial and executive professionalism.
12	Learning outcomes of the educational program:	RO1 Mastering the basics of Project Management and decision-making methods used in the development, design and operation of technological processes ; RO2 Apply methods of chemical and physico-chemical analysis of petroleum and petrochemical products to improve petroleum and gas refining processes.; PO3 Apply acquired theoretical knowledge to analyze the impact of engineering decisions in global, economic, environmental, and societal contexts, taking into account the principles of sustainable development and social responsibility. ; PO4 To be able to combine theory and practice in solving engineering problems; ability to independently define, formulate and solve technical problems ; RO5 Demonstrate knowledge of socio-ethical values and trends in the social, political and economic development of society in their professional activities, as well as leadership skills and willingness to

		maintain partnerships, while showing intolerance to any corruption manifestations and a firm civic position ; RO6 Know the theoretical foundations of industrial processes, the structure of technological schemes and the relationship of individual technological stages in the production of petrochemical products; RO7 Be able to apply the methods of mathematical analysis and modeling in the design and optimization of technological processes, demonstrate skills in calculating typical equipment for the main types of production ; RO8 Demonstrate knowledge of the chemical processing of oil and hydrocarbon gas, the production of organic substances and petrochemical products; RO9 Ensure the safe operation of technological equipment in compliance with occupational safety, industrial safety, and environmental protection requirements in the context of sustainable industry development. ; RO10 Know and understand the fundamental laws of natural sciences and special technical disciplines, be able to operate with them in professional activities; RO11 Apply basic knowledge about catalysts and catalytic processes to select optimal ways/technologies for processing raw materials into industrially important products ; RO12 Apply knowledge on corrosion prevention in oil production at refineries; use various techniques, skills and modern engineering tools for engineering activities.
13	Form of study	Full-time
14	Training period	4 years
15	Volume of loans	240
16	Languages of instruction	Kaz, Russian and English
17	Awarded Academic Degree	Bachelor of Engineering and Technology
18	Developer(s) and authors:	Selenova B.S., Mangazbayeva R.A., Aitkaliyeva G.S.

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

№	Name of discipline	Brief description of discipline	Number of credits	Formed learning outcomes (codes)											
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Cycle of basic disciplines University component															
1	English language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency.	10	v											
2	Kazakh (russian) language	When moving from level to level, prerequisites and postrequisites of disciplines are observed.	10	v											
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.													
4	Information and communication technologies (in English)	The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course covers the specifics of the scientific style in order to develop and activate the professional communication skills and abilities of students, allows students to practically master the basics of the scientific style and develops the ability to produce a structural and semantic analysis of the text.	5					v							
5	Modern history of Kazakhstan	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, new information	5		v										

		technologies, local and global computer networks, methods of information protection; obtaining skills in the use of text editors and spreadsheet processors; creation of databases and various categories of application programs.													
6	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of being and endows them with a methodology for solving various theoretical practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, contributes to the education of self-esteem, awareness of the value of human existence. It teaches to think and act correctly, develops the skills of practical and cognitive activity, helps to seek and find ways and means of life in harmony	5												

		with oneself, society, and the world around.													
7	Module of socio-political knowledge (sociology, political science)	Studying the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary for understanding political processes, for forming a political culture, developing a personal position and a clearer understanding of the measure of one's responsibility.	3	v											
8	Module of socio-political knowledge (culturology, psychology)	The module of socio-political knowledge (culturology, psychology) is designed to acquaint students with the cultural achievements of mankind,	5		v										

		for their understanding and assimilation of the main forms and universal patterns of the formation and development of culture. During the course of cultural studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms for the formation and development of culture, the main historical stages of the formation and development of Kazakhstani culture are considered.													
Cycle of general education subjects Selectable component															
9	Fundamentals of Entrepreneurship and Leadership	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.	5			v		v							

10	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5			v		v							
11	Law basics	The purpose of the study: To attain knowledge in legal sphere in order to use them effectively in engineering activity; To make students know about efficient management of a work collective basing on legal mechanisms. Short content: the course allows students to get knowledge about specified directions of law, to organize	5			v									

		information about subject and object of legal relations, about the main institutes and functions of legal directions. Expected results: After the course studying students should know, how to use legal norms in particular situations, how to make necessary documents and how to use special legal measures to restore broken rights.												
Cycle of basic disciplines University component														
12	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial	5				v							v

		derivatives. The extremum of a function of two variables.													
13	Physics	Purpose: To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents_ physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.	5				v							v	
14	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals.	5				v							v	

		Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations													
15	Engineering and computer graphics	Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections, metric tasks, types and features of connections, creating part sketches and assembly drawings, detailing, and creating complex 3D solid objects in AutoCAD.	5							v			v		
16	Introduction to specialty	The purpose of the discipline is to acquaint students who have started studying at the university with the basic and basic provisions of the specialty and training program; the	4	v		v									

		development of interest in the chosen profession, the formation of students' competence and understanding of the chosen field of study, initial professional knowledge about the physico-chemical fundamentals of organic matter technology; the formation of technological and environmental thinking among students. The basic initial concepts of chemical technology are considered: kinetic patterns of chemical transformations, types of reactors and equations of molar balances, technological indicators of processes, preparation of technological schemes of chemical processes.													
17	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	5				v						v		

		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.													
18	Organic Chemistry I	The purpose of the discipline is to master the complex of knowledge and scientific ideas about the fundamental theoretical and experimental foundations of organic chemistry of aliphatic compounds; in obtaining students' knowledge of the basic concepts of theoretical organic chemistry, mastering the skills to characterize the structure, physico-chemical properties of organic substances, as well as modern methods of synthesis of organic substances. The course forms the basis of chemical reactions and methods of synthesis of organic compounds for the most	6										v		

		important branches of the chemical and biochemical industry													
19	Organic Chemistry II	The aim of the course is to study the general patterns of organic reactions of cyclic compounds, such as cycloalkanes, aromatic hydrocarbons, and heterocyclic compounds. Each class of compounds is considered in terms of their chemical structure, isomerism and nomenclature, method of preparation, physical and chemical properties, and scope of their application. In the process of mastering this discipline, the student forms and demonstrates competencies that allow applying the acquired basic scientific and theoretical knowledge to solve scientific and practical problems.	5										v		
20	Fundamentals of petrochemical synthesis	Formation of students' understanding of modern industrial processes for the production of various hydrocarbons, their halogen- and oxygen-containing derivatives as raw materials for	5	v	v										

		petrochemical processes. As a result of the discipline, the student forms and demonstrates competencies that allow the correct application of the acquired knowledge to lay the scientific foundations of modern industrial processes for the production of various hydrocarbons, their halogen- and oxygen-containing derivatives as raw materials.													
21	Field preparation of oil and gas	The purpose of the discipline is to acquire students basic knowledge related to oil and gas production, their processing, pipeline transportation of oil and gas, storage and distribution of oil, petroleum products and gas, construction and operation of pumping and compressor stations, pipelines and storage facilities. As a result of mastering the discipline, the student should know: - basic concepts, definitions and professional terminology; -methods of	5			v	v								

		calculation of the main technical devices and installations; -industrial methods and technology of oil and gas treatment.													
22	Collection, preparation and transportation of hydrocarbon gas	To form students' readiness for production, technological and project activities, ensuring the modernization, implementation and operation of equipment for production, for organizational and management activities for making professional decisions in the interdisciplinary areas of modern oil and gas technologies using the principles of management and management. As a result of mastering the discipline, the student forms and demonstrates competencies that allow to apply the obtained basic scientific and theoretical knowledge in the field of collection, preparation and transportation of hydrocarbon gas.	5			v	v								
23	Technological processes of oil	Formation of students' understanding of technological processes of	5			v	v								

	production intensification	oil production intensification, acquisition of theoretical knowledge necessary for the development of economically feasible and environmentally safe oil production technology and engineering calculation skills. As a result of the discipline, the student forms competencies that allow the correct application of the acquired knowledge to lay the scientific foundations of technological processes for the intensification of oil production; apply demonstrate skills.													
24	CAD Chemical Engineering I	The purpose of studying the discipline is to develop the ability to create effective and optimal technologies for various chemical processes using the modeling computer program CemKad. The issues considered in the course are the study of the laws of hydromechanical and heat exchange processes occurring in various systems, and the development of various	5				v			v					

		calculation methods. The method of calculating chemical technology devices using a modeling program. The course-forms the student's ability to perform engineering and technological calculations using a computer modeling program, encourages the creation of various projects.													
25	CAD Chemical Engineering II	The purpose of the discipline is to study the modeling of chemical and technological processes using the AspenHysys modeling software package. The course studies the basic concepts of the modeling method, methods of constructing a technological scheme, characteristics of the technological scheme and flows, calculation of parameters of all flows and equipment. The course forms the ability to develop an optimal chemical process technology with a high-quality output of the target product.	5				v			v					

26	Hardware design of oil and gas processing processes I	The course forms students' understanding of the laws of hydromechanical and heat exchange processes occurring in systems with several phases and several components. Students study the basic methods of calculating the equipment, choosing a rational design and determining the size of the devices. As a result, the course forms competencies that allow calculations of processes and apparatuses of hydromechanical and heat exchange processes, perform constructive calculations of apparatuses.	5				v								
27	Hardware design of oil and gas processing processes II	The course forms students' understanding of the regularities and mathematical description of mass transfer processes occurring in systems with several phases and several components. Students will be able to apply the acquired theoretical and practical skills for independent work on performing calculations of chemical equipment and graphic design of design objects.	4				v					v			

28	Fundamentals of physicochemical analysis of oil refining and petrochemical products	The purpose of studying the discipline is to systematize theoretical and applied knowledge about modern methods of analysis of petroleum products and their mixtures of both natural and artificial origin. The main physical research methods used in the analysis of products of petrochemical synthesis are considered: spectral and chromatographic methods, as well as standardized by GOST. As a result of mastering the discipline, the student must: know standardized modern physico-chemical methods of qualitative and quantitative analysis of petroleum products.	5		v		v								
29	Technology of processing of hydrocarbon raw materials I	To form the ability to use knowledge of the physico-chemical features of the technology of processing heavy oil raw materials in order to increase the depth of oil refining. Preparation of graduates for production and technological activities, search and acquisition of new	5		v		v								

		information, integration of knowledge in relation to professional activity. To form basic knowledge and basic concepts of technology, ideas about its fundamental laws and basic methods, the ability to acquire new knowledge in the field of natural sciences.													
30	Processing technology of hydrocarbon raws II	The purpose of the discipline is to provide students with the necessary professional competencies in the field of chemical technology of secondary processing of hydrocarbon raw materials. As a result of studying the discipline, the student will know the basics of managing chemical and technological processes of processing products of primary processing of oil and gas; possess the skills to study the physical and chemical properties and composition of raw materials and the quality of products of processing of hydrocarbon raw materials; be able to make specific technical decisions in the	5		v		v								

		development of technological processes.													
31	Practical training	Passing an instruction on familiarization with the requirements of labor protection, safety, fire safety, and the rules of the internal labor regulations of the enterprise. Conducting a general tour of the enterprise, studying the structure. The stage of collecting, processing and analyzing technical or technological information on the technology being implemented.	2			v		v							
Cycle of basic disciplines Selectable component															
32	Analytical chemistry and physico-chemical methods of analysis	The purpose of the course is to master the methods of analysis of organic substances and their application to solve problems in professional activity. The course discusses the principles and methods of determining the chemical composition of substances and their structure, including using physico-chemical research methods. Application of analytical methods for	5			v								v	

		product quality control in various industries.													
33	Physical chemistry	Purpose: to form students' abilities to understand the physico-chemical essence of processes and to use the basic laws of physical chemistry in complex industrial and technological activities. Contents: laws of thermodynamics; basic equations of chemical thermodynamics; methods of thermodynamic description of chemical and phase equilibria in multicomponent systems; properties of solutions; fundamentals of electrochemistry; basic concepts, theories and laws of chemical kinetics and catalysis.	5										v		
34	Fundamentals of scientific research	Purpose: to form students' research skills, to develop interest in scientific activity. Content: based on the course study, students will consider: - formation of practical skills in planning and performing scientific research; - development of skills of independent search,	5		v			v		v		v			

		analysis and use of scientific information using software and hardware; - mastering the concepts of sustainable development and ESG principles, with an emphasis on their application in the oil and gas sector of Kazakhstan.													
35	Ecology and life safety	The discipline studies the main approaches to solving environmental problems; sources and types of environmental pollution by transport enterprises; methods of reducing harmful effects on the environment. Natural and man-made emergencies, their causes, methods of prevention and protection. Carrying out rescue and other urgent work, rules of behavior of people in emergency situations.	5			v						v			
36	General chemical technology	The purpose of the course: to study the general patterns of chemical and technological processes (CTP) of the most important chemical industries. The course examines the patterns of chemical transformations	5	v			v					v			

		in industrial production conditions; basic chemical equipment. Calculation of technical and economic indicators of the process, material and energy balances. Industrial catalysis. Basic mathematical models of chemical reactors. Methods of development of effective chemical-technological processes and systems, methods of energy and resource conservation, environmental protection.												
37	General principles of chemical and technological processes	The course is designed to get acquainted with the general laws of chemical technology, the most typical chemical-technological processes, reactors and chemical-technological systems. As a result, the course forms competencies that allow carrying out the technological process in accordance with the regulations and using technical means to control its main parameters of the technological process, the	5	v			v					v		

		properties of raw materials and products													
38	Automation of control systems in chemical-technological processes	The purpose of studying the discipline is to acquire the knowledge necessary for effective use in the development of modern automatic control systems. Gaining skills in building and researching mathematical models. Possession of TAR sections necessary for solving research and applied problems. The course "APCS" provides a presentation of the sections of the basics of TAP, measuring elements, actuators, functional diagrams. The study of this discipline will allow the student to acquire the skills to choose the types of switching devices and regulators depending on the law of regulation, to develop a functional and mathematical model of the control system, to analyze the operation of the system based on quality indicators of regulation.	6										v		
39	Automation of control systems	Purpose: - to form the ability to develop, research	6				v				v				

		and operate modern automated process control systems. As a result of training: understand the theory and practice of automated process control systems, learn the principles of building a technical base, mathematical and information support for automated process control systems, be able to apply the basic principles of preparing technological processes and industries for automation.													
40	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning,	5			v									

		statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.													
41	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5	v											
42	Fundamentals of anti-corruption culture	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of	5			v		v							

		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 discipline "Fundamentals of anti-corruption culture" 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.													
43	ESG principles in inclusive culture	Purpose of the course: It focuses on studying ESG (Environmental, Social, Governance) principles and their interaction with the creation of an inclusive culture within an	5			v		v				v			

		organization. Content: Students will gain knowledge on how implementing ESG principles contributes to corporate social responsibility, sustainable development, and equal opportunities for all employees, including those who may face various forms of discrimination. The course will help students understand the importance of an inclusive culture in achieving long- term business goals and ensuring sustainable organizational development.													
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44	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	5			v		v							
Cycle of profile disciplines University component															
45	Fundamentals of enterprise design	The purpose of the discipline is to study the structures, the principle of operation of basic and special equipment for chemical production, familiarization with its main components and details. At the end of the course, the student should know the basic principles	5	v			v					v			

		of design and development of a feasibility study of production; parameters and modes of operation of standard equipment; typical processes of chemical technology, corresponding devices and methods of their calculation; requirements for the technical condition of equipment; methods of technological calculations of individual components and parts of chemical equipment.													
46	Chemical processing of hydrocarbon gas	The purpose of this discipline is to study the theoretical foundations and technology of chemical processing of natural and associated gas. As a result of mastering the discipline, the student should know: - composition and physico-chemical properties of hydrocarbon gases; - chemistry and mechanism of the most important catalytic processes of hydrocarbon gas processing; - technologies for obtaining the main products of organic and petrochemical synthesis	4		v		v				v				

		(paraffins, olefins, methanol, synthesis gas, monomers for polymerization and polycondensation of polymer materials.													
47	Technology of organic and petrochemical production	The course examines the use of modern processes for obtaining organic products based on hydrocarbon raw materials: their specifics and technological features of the hardware design of the most important processes of the branch of basic organic and petrochemical synthesis and promising areas for their improvement, the assimilation of the principles of the organization of waste-free and low-waste production, as well as the directions of their improvement for the purpose of resource and energy conservation, increasing industrial and environmental efficiency. security. Basic knowledge and skills in the field of technological processes for obtaining organic and petrochemical synthesis	4		v						v				

		products, as well as methods for optimizing production processes will be presented.													
48	Equipment of an oil and gas enterprise	The course of this discipline is the study of the composition of the project (working draft), design and estimate documentation, the grounds for its development, the organizational foundations of the design of an oil and gas enterprise, the study of the designs of equipment for oil refining. In the course of studying the discipline, students also gain skills in using scientific, technical and reference literature, determining the technical characteristics of devices and equipment and evaluating their technical and economic efficiency.	6	v			v					v			
49	Pipeline transport of oil and oil products	The purpose of the course is to study the technology of pipeline transportation of oil and petroleum products, including oil and gas production sites with places of their processing and consumption. The	4						v						

		course also studies the construction of main gas and oil pipelines, calculations of main oil pipelines and oil product pipelines, methods of increasing their capacity. In the process of mastering this discipline, the student forms and demonstrates competencies that allow applying the received scientific and theoretical knowledge to solve scientific and practical problems.													
50	Production practice I	The production practice I is of an introductory nature. During the internship, students will get acquainted with the work of the production enterprise, they will observe the production process.	2				v			v					
51	Production practice II	Goals and objectives of the practice: 1. To ensure the formation of professional knowledge, skills and abilities in the information and communication field. 2. To acquaint students with the methods of work and the specifics of the	3				v			v					

		activities of specialists in the production process. 3. To demonstrate the relationship between theoretical courses taught in the learning process and practical activities. 4. Consolidate students' knowledge													
Cycle of profile disciplines Selectable component															
52	Chemical technology of solid combustible minerals	The purpose of the discipline is to form students' technological thinking in the field of solid fuel processing technology as an alternative to petroleum fuel, to provide information about the main methods and stages of fuel processing and the prospects for the development of the industry, and to teach students to creatively use general scientific and general engineering disciplines for management, understanding and explanation complex phenomena occurring in the processes of chemical processing of solid fuels	5	v					v				v		

53	Thermal decomposition of coal	The purpose of studying the course "Thermal decomposition of coal" is to train highly qualified specialists, chemical engineers and technologists for the processing of solid fossil fuels, who know the methods of calculation and design of operational installations and equipment, the formation of a scientific and technical worldview among future specialists. The technology of thermal decomposition of coal for the purpose of production of various types of fuels is considered; state and prospects of the raw material base of the coke industry.	5				v				v				
54	Gas chemistry	The purpose of the discipline is to form the competence of the student in the field of natural and associated gas processing technology. In the course of studying the discipline, the student must: - know the importance of natural gases in the economy and energy, the composition of hydrocarbon gases, their physical and chemical	5		v						v				

		properties, the current state and prospects for the development of the gas processing industry in Kazakhstan and the world; -be able to assess the technical and economic efficiency of the technology and possess the skills to determine the technical characteristics of devices and equipment;													
55	Production of hydrocarbon raw materials for the petrochemical industry	The purpose of studying the discipline: The formation of students' systemic knowledge on the theoretical foundations and technology for the production of hydrocarbon raw materials for the petrochemical industry. In the course of studying the discipline, the student must: -know the chemistry and mechanism of thermal and catalytic transformations of oil and gas components; - to know the physical and chemical properties of hydrocarbons and other components of oil and their influence on the properties of petroleum products, - to know the principles of constructing	5				v								

		technological schemes and designing technological processes in the petrochemical industry.													
56	Corrosion, types of corrosion of petroleum equipment and corrosion inhibitors	The discipline is devoted to the study of the main provisions of the theory of corrosion of metals and alloys, the analysis of factors affecting the corrosion of structural materials and considers corrosion inhibitors in relation to oilfield equipment. Knowledge of the basics of this course will allow you to make the right choice of structural materials when creating chemical equipment in corrosion-resistant design. All this will make it possible to design and operate production equipment technically and technologically more competently	5	v											
57	Preparation and use of reservoir and fresh waters for injection into the reservoir	The course presents measures to maintain reservoir pressure, which is a complex of technological equipment that is necessary for the preparation, transportation and injection of water into the oil	6				v								

		reservoir. The student must know: the theory of oil treatment in the fields; theory of the theoretical basis of the requirements for formation waters; use of statistical methods for processing experimental data.													
58	Technology for the production of aromatic hydrocarbons	The purpose of the discipline: The formation of students' systemic knowledge on the theoretical foundations and industrial technologies for the production of aromatic hydrocarbons from petroleum feedstocks. In the course of studying the discipline, the student must: -know the structure, physicochemical and thermodynamic properties of aromatic hydrocarbons; - to know the industrial methods of separation and isolation of individual aromatic compounds from the concentrate of aromatic hydrocarbons; -know industrial technologies for increasing the resources of individual aromatic hydrocarbons and their isomers;	5		v		v		v		v				

59	Modern petrochemistry industry	The discipline "Modern petrochemical production" is intended for professional training of specialists in the field of petrochemical production. As a result of studying the discipline, the student must: -know the chemistry and production technologies of basic petroleum products - raw materials for the production and processing of polymers (plastics, chemical fibers, films, rubbers, varnishes, coatings, etc.); - to develop an economically viable and environmentally safe technology for processing raw materials and semi-products of petrochemical synthesis; - have skills in engineering calculations.	5		v		v				v				
60	Hydrogenation of coal	Purpose: - to form the ability to understand the origin, composition and properties of coals, coal hydrogenation processes, as well as technologies for obtaining motor fuels and organic substances from coal hydrogenation products. As a result of training: know the	5		v		v				v				

		molecular structure and petrographic composition of coals, carry out a macroscopic description of coals, have an idea about the microcomponents of coals, organic and inorganic constituents of coal, the influence of various factors on the process of coal hydrogenation													
61	Engineering design of chemical-technological processes	Purpose: -to form the ability to understand the issues of calculating chemical reactions occurring in reactors typical of chemical technology processes. As a result of training: know the basics of the kinetics of homogeneous and heterogeneous processes, draw up the material and energy balances of reactors, understand the issues of hydrodynamics. thermodynamics of chemical reactions, schemes and principles of operation of absorber apparatuses, distinctive features of bubbling and spraying absorbers	5				v					v			

62	Catalysts and catalytic processes of petrochemistry	The purpose of studying the discipline "Catalysts and catalytic processes of petrochemistry" is the assimilation by students of the scientific foundations of catalysis, the development of the student's competence in the field of industrial catalysis. As a result of studying the discipline, the student should know: - fundamentals of kinetics and mechanisms of catalytic reactions; - the importance of catalytic processes in the creation of industrial technologies; - theoretical foundations of the most important catalytic processes of the petrochemical industry; - methods of preparation and conditions of application of catalysts; - principles of operation and methods of regulating the parameters of catalysts.	5	v									v	
63	Processing of hydrocarbon gas into fuel components and valuable chemical products	The purpose of studying the discipline is to lay the scientific foundations for the subsequent study and creation of the principles of resource- and energy-	5		v						v		v	

		saving technologies of the gas processing industry. As a result of mastering the discipline, the student will master: physico-chemical methods of separation of a mixture of hydrocarbon gases and isolation of individual compounds; scientific foundations and technologies of processes for processing natural and liquefied petroleum gases; to focus on the development of energy-saving environmentally friendly technological productions.													
64	Ways to improve the technology of water injection into the reservoir	The course describes in detail the method of reservoir flooding, which helps to maintain reservoir pressure and increase the final oil recovery coefficient. As a result of studying the discipline, the student will have the data on the development of a methodology for analyzing the effectiveness of the flooding system, which allows determining the reacting producing wells for injection of each injection, distributing the	6		v		v								

		volume of injection in accordance with the technological indicators of wells and geological and physical characteristics of the formation, forming a step-by-step analysis algorithm with recommendations for its improvement.													
65	Theoretical foundations of the corrosion process of oilfield equipment	The purpose of the course is to study the basics of the theory of corrosion of various types of materials. As a result of studying the discipline, the student will know: the technology of oil and gas processing at refineries and gas processing plants; the principle of operation of the main equipment for primary oil and gas processing; the conditional image of equipment and methods of constructing technological schemes of installations; Be able to: perform and read technological schemes of oil and gas processing plants; Own: methods of technological calculation.	5												v

5. Curriculum of the educational program



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

WORKING CURRICULUM

Academic year 2025-2026 (Autumn, Spring)
Group of educational programs B060 - "Chemical engineering and processes"
Educational program 6B07117 - "Chemical technology of petroleum and chemical products"
The awarded academic degree Bachelor of engineering and technology
Form and duration of study full time - 4 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisite	
									1 course		2 course		3 course		4 course			
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																		
M-1.Module of language training																		
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5									
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5									
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5								
M-2.Module of physical training																		
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2									
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2								
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2							
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2						
M-3.Module of information technology																		
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E			5							
M-4.Socio-cultural development module																		
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE		5								
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E			5							
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E				5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E				3						
M-5. Module on the basis of anti-corruption culture, ecology and life safety																		
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E				5						
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E				5						
HUM159	Law basics	1	GED, CCH	5	150	30/0/15	105	E				5						
CYCLE OF BASIC DISCIPLINES (BD)																		
M-6. Module of physical and mathematical training																		
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5									
PHY468	Physics		BD, UC	5	150	15/15/15	105	E	5									
MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5								MAT101
M-7. Module of basic training																		
CHE692	Introduction to speciality		BD, UC	4	120	30/0/15	75	E	4									

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GEN429	Engineering and computer graphics		BD, UC	5	150	15/0/30	105	E	5								
CHE495	Chemistry		BD, UC	5	150	15/30/0	105	E		5							
AAP173	Practical training		BD, UC	2				R		2							
CHE665	Organic Chemistry I		BD, UC	6	180	30/15/15	120	E			6						
CHE456	Field preparation of oil and gas		BD, UC	5	150	30/0/15	105	E			5						
CHE127	Physical chemistry	1	BD, CCH	5	150	15/15/15	105	E			5						
HBI126	Analytical chemistry and physico-chemical methods of analysis	1	BD, CCH	5	150	15/15/15	105	E			5						
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E			5						
CHE639	Organic chemistry II		BD, UC	5	150	15/15/15	105	E			5						
CHE470	Collection, preparation and transportation of hydrocarbon gas		BD, UC	5	150	30/0/15	105	E			5						
CHE570	General chemical technology	1	BD, CCH	5	150	30/15/0	105	E			5						
CHE682	General principles of chemical and technological processes	1	BD, CCH	5	150	30/0/15	105	E			5						
IDD427	Ecology and life safety	1	BD, CCH	5	150	30/0/15	105	E			5						
CHE950	ESG principles in inclusive culture	1	BD, CCH	5	150	30/0/15	105	E			5						
HUM158	The basics of anti-corruption culture	1	BD, CCH	5	150	30/0/15	105	E			5						
PET525	Fundamentals of scientific research	1	BD, CCH	5	150	30/0/15	105	E			5						
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	1	BD, CCH	5	150	30/0/15	105	E			5						
CSE880	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	30/0/15	105	E			5						
CHE471	Technological processes of oil production intensification		BD, UC	5	150	30/0/15	105	E			5						
CHE453	Fundamentals of petrochemical synthesis		BD, UC	5	150	30/0/15	105	E			5						
CHE467	Hardware design of oil and gas processing processes I		BD, UC	5	150	30/0/15	105	E			5						
CHE695	CAD Chemical engineering I		BD, UC	5	150	0/15/30	105	E			5						
CHE472	Fundamentals of physical and chemical analysis of oil refining products and petrochemistry		BD, UC	5	150	30/15/0	105	E			5						
CHE698	Technology of processing of hydrocarbon raw materials I		BD, UC	5	150	15/15/15	105	E			5						
CHE699	CAD Chemical Engineering II		BD, UC	5	150	0/15/30	105	E				5					
CHE600	Hardware design of oil and gas processing processes II		BD, UC	4	120	30/0/15	75	E				4					
HBI137	Processing technology of hydrocarbon raws II		BD, UC	5	150	30/0/15	105	E				5					
AUT434	Automation of control systems in chemical engineering processes	1	BD, CCH	6	180	30/15/15	120	E					6				
AUT435	Automation of control systems	1	BD, CCH	6	180	30/15/15	120	E					6				
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-7. Module of basic training																	
AAP102	Production practice I		PD, UC	2				R			2						
M-8. Module of professional activity																	
CHE681	Chemical processing of hydrocarbon gas		PD, UC	4	120	30/0/15	75	E					4				
CHE560	Fundamentals of enterprise design		PD, UC	5	150	30/0/15	105	E					5				
CHE680	Technology of organic and petrochemical production		PD, UC	4	120	30/0/15	90	E					4				
AAP183	Production practice II		PD, UC	3				R				3					
CHE670	Equipment of an oil and gas enterprise		PD, UC	6	180	30/0/30	120	E					6				
CHE463	Catalysts and catalytic processes of petrochemistry	1	PD, CCH	5	150	30/0/15	105	E					5				
CHE683	Engineering design of chemical-technological processes	1	PD, CCH	5	150	30/0/15	105	E					5				
CHE411	Corrosion, types of corrosion of petroleum equipment and corrosion inhibitors	2	PD, CCH	5	150	30/15/0	105	E					5				
CHE482	Theoretical foundations of the corrosion process of oilfield equipment	2	PD, CCH	5	150	30/0/15	105	E					5				
CHE671	Preparation and applying of reservoir and fresh water for injection into the reservoir	3	PD, CCH	6	180	30/0/30	120	E					6				
CHE685	Ways to improve the technology of water injection into the reservoir	3	PD, CCH	6	180	30/0/30	120	E					6				
CHE476	Processing of hydrocarbon gas into fuel components and valuable chemical products	4	PD, CCH	5	150	30/0/15	105	E					5				

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CHE686	Hydrogenation of coal	4	PD, CCH	5	150	30/0/15	105	E							5		
HBI101	Pipeline transport of oil and oil products		PD, UC	4	120	30/0/15	75	E							4		
CHE610	Technology for the production of aromatic hydrocarbons	1	PD, CCH	5	150	30/0/15	105	E							5		
CHE484	Modern petrochemistry industry	1	PD, CCH	5	150	30/0/15	105	E							5		
CHE611	Chemical technology of solid combustible minerals	2	PD, CCH	5	150	30/0/15	105	E							5		
CHE687	Thermal decomposition of coal.	2	PD, CCH	5	150	30/0/15	105	E							5		
CHE146	Gaschemistry	3	PD, CCH	5	150	30/0/15	105	E							5		
CHE462	Production of hydrocarbon raw materials for the petrochemical industry	3	PD, CCH	5	150	30/0/15	105	E							5		
M-9. Final certification module																	
ECA103	Final examination		FA	8											8		
Additional type of training (ATT)																	
AAP500	Military training																
Total based on UNIVERSITY:										31	29	28	32	30	30	33	27
										60		60		60		60	

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	51	0	5	56
BD	Cycle of basic disciplines	0	96	16	112
PD	Cycle of profile disciplines	0	28	36	64
Total for theoretical training:		51	124	57	232
FA	Final attestation				8
TOTAL:					240

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 28.11.2024

Signed:
Governing Board member - Vice-Rector for Academic Affairs Uskenbayeva R. K.

Approved:
Vice Provost on academic development Kalpeyeva Z. B.
Head of Department - Department of Educational Program Management and Academic-Methodological Work Zhumagaliyeva A. S.
Director - Geology and Oil-gas Business Institute named after K. Turyssov Auyelkhan Y. .
Department Chair - Chemical and biochemical engineering Mangazbayeva R. A.
Representative of the Academic Committee from Employers Seytenova G. Z.
____Acknowledged____

