

"Kazakh University of Technology and Business" named after K.Kulazhanova" JSC

EDUCATIONAL PROGRAM

7M07138 Chemical technology of organic substances

Level: Master's

Approved
by the Board of Directors of JSC «K.Kulazhanov
KazUTB» 18.05 2026, protocol No. 4



Recommended
by the Academic Council of JSC «K.Kulazhanov
KazUTB» 22.02 2026, protocol No. 7

Astana – 2026

©Is the intellectual property of JSC "KazUTB named after K.Kulazhanov"
Reprinting and/or further transfer to third parties is prohibited

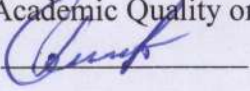
CONTENT

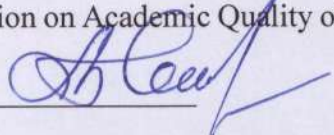
Preface	3
Approval sheet	4
1 Passport of the educational program	5
2 Qualification characteristics of a graduate of an educational program	5
3 Requirements for the content of the educational program	6
4 Competency map of the educational program	6
5 Learning outcomes of the educational program and modules	8
6 The relationship between the attainability of the formed learning outcomes according to the educational program and academic disciplines	13
7 Alignment of planned learning outcomes with assessment technologies and teaching methods within the module	19
8 Correlation of learning outcomes of the educational program with the labor functions of professional standards	21
9 Graduate model	25
10 Typical curriculum (appendix to the OP)	
11 Expert opinion	

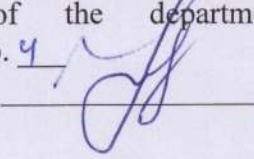
Preface

The educational program "7M07138 Chemical Technology of Organic Substances" was developed in accordance with the State Mandatory Standard of Higher Education / 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, as well as on the basis of the professional standard of the Career Enbek system "Teacher (faculty) of higher and secondary education organizations (or) postgraduate education No. 591 dated 11/20/2023; Quality control of oil, gas and products of their processing No. 486 dated 06/12/2022; Oil, gas refining and petrochemistry No. 486 dated 06/12/2022.

Atlas of New Professions and Competencies in Kazakhstan in the Oil and Gas Sector: the profession "Chemical Engineering Technologist," as well as the competencies provided for in the regional professional standard for the Aktobe Region, "Oil and Gas Waste Processing Engineer."

The educational program "7M07138 Chemical technology of organic substances " was approved at the meeting of the Council on Academic Quality on "22" 01 2026 protocol No. 3
Chairman E.B.Askarbekov 

The educational program "7M07138 Chemical technology of organic substances" was approved at the meeting of the Commission on Academic Quality of the Faculty on "21" 12 2025 protocol No. 3/1
Chairman B. Serimbetov 

The educational program "7M07138 Chemical technology of organic substances " was developed and discussed at the meeting of the department "CC T u E" dated "22" 11 2025, protocol No. 4
Head of the department Zh.Nurtai 

Approval sheet

Educational program "7M07138 - Chemical technology of organic substances"

AGREED:

Vice-Rector for
Administrative Affairs



БІРІНБІ
БАШҚАРМАЛАРЫ
БАСҚАРМАСЫ
УПРАВЛЕНИЕ
ОБЩЕОБРАЗОВАТЕЛЬНЫХ
ПРОГРАММ

E. Askarbekov

"22" 01 2026 year

Head of Educational
Programs Department



Б. БАЯДИЛОВА

B. Bayadilova

"22" 01 2026 year

Director of «Astana Gas
Service» LLP



«Astana Gas Service»
ЖАУАПҚЕРШІЛІК
ҚАҒАҢДЫ

K. Bagramova

"27" 11 2025 year

Director of «Institute of
Chemistry, Coal and
Technology» LLP



«Институт химии,
угля и технологии»
ЖАУАПҚЕРШІЛІК
ҚАҒАҢДЫ

B. Yermagambet

"27" 11 2025 year

Director of
«Scientific and Production
Association "Energy-
saving Technologies"»
LLP



«Энергосберегающие
технологии»
ЖАУАПҚЕРШІЛІК
ҚАҒАҢДЫ

E. Zhatkanbayev

"27" 11 2025 year

Director of «KazGeoMap»
LLP



"KazGeoMap"
ЖАУАПҚЕРШІЛІК
ҚАҒАҢДЫ

A. Rakhmetulla

"27" 11 2025 year

Director of «Petrum» LLP



«Petrum»
ЖАУАПҚЕРШІЛІК
ҚАҒАҢДЫ

R. Romazanov

"27" 11 2025 year

Master's student
HTOVNPN-242/1



К. МАНАРБЕК

K. Manarbek

"27" 11 2025 year

1 Passport of the educational program

International Classification of Education (ISCED) level	Standard Education	7
National Qualification Framework (NQF) level		7
Sectoral Qualifications Framework (SQF) level		7
Code and name of the field of education	7M07 Engineering, manufacturing and construction industries	
Direction of training	7M071 Engineering and Engineering affairs	
Number and name of the group of educational programs	M097 Chemical engineering and processes	
Code and name of the educational program (EP)	7M07138 Chemical technology of organic substances	
Educational program profile	Scientific and pedagogical	
Purpose of the educational program	Training of highly qualified specialists in the field of chemical technology of organic substances, with deep professional and social competencies, in demand in almost all industries, focused on solving issues of development of the most important areas of the petrochemical and oil and gas processing industries.	
Completion criterion of an educational program	120 academic credits	
Language of instruction of the educational program	Russian, Kazakh,	
Distinctive features of the educational program	-	
Partner University	-	

2 Qualification characteristics of a graduate of an educational program

Degree awarded	Master of Engineering Sciences in the educational program 7M07138 Chemical technology of organic substances
Field of professional activity	The graduate is intended to work in the following industries (fields): science and education; oil refining; petrochemistry; polymer processing; geology; hydrogeology; manufacturing plants and laboratories in the food and processing, microbiological, pharmaceutical and mining industries.
Types of professional activities	Graduates of the educational program 7M07138 Chemical technology of organic substances can perform the following types of professional activities: - scientific research; - educational, pedagogical; - organizational and technological; - production and management; - design

Object of professional activity	Enterprises for the production of organic substances, for the processing of oil, gas, coal and polymers, elastomers, paints and varnishes, gunpowder, solid and liquid rocket fuels, for the preparation, extraction and transportation of hydrocarbon raw materials and their rational use; research and design industry institutes; secondary technical educational institutions; defense enterprises, mining industries.
Functions of professional activity	The objects of professional activity of graduates are enterprises producing organic substances, processing oil, gas, coal and polymers, elastomers, paints and varnishes, gunpowder, solid and liquid rocket fuels, preparing, extracting and transporting hydrocarbon raw materials and their rational use; research and design industry institutes; secondary technical educational institutions; defense enterprises, mining industries. Implementation of research and teaching activities in accordance with modern requirements in the field of chemical technology; collection and preparation of scientific materials, qualified setting up of experiments, conducting research work.

3 Requirements for the content of the educational program

Name of cycles and disciplines	Workload in academic credits
Cycle of basic disciplines (BD)	35
University component	20
Component of choice	15
Professional practice	53
Cycle of major disciplines (MD)	25
University component	20
Component of choice	13
Professional practice	24
Final certification	8
Total	120

4 Competency map of the educational program «7M07138 Chemical technology of organic substances »

Type of competence	Learning Outcomes Code	Learning outcome (according to Bloom's taxonomy)
Behavioral skills and personality traits (Softskills)	LO 1	Conducts research in the industrial field of technology based on a holistic systematic scientific worldview using knowledge of the history and philosophy of science
	LO 2	Participates in oral and written communications in a foreign language to solve problems of interpersonal and intercultural interaction in professional activities
	LO 3	Applies knowledge of psychology and methodological foundations of higher school pedagogy in planning professional and personal development, training and socialization of students
Digital competencies (Digital skills)	LO 8	Selects the type of control and measuring instruments and automation equipment using artificial intelligence, monitoring and analyzing the input and output parameters of technological processes to optimize and improve the efficiency of control and management of production systems
Professional skills (Hardskills)	LO 4	Applies modern scientific concepts and theories in the field of creating organic substances for innovative technologies using

		engineering models of technological installations and processes
	LO 5	Applies conceptual, logical, and analytical thinking skills, as well as modern scientific methods and tools of cognition for intellectual and cultural development and enhancement of professional competence
	LO 6	Develops technological processes for the processing of oil, gas, and carbon-based feedstock, ensuring product quality, automation, and production efficiency, including the monitoring of technological processes and products
	LO 7	Creates engineering models of process plants and processes capable of simulating various operating conditions of the plants in the appropriate software
	LO 9	Implements modern approaches to modeling and designing industrial processes of organic and petrochemical synthesis using specialized software packages using the fundamentals of scientific research methodology in chemistry

5 Learning outcomes of the educational program and modules

Key competence	Learning Outcomes (LO) for the educational program	Name of module	Learning outcomes for the module	Name of disciplines that form learning outcomes
Behavioral skills and personality traits (Softskills)	LO1 Conducts research in the industrial field of technology based on a holistic systematic scientific worldview using knowledge of the history and philosophy of science	Modern problems of science and education	Applies philosophical knowledge to planning tasks of professional and personal development, the basis of a holistic systemic scientific worldview using knowledge in the field of history and philosophy of science.	History and philosophy of science
	LO2 Participates in oral and written communications in a foreign language to solve problems of interpersonal and intercultural interaction in professional activities		Demonstrates the ability to communicate orally and in writing in a foreign language to solve problems of interpersonal and intercultural interaction.	Foreign language (professional)
	LO3 Applies knowledge of psychology and methodological foundations of higher school pedagogy in planning professional and personal development, training and socialization of students		Demonstrates the ability to apply knowledge of psychology for the purposes of self-knowledge, solves psychological problems in management systems; Demonstrates the ability to apply the methodological foundations of higher education pedagogy, conduct scientific research and use professional knowledge for the socialization of young students.	Management psychology Higher school pedagogy Pedagogical practicum
Digital competencies (Digital skills)	LO8 Selects the type of control and measuring instruments and automation equipment using artificial intelligence, monitoring and analyzing the input and output parameters of technological processes to optimize and improve the efficiency of control and management of production systems	Fundamentals of technology and design of organic and petrochemical production	Demonstrates knowledge of the classification, types, purpose and main characteristics of typical control and measuring instruments, automatic and signaling devices at their installation location, design and operating principles. Applies skills in the application of methods for developing functional control and regulation systems for chemical-technological processes.	Software complexes for modeling and designing industrial processes of organic and petrochemical synthesis Fundamentals of designing chemical production
		Scientific	Possesses the principles of constructing automated	Automation and control at

	Topical issues of petrochemical synthesis	purposes in oil and gas production. Conducts experimental studies of physical and chemical processes in oil and gas production. Explore new methods and catalysts, master the principles of sustainable production, environmentally friendly technologies, analysis of scientific information, process design, product life cycle assessment and the use of innovative materials in the chemical industry	Planning and processing an experiment Modern problems of chemistry and polymer technology Modern trends in the development of basic organic and petrochemical synthesis
LO5 Applies conceptual, logical, and analytical thinking skills, as well as modern scientific methods and tools of cognition for intellectual and cultural development and enhancement of professional competence	Modern approaches and technologies in organic chemistry and oil and gas processing	Demonstrates knowledge of the use of theoretical foundations of fundamental sections of chemistry in solving professional problems. Apply acquired skills to search, accumulate and process scientific information, as well as conduct, process and formalize the results of experimental research	Special technology for the production of fuels from oil and gas Modern organic chemistry Research Methodology in Chemistry Advanced technologies for processing organic substances
	Fundamentals of technology and design of organic and petrochemical production	Capable of adapting modern versions of quality management systems to specific production conditions based on international standards. Uses the acquired knowledge about the theoretical foundations of physicochemical methods of analysis in the study of the physicochemical properties of substances, areas and boundaries of use of the main methods of physicochemical analysis of chemical substances and reactions.	Fundamentals of planning research work for master's students Modern methods of physical and chemical research
LO6 Develops technological processes for the processing of oil, gas, and carbon-based feedstock, ensuring product quality,	Modern approaches and technologies in organic	Selects optimal conditions for the technological process. Demonstrates basic knowledge in the ability and readiness to use the basic laws of natural sciences in professional activities, in the implementation of the	Modern organic chemistry Special technology for the production of fuels from oil and gas

automation, and production efficiency, including the monitoring of technological processes and products	chemistry and oil and gas processing	technological process in accordance with the technological regulations and use technical means for measuring the main parameters of the technological process, the properties of raw materials and products	Research Methodology in Chemistry
	Innovative technologies and quality control in oil refining and petrochemistry	Apply acquired knowledge and skills in the basic methods of analysis and synthesis of organic substances, analyze available information, identify fundamental problems and perform laboratory research using modern equipment.	Modern methods of analysis of petroleum products Innovative technologies of oil refining and petrochemistry
	Topical issues of petrochemical synthesis	Analyzes industrial technological installations for the production of surfactants, and the designs of the main devices of technological installations. Develops practical work skills in the field of organic synthesis, studies the principles and methods of organizing technological processes for obtaining basic products of organic synthesis, the main methods of technological calculation of the most important apparatuses for organic synthesis	Modern problems of chemistry and polymer technology Modern trends in the development of basic organic and petrochemical synthesis
	Scientific methods for the study of gas chemistry	Capable of analyzing flow and basic process flow diagrams; performs process calculations for the main equipment of oil and gas refining processes	Oil and gas chemistry Research practice
	Fundamentals of technology and design of organic and petrochemical production	Applies skills in complex experimental planning on the fundamental principles of the tasks (processes) under consideration, modern methods for solving them, and choosing ways to achieve the final result of the research being conducted	Modern methods of physical and chemical research
LO7 Creates engineering models	Innovative	Applies practical skills in the application of modern	Innovative technologies of

of process plants and processes capable of simulating various operating conditions of the plants in the appropriate software	technologies and quality control in oil refining and petrochemistry	methods for calculating technological and structural equipment	oil refining and petrochemistry
	Topical issues of petrochemical synthesis	Demonstrates the knowledge, skills and abilities necessary to study the composition of pre-project and design documentation, requirements for it, principles, methods and technology of modeling and industrial design of organic and petrochemical synthesis enterprises,	Modern trends in the development of basic organic and petrochemical synthesis
	Scientific methods for the study of gas chemistry	Demonstrates knowledge of the basics of automation and control of oil and gas refining processes, types and methods of measurement. Applies skills in solving problems in the analysis and synthesis of automatic control systems for process parameters and principles of building automated control systems for technological processes of oil and gas refining enterprises	Oil and gas chemistry Automation and control at oil and gas processing enterprises
	Fundamentals of technology and design of organic and petrochemical production	Demonstrates knowledge of the main stages and principles of technological design of chemical production; analysis and assessment of the impact of designed enterprises on the environment; principles of calculation and design of main and auxiliary equipment	Fundamentals of designing chemical production Software complexes for modeling and designing industrial processes of organic and petrochemical synthesis
LO9 Implements modern approaches to modeling and designing industrial processes of organic and petrochemical synthesis using specialized	Fundamentals of technology and design of organic and petrochemical	Expands and deepens knowledge in the ability to set up, configure, organize and carry out preventive inspections and routine repairs of equipment, check equipment and software; is able to check the technical condition of equipment; master and operate newly	Software complexes for modeling and designing industrial processes of organic and petrochemical synthesis

	software packages using the fundamentals of scientific research methodology in chemistry	production Modern approaches and technologies in organic chemistry and oil and gas processing	introduced equipment. Possesses skills in placing technological equipment in industrial buildings and open areas. Conducts patent search, analytical review of scientific literature. Defines research objectives and conducts experiments.	Research Methodology in Chemistry
--	--	--	---	-----------------------------------

6 The relationship between the attainability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Numb er of credits	Formed learning outcomes (codes)								
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9
Cycle of basic disciplines												
University Component/Elective Component												
1	Foreign language (professional)	The discipline is aimed at developing academic interaction and scientific writing skills. While studying the subject, the master's student systematizes foreign information in their field of expertise and conducts professional activities in a foreign language. This enables the effective presentation of original research results in an international environment, the preparation of articles for high-ranking journals, and the delivery of lectures on specialized subjects, thereby enhancing the overall competitiveness of the future researcher.	4	+								
2	History and philosophy of science	The discipline aims to cultivate a culture of scientific thinking and develop methodological analysis skills. The learning process focuses on a profound understanding of the specifics of cognition, ensuring the high-quality completion of the master's thesis and the achievement of a high level of academic integrity in preparing scientific	4	+								

[illegible]

	of physical and chemical research	foundations and experimental techniques of modern physical research methods for the characterization and solution of chemical problems. Within the course, students learn comprehensive experimental planning, the fundamental principles of the processes under consideration, modern methods for solving them, and the selection of approaches to achieve the final research outcome. As a result of the training, a master's student justifies the choice of physicochemical research methods.																		
14	Modern problems of chemistry and polymer technology	The discipline is aimed at developing systematic knowledge of modern problems in polymer chemistry and technology, as well as the prospects of multifunctional polymers. Within the course, students learn methods for producing polymer materials and products for various applications, modern approaches to the synthesis of multifunctional polymers using engineering formulas for calculating process parameters, and the analysis of technological schemes for producing major polymers. As a result of the training, a master's student optimizes technological processes for polymer production.	5						+											
15	Modern trends in the development of basic organic and petrochemical synthesis	The discipline is aimed at developing fundamental scientific knowledge of organic synthesis and current trends in the development of organic and petrochemical synthesis. Within the course, students master the main synthesis processes, principles and methods of organizing technological processes for producing basic products, as well as methods for the technological calculation of equipment and practical skills. As a result of the training, a master's student calculates the parameters of technological processes in organic synthesis.	5						+									+		
16	Automation and control at oil and gas processing enterprises	The discipline is aimed at developing theoretical knowledge of the fundamentals of automation and process control in oil and gas processing, as well as the types and methods of measurement, and the design and operation of	5															+		+

		sensors, secondary instruments, and microprocessor technology. Within the course, students learn the analysis and synthesis of automatic control systems for technological parameters and the principles of designing automated process control systems. As a result of the training, a master's student designs automatic control systems for technological processes.																	
17	Oil and gas chemistry	The discipline is aimed at studying oil and gas processing technologies, as well as developing skills in designing units and automating process control in the oil refining and petrochemical industries. Within the course, students learn to analyze flow and process flow diagrams, carry out laboratory control of production processes, and perform technological calculations of main equipment. As a result of the training, a master's student develops oil and gas processing technological processes and manages product quality control and technological processes, taking into account requirements for efficiency and automation.	5																
18	Fundamentals of designing chemical production	The discipline is aimed at developing skills in designing and automating processes and equipment of chemical production, as well as in developing technological flow schemes. Within the course, students learn the stages and principles of process design, the analysis and assessment of the environmental impact of designed facilities, and the principles of calculation and design of main and auxiliary equipment. As a result of the training, a master's student designs chemical production facilities taking into account engineering, technological, and environmental requirements.	5																
19	Advanced technologies for processing organic substances	The discipline is aimed at developing a system of knowledge in the synthesis and separation of organic substances, as well as the principles of creating low-waste technologies. Within the course, students learn to apply basic reaction equipment, construct technological schemes	5																

	philosophy of science		
LO2	Participates in oral and written communications in a foreign language to solve problems of interpersonal and intercultural interaction in professional activities	Project defense. Abstract. Problem solving, presentation. Survey, colloquium, test assignments. Submission of calculation and graphic work, research work.	Brainstorming. Case study. Project. Portfolio, Round table, discussion, polemics, debate, "Get the question" method. Business and/or role-playing game.
LO3	Applies knowledge of psychology and methodological foundations of higher school pedagogy in planning professional and personal development, training and socialization of students	Colloquium. Business and/or role play, case task, delivery calculation and graphic work, Research work. Creative work, independent work	Problem-solving method. Discussion. Associogram method. Work in small groups, Brainstorming method. Question and answer method.
LO4	Applies modern scientific concepts and theories in the field of creating organic substances for innovative technologies using engineering models of technological installations and processes	Presentation, survey, test, colloquium, tasks in test form. Research work, creative work. Independent work, test work	Interactive lectures. Trainings. Discussions. Role-playing games, Situational games. Venn diagram, association method, cluster, dialogue learning, group work, brainstorming, video, project method
LO5	Applies conceptual, logical, and analytical thinking skills, as well as modern scientific methods and tools of cognition for intellectual and cultural development and enhancement of professional competence	Round table, discussion, polemic, debate, debate, colloquium. Interview, abstract. Essay, etc.	Interactive practical lesson (problem topics, business and role-playing games, case studies (analysis of specific circumstances), brainstorming. "Questions-answers-discussion". Strategic methods "INSERT"
LO6	Develops technological processes for the processing of oil, gas, and carbon-based feedstock, ensuring product quality, automation, and production efficiency, including the monitoring of technological processes and products	Colloquium. Workbook, Creative task, essay	Interactive lectures. training and. discussions. Group work, game methods. Situational games, circle of time, philosophy of children. Rainbow groups. Paired speech, listening trio, Jigsaw method, spectrum of values, distance.
LO7	Creates engineering models of process plants and processes capable of simulating various operating conditions of the plants in the	Simulator, case task, creative assignment	Brainstorming. SWOT analysis. Case study. Controversy, dispute, debate

	appropriate software			
LO 8	Selects the type of control and measuring instruments and automation equipment using artificial intelligence, monitoring and analyzing the input and output parameters of technological processes to optimize and improve the efficiency of control and management of production systems	Abstract. Problem solving. Presentation, survey, colloquium, test assignments, research work. Creative work	Interactive lectures. Trainings. Discussions. Role-playing games, Situational games. Venn diagram, association method, cluster, dialogue learning, group work, brainstorming, video, project method	
LO 9	Implements modern approaches to modeling and designing industrial processes of organic and petrochemical synthesis using specialized software packages using the fundamentals of scientific research methodology in chemistry	Project defense. Abstract. Problem solving, presentation. Survey, colloquium, test assignments. Submission of calculation and graphic work, research work. Creative work, independent work	Interactive practical lesson (problem topics, business and role-playing games, case studies (analysis of specific circumstances), brainstorming. "Questions-answers-discussion". Strategic methods "INSERT", "Bingo"	

8 Correlation of learning outcomes of the educational program with the labor functions of professional standards (if any)

Name of used professional standards	Professions by level 7	Labor functions	Tasks	Learning Outcomes by LO
"Quality control of oil, gas and their processed products" dated 12.06.2022 No. 486	Head of Laboratory (Manufacturing Industry)	Labor function 1: Management of the quality control process for oil, gas, and their processed products.	Task 1: Carrying out work on the preparation and sampling of oil, gases, and petroleum products for Task 2: Ensuring safety during the sampling of aggressive substances and conducting an initial assessment of the samples.	LO6 Manages the process of quality control of oil, gas and their refined products

Requirements for personal competencies		Responsibility, teamwork skills, diligence, attentiveness.	
"Oil, gas and petrochemical processing" 06.12.2022 No. 486	Head of Installation	Labor function 1: Ensuring and monitoring the correct operation of the installation	Task 1: Organization of work at the installation LO8 Selects the type of control and measuring instruments and automation equipment using artificial intelligence, monitoring and analyzing the input and output parameters of technological processes to optimize and improve the efficiency of control and management of production systems
	Process modeling engineer	Labor function 1: Support for engineering models of technological processes in oil and gas processing and petrochemicals.	Task 1: Creation and adjustment of engineering models of technological installations and processes capable of simulating various operating conditions of the plants in the appropriate software LO7 Creates engineering models of process plants and processes capable of simulating various operating conditions of the plants in the appropriate software LO8 Selects the type of control and measuring instruments and automation equipment using artificial intelligence, monitoring and analyzing the input and output parameters of technological processes to optimize and improve the efficiency of control and management of production systems
			PO4 Applies modern scientific concepts and theories in the field of creating organic substances for innovative technologies using engineering models of technological installations and processes. LO9 Implements modern approaches to modeling and designing industrial processes of organic and petrochemical synthesis using specialized software packages using the fundamentals of scientific research methodology in chemistry
Requirements for personal competencies		Diligence, stress resistance, independence, attentiveness, responsibility, ability to work in a team.	

"Teacher (teaching staff) of higher and (or) postgraduate education organizations" dated 20.11.2023 No. 591	Teacher, assistant in the field of education, OVPO	Job Function 1: Training	Skill 1: Ensuring the required level of academic competencies of students	LO2 Participates in oral and written communications in a foreign language to solve problems of interpersonal and intercultural interaction in professional activities
			Skill 2: Ensuring the required level of professional competencies of students	LO3 Apply knowledge of psychology and methodological foundations of higher education pedagogy in planning professional and personal development, training and socialization of young students
		Job Function 2: Conducting Scientific Research	Skill 1: Ensuring the integration of science, higher education and the labour market	LO1 Conducts research in the industrial field of technology based on a holistic, systems-based scientific worldview using knowledge of the history and philosophy of science LO5 Possesses the skills of conceptual, logical and analytical thinking, applying modern scientific methods and means of cognition for intellectual improvement and cultural development, increasing professional competence
			Skill 2: Developing the required level of research skills in students	LO4 Applies modern scientific concepts and theories in the field of creating organic substances for innovative technologies using engineering models of technological installations and processes. LO9 Implements modern approaches to modeling and designing industrial processes of organic and petrochemical synthesis using specialized software packages using the fundamentals of scientific research methodology in chemistry

		Labor function 3: Socialization of studying youth	Skill 1: Scientific and methodological support for the macroprocesses of OVPO	LO1 Conducts research in the industrial field of technology based on a holistic, systemic scientific worldview using knowledge of the history and philosophy of science LO3 Apply knowledge of psychology and methodological foundations of higher education pedagogy in planning professional and personal development, training and socialization of young students
Atlas of New Professions: «Oil and Gas»	Chemical engineering technologist	Novelty of the profession: development of new materials (for Kazakhstani practice); composite materials. Key competencies of the profession: Development of technology for the production of consumer goods Adaptation of existing technologies for Kazakhstani enterprises	Skill 1: Performing work related to the preparation and sampling of oil, gases, and petroleum products for testing.	RO6 develops technological processes for the processing of oil, gas, and carbon raw materials, ensuring product quality, automation, and production efficiency, including the control of technological processes and products.
Regional Atlas of Professions in the Aktobe Region	Oil and Gas Waste Processing Engineer	Professional skills and abilities: • Implementation and adaptation of technologies for processing oil and gas waste, management of industrial waste, creation of dead-end waste, • Implementation	Skills 1: Creating and adjusting engineering models of technological units and processes capable of simulating various operating conditions of the units in the appropriate software.	RO6 develops technological processes for the processing of oil, gas, and carbon raw materials, ensuring product quality, automation, and production efficiency, including the control of technological processes and products.

		of recycling, • Conducting an environmental audit taking into account current environmental and safety requirements, • Organization of waste processing based on a wide range of technologies, • Design of waste management systems, • Automation of recycling production processes, • Assessment of the economic efficiency of waste processing, • Conducting a patent search in order to introduce new recycling technologies. • Project management and organization of safety measures.		
Requirements for personal competencies	Develops technological processes for the production efficiency, including monitoring of technological processes and products.	Benevolence, sociability, empathy, stress resistance, emotional balance, professional and social responsibility, ability to develop teaching and research skills.		

9 Graduate model

MODEL OF A GRADUATE			
Professional standard "Quality control of oil, gas and their processed products"	Competencies (Soft skills, digital skills)		
	Attributes of a graduate	Knowledge	Skills
	"Teacher (academic staff) of higher and (or) postgraduate education institutions No. 591 dated 20.11.2023; Quality control of oil, gas and their processed products No. 486 dated 12.06.2022; Oil, gas processing and petrochemicals No. 486 dated 12.06.2022." The competencies of the profession "Chemical Engineering Technologist", presented in the "Atlas of New Professions and Competencies in the Republic of Kazakhstan" and the Atlas regional standard competencies "Engineer for the processing of oil and gas waste"	1. Methods of product quality control. 2. Regulatory requirements and quality standards. 3. Analysis of test results. 4. Occupational safety and health rules. 5. Documentation and reporting. 6. Methods of personnel training and development.	1. Ensure efficient use of laboratory equipment - organization of work with equipment, planning its maintenance and modernization, minimizing downtime. 2. Conduct analysis of test results and optimize analysis methods - analysis of the obtained data to find ways to improve accuracy and the effectiveness of laboratory tests. 3. Assess and eliminate the causes of errors during testing - analyze the causes of possible deviations or errors in test results and implement measures to prevent them
	Professional skills (hard skills)		
	1. Conduct testing management to check the quality of oil, gas and their refining products 2. Assess and eliminate the causes of errors during testing - analyze the causes of possible deviations or errors in test results and implement measures to prevent them 3. Conduct modern methods of calculating technological and structural equipment; analyze oil refining processes aimed at solving the problem of increasing the depth of oil refining, improving the quality of the obtained petroleum products		
Professional standard "Oil, gas and petrochemical"	Competencies (Soft skills, digital skills)		
	Attributes of a graduate	Knowledge	Skills
	"Teacher (academic staff) of higher and (or) postgraduate education institutions No. 591 dated 20.11.2023; Quality control of oil, gas and their processed products No. 486 dated 12.06.2022; Oil, gas processing and petrochemicals No. 486"	1. Basic requirements for operation and maintenance of the installation 2. Legislative and regulatory legal acts, methodological materials on the organization of operation, maintenance and repair	1. Implementation of the organization and distribution of work at the installation 2. Ability to rationally assign personnel to jobs 3. Implementation of administrative and technical management of production activities 4. Carrying out work on the

"Teacher (teaching staff) of higher and (or) postgraduate education organizations" <i>"Quality control of oil, gas and their processed products"</i>	dated 12.06.2022." The competencies of the profession "Chemical Engineering Technologist", presented in the "Atlas of New Professions and Competencies in the Republic of Kazakhstan" and the Atlas regional standard competencies "Engineer for the processing of oil and gas waste"	technological equipment 3. Production capacities, technical characteristics, design features, purpose and operating modes of the installation, its rules exploitation	introduction of new equipment and production technology to improve the efficient operation of installations
	Professional skills (hard skills)		
	1. Analysis of the quality and properties of raw materials, products, parameters of the process installations for the development of updated engineering models 2. Modeling of physicochemical processes before conducting technological runs on technological installations to predict changes in the technological regime and properties of products 3. Ensuring optimization of the technological mode of installations, analysis, control and forecasting of the operation of technological equipment and quality indicators of refinery products		
	Competencies (Soft skills, digital skills)		
	Attributes of a graduate	Knowledge	Skills
"Teacher (teaching staff) of higher and (or) postgraduate education organizations" <i>"Quality control of oil, gas and their processed products"</i>	"Teacher (academic staff) of higher and (or) postgraduate education institutions No. 591 dated 20.11.2023; Quality control of oil, gas and their processed products No. 486 dated 12.06.2022; Oil, gas processing and petrochemicals No. 486 dated 12.06.2022." The competencies of the profession "Chemical Engineering Technologist", presented in the "Atlas of New Professions and Competencies in the Republic of Kazakhstan" and the Atlas regional standard competencies "Engineer for the processing of oil and gas waste"	1. Principles of pedagogical interaction with students; 2. Strategies and mechanisms of communication in the academic and professional environment. 3. Regulatory legal acts (including the National Qualifications System) in the field of higher education; 4. Mechanisms and principles of integration of psychological, pedagogical and subject (special) knowledge	1. To involve students in public youth movements and organizations; 2. Involve employers in the process of training future specialists; 3. Develop and implement programs for advanced training courses for industry employees in the area of training; 4. Publish relevant articles in the media at various levels, social networks
	Professional skills (hard skills)		

- | |
|--|
| <ol style="list-style-type: none">1. Develop teaching and methodological materials for the disciplines taught, taking into account the integration of education, science and innovation2. Take part in the implementation of research and development work/creative projects3. Involve undergraduate and graduate students in research and development work.4. Interaction with stakeholders of higher and postgraduate education |
|--|

[illegible]

[illegible]

Средняя оценка / Среднее значение / Average score

Барлығы модуль бойынша / Итого по модулю / Total for modules

EXPERT OPINION
on educational program 7M07138 – "Chemical Technology of Organic
Substances" for 2026-2028
JSC "Kazakh University of Technology and Business named after K.
Kulazhanov"

This educational program has been developed in accordance with the requirements of the State Compulsory Standard for 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, and also reflects the provisions of relevant professional standards.

The duration of the master's program in specialty 7M07138 – "Chemical Technology of Organic Substances" is two years. The goal of this educational program is to provide specialized education and in-depth training for industrial specialists. This goal is achieved through the study of specialized courses in all modules.

From the perspective of an expert representing the chemical industry, it should be noted that the presented educational program in "Chemical Technology of Organic Substances" meets the basic needs of the industry. The program addresses current issues related to modern hydrocarbon processing technologies, the synthesis of organic compounds, catalytic processes, and the management of chemical engineering systems.

The program's relevance is driven by the high demand for specialists capable of addressing challenges related to environmental safety, import substitution of chemical products, and the transition to sustainable and energy-efficient technologies. It is particularly important that the program includes courses on the digitalization of chemical processes and the use of software for modeling and optimization of production. A positive aspect is the availability of on-site practical training, which allows students to participate in solving real-world production problems.

We believe that the disciplines of the educational program and the catalog of elective courses for specialty 7M07138 – "Chemical Technology of Organic Substances" submitted for approval are sufficiently developed, logically interconnected, and aimed at developing students' practical skills and abilities in the field of study.

This educational program has high potential for training specialists capable of working effectively in chemical plants and is recommended for implementation.

Expert: B. N. Satbaev B.N. Satbaev, Director of the Astana Branch of the National Center for Integrated Processing of Mineral Raw Materials, Doctor of Engineering, Professor, and Laureate of the State Prize of the Republic of Kazakhstan



EXPERT OPINION

on the Educational Program "7M07138 – Chemical Technology of Organic Substances" for 2026-2028

Educational program 7M07138 – "Chemical Technology of Organic Substances" was developed in accordance with the requirements of the State Compulsory Standard for 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, and is also based on the professional standards: "Oil and Gas Refining," "Quality Control of Oil and Petroleum Products," and "Management of Oil and Gas Refining and Sales."

The relevance of this educational program is determined by the need to train specialists with in-depth knowledge in organic synthesis, engineering chemistry, process design, and production management systems.

The goal of this educational program is to develop students' professional, analytical, and managerial competencies and critical thinking skills, enabling them to participate in scientific research and innovation. This is necessary for solving research, design, and production problems in the chemical and petrochemical industries and for the technological modernization of the chemical industry. The program's curriculum covers modern methods of organic synthesis, catalysis, process design, engineering analysis, and environmental assessment of production processes.

The program also provides in-depth study of digital technologies in chemical engineering systems. Practical training is provided at research institutes and manufacturing facilities, facilitating the practical application of theoretical knowledge and strengthening the university's ties with industry.

This educational program is recommended for implementation as it aims to train competitive specialists capable of effectively solving scientific and applied problems, as well as developing and implementing innovative solutions in the chemical engineering industry at a modern level. The program is relevant and in demand in the labor market and aligns with current trends in chemical engineering.

Expert:

Head of the Chemical Products
Development Directorate
of JSC "Kazakhstan Industry and
Export Center "QazIndustry"



Zhatkanbaev E.E.

EXPERT OPINION
on educational program 7M07138 – "Chemical Technology of Organic
Substances" for 2026-2028
JSC "Kazakh University of Technology and Business named after K.
Kulazhanov"

The master's program "7M07138 – Chemical Technology of Organic Substances" meets the requirements of the State Compulsory Standard for 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, and also reflects the provisions of relevant professional standards.

The goal of the educational program is to provide specialized education and in-depth training of highly qualified specialists for the chemical industry. This goal is achieved through the study of specialized courses in all modules.

From an academic perspective, this master's program demonstrates a balanced combination of fundamental training and practice-oriented disciplines. Particular attention is paid to modern areas of organic chemical engineering, including organic synthesis, catalysis, environmentally friendly technologies, and scientific methods for studying materials and products. The program includes courses on the digitalization of chemical processes and the use of software for modeling and optimization of production.

The program is structured according to a scientific approach, from fundamental chemical and physicochemical principles to applied problems. This allows students to integrate into scientific activities from the early stages of their studies.

One of the significant advantages is the research component of the educational trajectory. Master's students will be involved in scientific work that has potential for publication and implementation.

The program demonstrates a high degree of scientific maturity and promises to train highly qualified research practitioners. It is recommended for implementation and can serve as a model for similar master's programs in chemical engineering.

Expert: _____

Lu N. Yu., Deputy Director for Research,
Branch of the Zh. Abishev Chemical-Metallurgical Institute of the National Center
for Integrated Processing of Mineral Raw Materials, Ph.D.



EXPERT OPINION
on the educational program 7M07138 – "Chemical Technology of
Organic Substances" for 2026-2028
JSC "Kazakh University of Technology and Business named after K.
Kulazhanov"

The educational program and catalog of elective courses have been developed in accordance with the requirements of the State Compulsory Standard for 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, and also reflect the provisions of relevant professional standards.

The goal of the educational program is to provide specialized education and in-depth training of highly qualified specialists for the chemical industry. This goal is achieved through the study of specialized courses in all modules.

From an academic perspective, this master's program demonstrates a balanced combination of fundamental training and practice-oriented disciplines. Particular attention is paid to modern areas of chemical engineering of organic substances, including organic synthesis, catalysis, environmentally friendly technologies, and scientific methods for studying materials and products. The program includes courses on the digitalization of chemical processes and the use of software for modeling and optimization of production.

It is important to note that the presented educational program in the "Chemical Engineering of Organic Substances" program meets the basic needs of the industry. The program addresses current issues related to modern hydrocarbon processing technologies, the synthesis of organic compounds, catalytic processes, and the management of chemical engineering systems.

The disciplines of the educational program and the catalog of elective courses for specialty 7M07138 – "Chemical Engineering of Organic Substances" submitted for approval are well-developed, logically interconnected, and aimed at developing practical skills and abilities in the student in the field of study.

The program demonstrates a high degree of scientific maturity and is promising for the training of highly qualified research practitioners. Recommended for implementation and can serve as a model for similar master's programs in chemical engineering.

Expert:
Karaganda National Research
University named after E.A. Buketov,
Doctor of Chemical Sciences,
Research Professor



Ибраев Марат Киримбаевич

ҚОЙЫЛҒАН ҚОЛДЫ РАСТАЙМЫН

Ст. Ученый МР
Шамава И. И.

EXPERT OPINION
on educational program 7M07138 – "Chemical Technology of Organic Substances"
for 2026-2028
JSC "Kazakh University of Technology and Business named after K. Kulazhanov"

The Master's degree program "Chemical Technology of Organic Substances" is relevant and in demand in the current context of the development of the chemical, petrochemical, pharmaceutical, and processing industries of the Republic of Kazakhstan. The program's content aligns with current trends in science, technology, and the state's industrial and innovation policy, which is focused on developing highly qualified personnel for the chemical engineering sector of the economy.

The educational program is designed to train master's students with fundamental knowledge in organic chemistry, chemical technology of organic substances, catalytic processes, petrochemistry, polymer technology, and hydrocarbon processing, as well as modern skills in the design, modeling, and optimization of chemical engineering processes.

The program's research component is particularly important. Master's students acquire skills in planning and conducting scientific research, processing and interpreting experimental data, working with modern laboratory equipment, preparing scientific publications, and presenting research results. This contributes to the development of specialists capable of solving scientific and technological problems at a modern level and participating in innovative projects.

The practical focus of the educational program is noteworthy. The program's professional internships and research internships allow master's students to consolidate their acquired knowledge and acquire practical skills in real-world production and research environments.

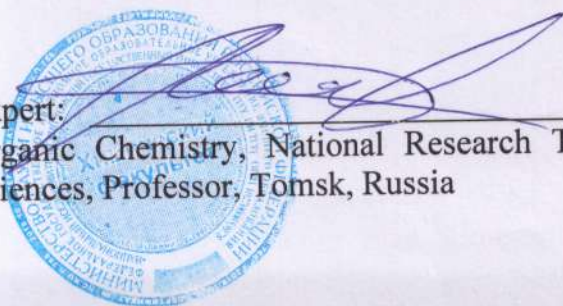
The program's relevance is also driven by the need to develop high-value-added production in Kazakhstan, deep processing of hydrocarbon and organic raw materials, the implementation of environmentally friendly and resource-saving technologies, and the development of "green" chemistry and innovative materials. Therefore, training master's students in "Chemical Technology of Organic Substances" is essential for ensuring the country's sustainable industrial development.

Overall, the educational program is recommended for implementation in higher and postgraduate educational institutions in the Republic of Kazakhstan and can be positively assessed as modern, practice-oriented, and aligned with the country's strategic priorities for the development of science, education, and industry.

Expert:

Organic Chemistry, National Research Tomsk State University, Doctor of Chemical Sciences, Professor, Tomsk, Russia

Bakibayev A.A., Professor, Department of



**International Academic Advisor Confirmation/ Шетелдік кеңесшінің қатысуы/
Участие зарубежного консультанта**

Educational Program/ Білім беру бағдарламасы/ Образовательная программа	7M07138 Chemical technology of organic substances/ 7M07138 Органикалық заттардың химиялық технологиясы/ 7M07138 Химическая технология органических веществ
Level/ Дәрежесі/ Уровень /	Master's / Магистр (ғылыми-педагогикалық бағыт)/ Магистр (научно-педагогическое направление)
International Academic Advisor/ Шетелдік академиялық кеңесші/ Зарубежный консультант	Khudaiberdieva Difuza Bakhramovna / Худайбердиева Дилфуза Бахрамқызы / Худайбердиева Дилфуза Бахрамовна
Academic degree/ Ғылыми дәреже/ Ученая степень	Doctor of Technical Sciences/ Техника ғылымдарының докторы/ Доктор технических наук
Position/ Лауазымы/ Должность	Professor/Профессор/Профессор
University/ Университет/ Университет	Tashkent Institute of Textile and Light Industry / Ташкент тоқыма және жеңіл өнеркәсіп институты/ Ташкентский институт текстильной и легкой промышленности
Country/ Ел/ Страна	Uzbekistan /Өзбекстан /Узбекистан

Approved/ Келісілді/ Согласовано

The educational program has been reviewed and approved. The updated content of the educational program, the sequence of courses, and the revised learning outcomes (LO) have been developed in accordance with modern academic approaches.

Білім беру бағдарламасы қарастырылып, келісілді. Білім беру бағдарламасының жаңартылған мазмұны, пәндерді оқу реттілігі және жаңартылған оқу нәтижелері (ОН) заманауи академиялық тәсілдерге сәйкес әзірленді.

Образовательная программа рассмотрена и согласована. Актуализированное содержание образовательной программы, последовательность изучения дисциплин и обновленные результаты обучения (РО) сформированы с учетом современных академических подходов.

International Academic Advisor/ Шетелдік академиялық кеңесші/ Зарубежный консультант	D. Khudaiberdieva/ Д. Худайбердиева/ Д. Худайбердиева	 (Signature/ Қолы/ Подпись)	_____ (Date/ Күні/ Дата)
--	---	---	-----------------------------------

Seal/ MO/ МП