



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

EDUCATION PROGRAM

**8D07108 « The main processes of synthesis and production of new organic
and polymeric materials »**

Code and classification of the field of education: **8D07** «Engineering,
manufacturing and construction industries»

Code and classification of areas of study: **8D071** «Engineering and Engineering»

Group of educational programs: **D097** «Chemical engineering and processes»

Уровень по НРК: 8

Уровень по ОРК: 8

Year of study: 3

Credits: 180

Almaty 2025

The educational program 8D07108 «The main processes of synthesis and production of new organic and polymeric materials»
was approved at the meeting of the Scientific Council of KazNTU named after K.I.Satpayev

Protocol №10 from «06» 03 2025y

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

Protocol №3 from «20» 12 2024y

The educational program 8D07108 «The main processes of synthesis and production of new organic and polymeric materials» was developed by the academic committee in the direction D097 «Chemical engineering and processes»

Name	Academic degree/ academic	Post	Place of work	
Chairman of the Academic Committee:				
Selenova Bagadat Samatovna	Doctor of Chemical Sciences	Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Teaching staff:				
Mangazbaeva Rauash Amantaevna	Candidate of Chemical Sciences	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Aitkalieva Gulzat Slyashevna	Doctor PhD	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev	
Employers				
Seitenova Gaini Zhumagalievna	Candidate of Chemical Sciences, Associate Professor	Head of the Project Office	Petro Gas Chemical Association,	
Students:				
Bogdanova Violetta	-	Student	Kazakh National Research Technical University named after K.I.Satpayev	

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List of abbreviations and designations

EP – Educational program
CC – Communicative competence
LO – Learning Outcomes
NJSC - Non-profit joint stock company

1. Description of educational program

The educational program is a set of documents developed by the academic committee of the Kazakh National Research Technical University named after K.I. Satpayev.

The EP considers the needs of the regional labor market, the requirements of government agencies and relevant industry requirements. The branch of organic and petrochemical synthesis, which uses oil, gas, coal as raw materials, is the leading one and determines the progress of the chemical industry - an important link in the economy of Kazakhstan. Products of organic and petrochemical synthesis, having valuable chemical and physico-chemical properties, are semi-products in the production of polymers, medicinal substances, plant protection products and other synthetic materials. And since the industry of organic and petrochemical synthesis provides raw materials for all other sub-sectors of the chemical industry that produce synthetic materials, it must develop at a faster pace.

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

The EP defines program educational goals, student learning outcomes, 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.

The EP includes the curriculum, the content of disciplines and learning outcomes and other materials to ensure a quality education for students.

2. Purpose and objectives of the educational program

The purpose of the EP:

Training highly qualified specialists with profound knowledge, methodological competencies, and research skills in the field of chemical technology of organic substances and their processing, capable of developing and implementing innovative and environmentally safe technologies for sustainable development and successfully competing in national and international labor markets.

The objectives of this EP are:

- social, humanitarian and professional training of bachelors in the field of chemical engineering in accordance with the development of science and production, as well as with the needs of oil and gas chemical clusters in Kazakhstan, national research centers, master's and doctoral studies of higher educational institutions;

- training of bachelors - technologists who know the raw material base, methods of analytical quality control of raw materials and commercial products, production technologies and areas of consumption of organic substances and materials with fundamental training in physics, mathematics, chemistry, physical and chemical foundations of technologies for obtaining the most important classes of organic substances, production of chemical reagents (additives, surfactants, polymers) used in the production of fuels and petroleum oils, in the processes of extraction, preparation and transportation of hydrocarbon raw materials.

- providing knowledge, skills and abilities that allow analyzing problems in the field of chemical engineering and finding ways to solve them, solve engineering problems in the design of production of organic substances and materials, conduct research work in the field of synthesis and study of the properties of new chemical compounds and materials using information technologies and methods of mathematical planning of experiment.

- preparation of students for professional activities in the conditions of existing production, the formation of skills and abilities to maintain the required level of labor and production discipline; on conducting a technical and economic analysis of production; on the adoption and implementation of management decisions in the face of different opinions.

3. Requirements for evaluating the learning outcomes of an educational program

The educational program was developed by the academic committee in accordance with the State Mandatory Standards of Higher and Postgraduate Education of the Republic of Kazakhstan dated July 20, 2022 No. 2 and reflects the learning outcomes on the basis of which curricula (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses) are developed. Formed learning outcomes: applies knowledge of natural science, socio-economic and profile disciplines of biotechnology to solve practical and professional tasks of the biotechnology industry.

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 production of organic substances, processing of oil, gas, coal and polymers, elastomers, paints and varnishes.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	8D07 «Engineering, manufacturing and construction industries»
1	Code and classification of areas of study	8D071 «Engineering and Engineering» (0710)
3	Group of educational programs	D097 Chemical Engineering and Processes"
4	Name of the educational program	8D07108 – The main processes of synthesis and production of new organic and polymeric materials
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 considers the needs of the regional labor market, the requirements of government agencies and relevant industry requirements.
6	Purpose of the OP	Training of specialists with key and professional competencies in the field of production of organic substances, processing of oil, gas, coal and polymers, elastomers, paints and varnishes.
7	OP type	new
8	NQF level	8
9	ORC level	8
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:	PO1 Develop teaching and methodological materials on the disciplines taught, taking into account the integration of education, science and innovation for independent lectures and practical classes at all levels of higher and postgraduate education, taking into account the principles of student-centred learning and assessment; PO2 Demonstrates high professional qualities and ethics when interacting with various stakeholders; PO3 Applies information to solve professional problems corresponding to his qualifications, to have an idea of alternative, technical, technologically safe solutions in the field of study; PO4 Integrates key concepts, theoretical developments and use them to solve analytical and managerial problems in new unfamiliar conditions; RO5 Applying cutting-edge knowledge in the production and processing of organic substances and polymers in his professional and academic career; RO6 Demonstrates high professional research and cognitive skills in the preparation and defense of a doctoral dissertation; RO7 Conducts independent research that contributes to the development of the industry in the production and technological, design, research and organizational and management spheres.
13	Form of study	Full-time
14	Training period	3 years
15	Volume of loans	180
16	Languages of instruction	Kaz, Russian and English
17	Awarded Academic Degree	PhD of Engineering and Technology
18	Developer(s) and authors:	Selenova B.S., Mangazbaeva R.A., Aitkalieva 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
CYCLE OF BASIC DISCIPLINES university component										
1	Simulation and optimization of chemical engineering processes	The discipline ensures that doctoral students develop skills in applying basic approaches to computer modeling of chemical technological processes for the synthesis of substances and materials, calculation methodology and construction of mathematical models of typical chemical technology processes, their determination using experimental data and optimization solutions.	5		v	v				v
2	Sustainability Science	Objective: to develop a deep understanding among doctoral students of the interactions between natural and social systems, as well as to develop skills for identifying and developing strategies for sustainable development that promote long-term human well-being and environmental preservation. Content: complex interconnections between ecosystems and societies. An analysis of sustainability issues at local, national, and international levels.	5				v	v		
3	Management of chemical technology processes	The purpose of studying the discipline: the formation of fundamental knowledge on process automation devices and devices that allow analysis and control of the technological process.	5		v					v

		Summary: System analysis of the technological process as an object of control and automation. Automation of hydromechanical, thermal, mass transfer processes. Automation of reactors. Automation of potentially dangerous chemical production processes. Automation of chemical and technological productions.								
CYCLE OF PROFILE DISCIPLINES component of choice										
4	Green chemistry in the production of chemicals and materials	The goal of the discipline is to develop in doctoral students the ability to apply key methodological approaches to the optimization of chemical technological processes to minimize their harmful effects on the environment while obtaining more sustainable products and products.	5		v	v	v			
5	Polymers with a complex of special properties	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, new information 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.	5	v				v		v
6	Modern catalytic methods for the synthesis of polymers	Formation of competencies in the field of synthesis of polymerization and condensation polymers and the study of their basic properties, as well as determining the dependence of properties on the structure of the monomer, functionality, conditions for obtaining the polymer, in order to create polymer structures with optimal functional	5	v				v		

		parameters for use in various fields science and technology								
7	GTL technologies	The purpose of the academic discipline is to develop in the doctoral student key concepts in the field of chemistry, kinetics and technology of processing of natural and liquefied petroleum gases in order to obtain high-quality synthetic liquid fuel with improved operational and environmental properties	5			v		v		v



«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

D097 - "Chemical engineering and processes"

Educational program

8D07108 - "The main processes of synthesis and production of new organic and polymeric materials"

The awarded academic degree

Doctor of Philosophy PhD

Form and duration of study

full time (scientific and pedagogical track) - 3 years

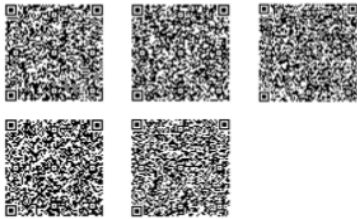
Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters						Prerequisites	
									1 course		2 course		3 course			
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem		
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																
CYCLE OF BASIC DISCIPLINES (BD)																
M-1. Module of basic training (university component)																
MET322	Methods of scientific research		BD, UC	5	150	30/0/15	105	E	5							
LNG305	Academic writing		BD, UC	5	150	0/0/45	105	E	5							
BIO322	Simulation and optimization of chemical engineering processes	1	BD, CCH	5	150	30/0/15	105	E	5							
MNG350	Sustainability Science	1	BD, CCH	5	150	30/0/15	105	E	5							
HBI308	Management of chemical technology processes	1	BD, CCH	5	150	30/0/15	105	E	5							
M-3. Practice-oriented module																
AAP350	Pedagogical practice		BD, UC	10				R		10						
CYCLE OF PROFILE DISCIPLINES (PD)																
M-2. Module of professional activity (component of choice)																
BIO323	Polymers with a complex of special properties	1	PD, CCH	5	150	30/0/15	105	E	5							
CHE314	GTL technologies	1	PD, CCH	5	150	30/0/15	105	E	5							
BIO324	Modern catalytic methods for the synthesis of polymers	2	PD, CCH	5	150	30/0/15	105	E	5							
CHE315	Green chemistry in the production of chemicals and materials	2	PD, CCH	5	150	30/0/15	105	E	5							
M-3. Practice-oriented module																
AAP355	Research practice		PD, UC	10				R			10					
M-4. Experimental research module																
AAP336	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	5				R	5							
AAP347	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	20				R		20						
AAP347	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	20				R			20					
AAP356	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	30				R				30				
AAP356	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	30				R					30			
AAP348	Research work of the doctoral student, including internships and doctoral dissertation		RWDS	18				R							18	
M-5. Module of final attestation																
ECA325	Final examination (writing and defending a doctoral dissertation)		FA	12											12	
Total based on UNIVERSITY:										30	30	30	30	30	30	

	60	60	60	
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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	0	0	0	0
BD	Cycle of basic disciplines	0	20	5	25
PD	Cycle of profile disciplines	0	10	10	20
Total for theoretical training:		0	30	15	45
RWDS	Research Work of Doctoral Student				123
ERWDS	Experimental Research Work of Doctoral Student				0
FA	Final attestation				12
TOTAL:					180

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