Ministry of Science and Higher Education of Republic of Kazakhstan
Karaganda University of the name of academician E.A. Buketov

«APPROVED»
By the decision of the Board
NLC «Karagandy University of the name of
academician E.A. Buketov»
Protocol no. 3 from « 24 » 05 2024 y.
prof. N.O.Dulatbekov.

«APPROVED»
By the decision of the Board of Directors of
NLC «Karagandy University of the name of
academician E.A. Buketov»
Protocol no. 5 from « 21 » 06 2024 y.

EDUCATIONAL PROGRAM

7M07102 - Chemistry and Chemical Engineering

Level: Master's

Karaganda
2024

APPROVAL SHEET
EDUCATION PROGRAMME «7M07102 CHEMISTRY AND CHEMICAL ENGINEERING»

«AGREED»

Chairman of the Board of "Eurasian Foods" JSC

_____ O.V. Vinokurov
«15» 05 2024 y.

«AGREED»

Head of the branch of "Aluminum of Kazakhstan" JSC
Krasnooktyabrskoye bauxite ore management

_____ M. R. Nurmagan
«22» 05 2024 y.

The "*7M071 Engineering"* Education Program was developed on the basis of this program:

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education"
- Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 152 dated 04/20/2011 "On approval of the Rules for organizing the educational process in credit technology"
- NQF dated 03/16/2016 The Republican Trilateral Commission on Social Partnership and Regulation of Social and Labor Relations
- Order of the Ministry of Education and Science of the Republic of Kazakhstan No.569 dated 10/13/2018 "On approval of the Classifier of areas of training with higher and postgraduate education"
- The State mandatory standard of postgraduate education of the Republic of Kazakhstan, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 2 dated 07/20/2022.
- The standard "Teacher", approved by Order of the Ministry of Education of the Republic of Kazakhstan No. 500 dated 12/15/2022.

Content

Passport of an educational programme

1. The code and name of the educational programme: "7M07102 Chemistry and Chemical Engineering".

2.Code and classification of field of education, training area: Field of education: 7M07 Engineering, manufacturing and construction industries. Field of study: 7M071 Engineering and Engineering.

3. Education Programme Group: Chemistry and Chemical Engineering.

4. Credit volume. The total workload for the whole period of Master's study is 120 academic credits (2 years);

Requirements for applicants: Bachelor of Engineering and Technology in the specialty 5B072100 - Chemical Technology of Organic Substances, Bachelor of Engineering and Technology in the educational program "6B05302 Chemistry and Chemical Engineering".

Prerequisites for mastering the program:

- in case of coincidence of profile of educational program of a master's degree with the program of higher education - is not required
- in the event that the profile of a master's degree program does not coincide with a higher education program:

For applicants from chemical specialties - Technology of hydrocarbon raw materials processing - 9 ESTC;

For applicants from non-chemical specialties - Organic Chemistry - 11 ESTC; Introduction to specialty - 4 ESTC.

5. Form of training: full-time,term of study: 2 years.

6.Language of instruction: Russian, kazakh.

7. Degree awarded. The graduate of the Master's degree is awarded with the degree "Master of Technical Sciences in the educational program *"7M07102 Chemistry and Chemical Engineering"*.

8. Type of education programme: acting.

9. Level according to ISCED – Level 7.

10. Level according to NQF – Level 7.

11. Level according to SQF – Level 7.

12. Distinguishing features of the Educational Programme

13. The number of the appendix to the license for the direction of training.

Appendix to the state license for educational activity: KZ83LAA000184956, application № 016, date of issue 28.07.2020.

14. Name of accreditation body and duration of accreditation of the study programme. Accreditation of the educational program: Independent Kazakhstan Agency for Quality Assurance in Education (IQAA), Certificate IA № 0086 of 02.04.2018 validity date 02.04.2018. – 31.03.2023.

15. The purpose of the educational program: training qualified specialists who have practical and theoretical knowledge in the field of future professional activity, based on international standards of postgraduate engineering education, ensuring their competitiveness.

16. Graduate Qualification Profile for the Educational Programme "7M07102 Chemistry and Chemical Engineering".

a) The list of jobs held: Chemist; Chemist-technologist; Technologist; Technician; Scientific worker; Laboratory Technician; Engineer; Senior Laboratory Technician; Junior Scientific worker; Specialist at the departments of the university in the field of chemistry; teacher of secondary, secondary and higher educational institutions, etc.

b) The sphere and objects of professional activity of the graduates of the educational program *"7M07102 Chemistry and Chemical Engineering"*

is:

- oil refining industry;
- polymer production and processing;
- geology and hydrogeology;
- mining industry;
- food industry;
- science and education.

The objects of professional activity of masters under the educational program *"7M07102 Chemistry and Chemical Engineering"* are:

- enterprises producing organic substances, polymers, elastomers, paintwork materials, powders, solid and liquid rocket fuels;
- enterprises for oil, gas and coal processing;
- enterprises engaged in production, preparation and transportation of hydrocarbon raw materials and their rational use;
- defense enterprises;
- mining and extractive industries;
- research and design industry institutes;
- secondary technical and higher educational institutions;
- chairs of chemical and special profile.

The subject of professional activity of the graduates under the educational program *"7M07102 Chemistry and Chemical Engineering"* are the products of basic and fine organic synthesis, polymers, devices and equipment of chemical technology of production and processing of organic substances and materials, various types of raw materials and auxiliary materials (including oil, gas, coal, vegetable raw materials), polymers, monomers, elastomers, chemical reagents and reagents, research instruments and equipment.

c) Types of professional activity:

- Educational, upbringing, social and communicative;
- industrial and technological;
- design and engineering;
- installation and adjustment;
- organizational and managerial;
- research.

d) Functions of professional activity:

Educational, upbringing and social and communicative activity:

- Training of youth in chemistry and technology of organic substances processing;

- education of the young generation in pedagogical and industrial activity;
- creation of friendly relations in professional environment;
- development of international cooperation in professional activity.

Production and technological activity:

- organization of collective work in the conditions of existing production;
- estimation of structure and properties of initial raw materials with the purpose of possibility of development of the new technological processes providing high quality;
- analysis of ways of improvement and modernization of technological lines, equipment with the purpose of carrying out of highly effective technological processes on production and processing of organic substances;
- carrying out of technical and economic analysis of production.

Organizational and management activities:

- Organization and realization of input control of raw materials from the point of view of possibility of production and processing of organic substances;
- implementation of technical control;

Settlement and design activity:

- Design of new and modernization of existing technological schemes, selection of technological parameters, calculation of equipment selection;
- development of design and estimate documentation, ensuring the efficiency of design solutions;
- analysis and evaluation of alternative variants of technological scheme and separate units on the basis of wide use of mathematical models.

Research and development activity:

- Planning and implementation of scientific research in the field of chemical technology of organic substances, in the field of organic and petrochemical synthesis, as well as production and processing of polymers;
- creation, modeling and optimization of production units and technological schemes, solving technological problems;
- analysis of modern trends in chemical technology development in various industries.

Formulating competency-based learning outcomes

Type of competences	Learning outcome code	Learning result (according to Bloom's taxonomy)
1. Behavioural skills and personality traits: (Soft skills)	LO4	Applies innovative methods in conducting various types of classes in technological disciplines in teaching
	LO5	Systematizes the basic laws of development of science and technology in the field of chemistry and chemical engineering, analyzes approaches to the study of the development of chemical engineering
	LO10	Demonstrates the skills of logical and analytical thinking in solving problems and their proper documentation
	LO11	Organizes and carries out operation of technological lines, takes part in development and modernization of technological schemes of production of oil products, polymers, products of industrial and household purpose
	LO12	Has a high motivation to perform professional activities; owns the technology of self-study and self-education, the ability to improve and develop their intellectual, cultural and professional level
	LO13	Has the skills of public speech, argumentation, discussion and debate; practical analysis of the logic of various kinds of reasoning
2. Digitalcompetences: (Digital skills):	LO7	Speaks a foreign language to the extent necessary to obtain information of professional content from foreign sources
	LO9	He is able to follow the basic rules adopted in scientific communication in his native and foreign languages
3. Professional competences: (Hard skills)	LO1	He is able to analyze alternative solutions to research and practical problems and assess the potential for the implementation of these options, in solving research and practical problems to generate new ideas that can be operationalized on the basis of available resources and constraints
	LO2	Uses modern information and communication technologies in research, development and production of organic substances and products for technical and household purposes
	LO3	Carries out a technical and economic analysis, comprehensively justifies the decisions taken and implemented, finds opportunities to reduce the cycle of work, promotes the preparation of the process of their implementation, provides the necessary technical data, materials and equipment
	LO6	He has the skills of analysis of scientific texts, various methods, technologies and types of communication in the implementation of professional activities in the native and foreign languages.
	LO8	Develops and performs work in the field of scientific and technical activities for design, information services, organization of production, labor and management, metrological support, technical control
	LO14	Classifies and systematically combines knowledge of scientific problems of chemistry and chemical engineering, research methods in engineering systems and uses them in specific situations

	LO15	Uses experimental methods to solve complex problems of chemistry and chemical engineering, plans and conducts chemical and technological experiments

Determination of modules of disciplines in accordance with the results of training

Learning outcome code	Module name	Name of the discipline	Объем (ECTS)
LO4, LO5, LO8, LO10, LO12, LO13	Philosophical-historical aspect of social and humanitarian discoveries	History and philosophy of science	4
LO4, LO5, LO7, LO1, LO12, LO13		Pedagogy of higher education	4
LO4, LO5, LO10, LO12, LO13		Management psychology	4
LO4, LO6, LO7, LO8, LO10, LO12, LO13		Pedagogical practice	4
LO10, LO11, LO12, LO13	Professional languages	Foreign language (professional)	4
LO5, LO10, LO11, LO12, LO13		Professional foreign terminology in chemistry and chemical engineering	5
LO5, LO10, LO11, LO12, LO13		Academic and professional communication in chemistry in a foreign language	
LO1, LO4, LO8, LO13, LO15	Innovative process of research organization	Commercialization of the results of scientific and technical activities	5
LO1, LO2, LO3, LO8, LO10, LO13, LO14		Organization and planning of scientific research in the field of chemical sciences	
LO1, LO2, LO3, LO4, LO6, LO8, LO14, LO15		Resource-saving technologies	5
LO1, LO6, LO8, LO9, LO14, LO15		Innovation in chemistry and chemical engineering	
LO4, LO5, LO7, LO10		Concept of engineering education for chemical technology (in English)	4
LO4, LO5, LO7, LO10		Methodology of teaching chemical engineering disciplines in higher education	
LO1, LO3, LO6, LO8, LO15	Chemistry and technology of processing of organic substances and fuels	New routes in synthesis and technology of producing composite materials	4
LO2, LO3, LO6, LO8, LO9, LO15		Innovative technologies of oil refining and petrochemistry	4
LO1, LO2, LO6, LO8, LO14, LO15		Modern problems of chemistry and technology of special purpose polymers	5
LO2, LO3, LO6, LO8, LO15	Modern problems of chemistry, chemical engineering and nanotechnology	Fundamentals of nanomaterials technology	4
LO2, LO3, LO6, LO8, LO15		Nanostructured polymer materials	
LO3, LO4, LO9, LO13		Molecular spectroscopy (in English)	4
LO3, LO4, LO9, LO13		Methods of statistical thermodynamics (in English)	
LO1, LO3, LO4, LO8, LO9, LO13, LO14		Contemporary issue of organic chemistry (in English)	5

LO2, LO3, LO4, LO8, LO9, LO13, LO14		Supramolecular chemistry (in English)	
LO1, LO3, LO8, LO9, LO13, LO14		Chemistry of functional materials	4
LO2, LO3, LO8, LO9, LO13, LO14		Chemistry of semiconductor materials	
LO1, LO3, LO8, LO9, LO13, LO14		Modern spectroscopic methods in organic chemistry (in English)	5
LO1, LO2, LO3, LO4, LO8, LO9, LO13, LO14		Modern methods of organic synthesis (in English)	
LO1, LO2, LO3, LO4, LO6, LO8, LO14, LO15		Research practice	14
LO1, LO2, LO3, LO4, LO6, LO8, LO14, LO15	Research work of a master student, including internship and master's thesis (RWM)	Research work of a master student, including internship and master thesis	24
	Final examination	Design and defense of a master's thesis	8

Matrix for the attainability of learning outcomes

No	Name ofdisciplines	Brief description of the discipline (30-40 words)	Number of credits	Formative learning outcomes (codes)														
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13	LO 14	LO 15
Cycle of basic disciplines University component																		
D1	History and philosophy of science	It is studied with the aim of forming knowledge about the significance of scientific knowledge in its tendency to development and sociocultural profile. Questions about the philosophy, methodology of science, science as a cognitive activity and tradition are considered.	4				+	+			+		+		+	+		
D2	Pedagogy of higher education	Studied to form ideas about the modern paradigm of higher education and the theory of scientific activity in higher education. The issues of pedagogy, education of professionals-specialists, professional skills of teaching in educational organizations, pedagogical control and evaluation of knowledge in higher education are considered.	4				+	+		+			+		+	+		
D3	Psychology of management	It is studied with the aim of forming knowledge about the psychological laws of managerial activity, skills in analysis of socio-psychological principles, the characteristics of the psychology of management, the personal characteristics of the leader.	4				+	+					+		+	+		
D4	Pedagogical practice	The purpose of pedagogical practice is to study the basics of educational and methodological work at the university, mastering the pedagogical skills of conducting training sessions. Pedagogical practice is aimed at mastering modern teaching methods and technologies, as well as the use of information resources and IT technologies to solve educational problems.	4				+		+	+	+		+		+	+		
D5	Foreign language (professional)	The course is taken for developing the skills and abilities of foreign language speech activity in the subject area for effective communication in situations of professional interaction. The course is designed to teach how to work with specialized literature, to practice of oral and written bilingual translation. There are considered the issues of a foreign language for specific purposes and norms of professional speech.	4										+	+	+	+		
D6	New routes in synthesis and technology of producing composite materials	The purpose of teaching the discipline is to study the manufacturing processes of composite materials to give multifunctionality and new properties, to reduce the material consumption of production. The discipline studies the development prospects in the field of production and	4	+		+			+		+							+

		processing of polymers, plastics and composite materials; organization and ways of improving technological processes for obtaining composite materials.																	
D7	Innovative technologies of oil refining and petrochemistry	The purpose of the discipline is to master the principles of constructing technological schemes for the processing of oil and gas raw materials, which are optimal in terms of organization and selection of process equipment. The discipline considers the physical and chemical laws of the processing of petroleum raw materials; principles of resource saving of petrochemical processes; the latest achievements of science in the field of preparation and processing of hydrocarbon raw materials.	4		+	+			+		+	+						+
D8	Modern problems of chemistry and technology of special purpose polymers	The purpose of the discipline is to acquire knowledge on the creation, modification and structural organization of polymers, the prospects for the use of materials based on polymers. The discipline studies the foundations, achievements, trends in the development of modern chemistry of special-purpose polymers and their areas of application; new approaches to the synthesis of promising polyfunctional polymers.	5	+	+				+		+						+	+
D9	Research practice	The purpose of the research practice is to acquire skills and professional competencies in the field of chemical engineering training, mastering the practical skills of research work. When conducting research practice, the undergraduate is recommended to collect the necessary theoretical and practical materials, experimental data to complete the master's thesis.	14	+	+	+	+		+		+						+	+
D10	Research work of a master student, in-cluding internship and master thesis	The purpose of the research work of undergraduates is to study, systematize the most important theoretical, methodological, technological achievements of domestic and foreign science, the application of modern methods of scientific research in the dissertation research. Preparation and implementation of a master's thesis, revealing the knowledge and skills of the graduate, analytical, creative abilities developed during the development of the dissertation.	24	+	+	+	+		+		+						+	+
Cycle of basic disciplines Elective Component																			
D11	Professional foreign terminology in chemistry and chemical engineering	The purpose of the discipline is to achieve a practical level of proficiency in modern communication technologies for academic and professional interaction in a foreign language. The discipline studies the features of an academic and professional business foreign language (lexical, grammatical aspects).	5					+					+	+	+	+		

	Academic and professional communication in chemistry in a foreign language	The purpose of the course is to update knowledge and improve competencies in the field of written and oral scientific speech in chemistry and chemical technology, which are necessary for effective communication in the academic environment. The discipline studies modern communication technologies in a foreign language for academic and professional interaction.						+					+	+	+	+		
D12	Commercialization of the results of scientific and technical activities	It is studied in order to form skills to use the results of scientific and scientific and technical activities, including the results of intellectual activity in order to withdraw new or improved goods aimed at extracting income to the market.	5	+			+				+					+		+
	Organization and planning of scientific research in the field of chemical sciences	It is studied in order to form the stages of research work, the foundations of scientific knowledge, the accumulation and processing of scientific and technical information, the organization of work in scientific libraries and libraries of research institutes, the processing of the data obtained using modern research methods. The design of the results of scientific work, the writing of a scientific article or a brief information message is considered		+	+	+					+		+			+	+	
D13	Innovation in chemistry and chemical engineering	The purpose of the discipline is to study the basics of designing technological processes of high technology production. The discipline considers modern and promising computer and information technologies used in high technology industries; purpose and capabilities of modern automated control systems for technological processes of science-intensive production.	5	+					+		+	+					+	+
	Resource-saving technologies	The purpose of the discipline is to develop students' skills in organizing resource-saving processes and introducing low-waste technologies at chemical industry enterprises. The discipline examines the importance of low-waste and resource-saving technologies, non-traditional renewable energy sources, the state of the problem of energy conservation, energy saving through the use of modern technologies.		+	+	+	+		+		+						+	+
D14	Concept of engineering education for chemical technology (in English)	The discipline purpose is mastering of modern educational technologies. The discipline forms skills of applying new methods of teaching chemistry & technology, forms knowledge on educational process organization in engineering education and ability to find creative solutions to professional problems.	4				+	+		+			+					
	Methodology of teaching chemical engineering disciplines in higher education	The discipline familiarizes master students with fundamental issues of general and private methods of teaching chemical engineering disciplines, focusing on achievements of modern pedagogical science. The discipline is aimed at forming master students'					+	+		+			+					

		ideas about innovative teaching technologies in universities.																	
D15	Fundamentals of nanomaterials technology	The purpose of the discipline is to study the properties of materials in a nanostructured state, methods for their production and research, the formation of ideas about modern achievements in the field of nanotechnology. The discipline considers the scientific and theoretical foundations of nanochemistry, nanotechnology; nanomaterials, criteria for their determination; application of nanotechnologies in industry; features of the physicochemical properties of nanopolymers.	4		+	+			+		+								+
	Nanostructured polymer materials	The purpose of the discipline is to study the structural features and properties of nanostructured polymers, technological methods for controlling the structure of polymeric nanomaterials. The course studies information about nanocomposites, the principles of creating nanostructured polymeric materials. The main technological methods for obtaining nanocomposite materials and methods for forming products based on them are considered.			+	+			+		+								+
D16	Molecular spectroscopy	The educational goal is to master the basics of light absorption by molecules of various structures and in various states of aggregation. The course studies such methods as microwave, UV, IR, Raman spectroscopy, NMR, EPR, mass spectrometry, determination of dipole moments, gas electron diffraction, Mössbauer spectroscopy.	4			+	+					+				+			
	Methods of statistical thermodynamics	The educational goal is to study the fundamental laws of thermodynamics, modern theoretical methods of physical chemistry. The discipline studies the scientific foundations of the quantum theory of chemical processes, methods for calculating energy levels, electronic-vibrational-rotational states of diatomic molecules, practical application of computational technologies in the field of quantum theory of chemical processes.				+	+					+				+			
D17	Contemporary problems of organic chemistry (in English)	Discipline studies theoretical questions about complex reactions mechanisms using modern research methods and equipment, problems of synthesizing new materials used in electronics, liquid crystal systems, in medicine - supramolecular systems, various bio-, electrochemical sensors, biological active materials and bio additives.	5	+		+	+				+	+				+	+		
	Supramolecular chemistry	The subject deals with the current state and development trends in the chemistry of supramolecular compounds. Basic concepts and terms of supramolecular compounds. Concepts: "host-guest", "receptor-substrate", "chelate and macrocyclic effects", "preorganization and complementarity". Main types			+	+	+				+	+				+	+		

		of non-covalent interactions: ion-ion interactions, ion-dipole interactions, hydrogen bonding, cation-π-interactions, π-π-stacking interactions, van der Waals interactions, dense packing in the solid state, hydrophobic interactions Main classes of organic supramolecular structures, etc..																	
D18	Chemistry of functional materials	It is studied in order to form knowledge about functional materials for organic electronics, general information about semiconductors; classification of semiconductors, intrinsic conductivity of semiconductors; impurity conductivity of semiconductors. Organic functional materials are considered: characteristics of individual groups of organic semiconductors; electrical conductivity of organic semiconductors; electrical conductivity of low molecular weight organic semiconductors; the mechanism of electrical conductivity	4	+		+					+	+				+	+		
	Semiconductor materials chemistry	It is studied in order to form knowledge about semiconductor materials, general information about semiconductors; classification of semiconductors; intrinsic conductivity of semiconductors; impurity conductivity of semiconductors. The practical application of organic semiconductors, polymers with conjugated bonds, OLED and OPV technologies, technology for producing OLED displays and organic solar cells, etc. is considered.displays and organic solar cells, etc.			+	+					+	+				+	+		
D19	Modern spectroscopic methods in organic chemistry	The purpose of the discipline is the formation of skills to establish the structure of organic compounds. The discipline studies the fundamentals of the theory and practice of using physical research methods such as UV, IR, 1H NMR, 13C NMR, 2D NMR spectroscopy and mass spectrometry to solve chemical problems.	5	+		+					+	+				+	+		
	Modern methods of organic synthesis	The purpose of the discipline is the formation of fundamental knowledge and skills in the field of modern organic synthesis. The course studies chemoselective, stereoselective, stereospecific, enantioselective methods of organic synthesis, retrosynthetic analysis and the use of functional group protection.		+	+	+	+				+	+				+	+		

Alignment of planned learning outcomes with the teaching and assessment methods of the module

Learning out-come code	Planned module learning outcomes	Teaching methods	Assessment methods
LO1	Systematizes the basic laws of development of science and technology in the field of chemistry and chemical engineering, analyzes approaches to the study of development of the fields of chemical engineering.	binary lecture	testing
LO2	Classifies and systematically combines knowledge of scientific problems of chemistry and chemical engineering, methods of scientific research in engineering systems and uses them in specific situations.	presentation	portfolio
LO3	Uses methods of setting up the experiment to solve complex problems of chemistry and chemical engineering, plans and conducts chemical and technological experiments.	BarCamp or anti-conference	presentation
LO4	Demonstrates the skills of logical and analytical thinking in solving tasks and properly documenting them.	case study	critical analysis of the situation
LO5	Possesses high motivation to perform professional activities; possesses technologies of independent learning and self-education, ability to improve and develop his intellectual, general cultural and professional level.	project training	project preparation
LO6	Organizes and operates technological lines, takes part in the development and modernization of technological schemes for the production of petroleum products, polymers, industrial and domestic products.	basket method	critical appraisal of the literature studied
LO7	Applies innovative methods in conducting various types of classes in technological disciplines in teaching activities.	conversation technique	Self-assessment and self-assessment-students
LO8	Is able to analyze alternative options for solving research and practical tasks and assess the potential opportunities for implementing these options, while solving research and practical tasks, generate new ideas that can be operationalized based on available resources and limitations.	problematic lecture	preparing a manual on the use of the equipment for a specific audience
LO9	Uses modern information and communication technologies in research, development and production of organic substances and products for technical and domestic purposes.	round table	presentation preparation
LO10	Skills in public speaking, argumentation, discussion and polemics; practical analysis of logic of different kinds of reasoning..	interactive lecture	colloquium
LO11	Speaks a foreign language to the extent necessary to obtain professional content information from foreign sources.	discussion	comments on an article, book, monograph
LO12	Classifies and systematically combines knowledge of scientific problems of chemistry and chemical engineering, methods of scientific research in engineering systems and uses them in specific situations.	training	keeping a reflective diary
LO13	Has the skills of analyzing scientific texts, various methods, technologies and types of communications in carrying out professional activities in his native and foreign languages.	business game	perfomance
LO14	Develops and performs works in the field of scientific and technical activity in design, information service, organization of production, labor and management, metrological support, technical control.	Flipped Class	essay writing
LO15	Conducts technical and economic analysis, comprehensively justifies the decisions taken and implemented, seeks opportunities to reduce the cycle of work, assists in the preparation of the process, provides the necessary technical data, materials and equipment.	tour	Article creation

Criteria for assessing the achievability of learning outcomes

Codes of LO	Criteria
LO1	**Knows:** the main directions of development of science and technology in the field of chemistry and chemical technology
	Able to: work with domestic and foreign scientific and technical literature and analyze the main perspectives in the field of chemistry and chemical engineering
	Master: a systematic approach to the analysis of problems and prospects of modern science and technology
LO2	**Knows:** basic methods, principles, tools for organizing and carrying out scientific research
	Able to: analyze, classify, systematize and combine knowledge about modern scientific achievements in the field of chemistry and chemical technology and use them to solve problems in the field of professional activity
	Master: engineering thinking skills
LO3	**Knows:** fundamental concepts of mathematical model and mathematical modeling
	Able to: justify the choice of a method for solving professional problems
	Master: conceptual formulation of the modeling problem
LO4	**Knows:** ways to train logical and analytical thinking
	Able to: solve professional problems, demonstrating analytical thinking skills
	Master: tools for activating analytical thinking, skills for modeling situations and developing an action strategy
LO5	**Knows:** methods, forms and tools for self-study, development and improvement of professional knowledge, skills and abilities
	Able to: work with tools for self-education and self-learning
	Master: skills and technologies of self-learning, development and improvement of professional knowledge, skills and abilities
LO6	**Knows:** production line technology
	Able to: to introduce modern achievements in the field of chemical technology into the operation of modern technological lines
	Master: skills in organizing and modernizing modern production lines
LO7	**Knows:** fundamentals and norms of digital representation of information
	Able to: effectively present information in the digital space in compliance with norms and ethics
	Master: digital ethics and legal regulation of the digital environment
LO8	**Knows:** methods for critical analysis and evaluation of modern scientific achievements, as well as methods for generating new ideas in solving research and practical problems, including in interdisciplinary areas
	Able to: analyze alternative options for solving research and practical problems and evaluate the potential advantages and disadvantages of implementing these options
	Master: skills in analyzing methodological problems that arise when solving research and practical problems, including those in interdisciplinary areas
LO9	**Knows:** main software products and applications for the development and research of organic and polymeric substances and materials
	Able to: effectively use computer programs and applications in professional activities
	Master: programming skills and user skills to solve complex production problems
LO10	**Knows:** basics of public speech, tools for effective communication
	Able to: use tools for preparing reports, presentations, for high-quality speeches in classes and scientific conferences
	Master: orientation skills in the communicative space, the ability to effectively interact with the target audience
LO11	**Knows:** basic norms of oral and written speech, grammatical constructions

	Able to: analyze educational and scientific literature in a foreign language
	Master: oral and written communication skills in a foreign language
LO12	**Knows:** theoretical foundations of physicochemical methods for the analysis of organic substances and polymeric materials
	Able to: carry out experiments using instrumental methods of analysis in the field of chemistry and chemical technology
	Master: theoretical and experimental apparatus of physical and chemical research methods
LO13	**Knows:** foundations of mathematical logic and theory of algorithms
	Able to: select, analyze and organize information, think logically and plan actions, knows how to organize work on a scientific basis
	Master: theory and regularities of algorithms, various models of representation
LO14	**Knows:** basics of management activity
	Able to: set and propose ways to solve production problems
	Master: tools for setting and solving complex production problems, as well as effective management skills
LO15	**Knows:** fundamentals of experimental and computational-theoretical research methods
	Able to: apply experimental and computational-theoretical research methods to solve problems in the field of professional activity and competently evaluate and interpret the results obtained
	Master: skills of interpreting the results of calculations and experiments

17. Model graduate of an educational program

Graduate Attributes

Qualified, comprehensively developed and able to demonstrate an advanced level of knowledge in the field of chemistry and chemical technology, creative, inquisitive, they have a broad outlook;

Ready to adapt easily to a rapidly changing world and willing to work for the good of the country;

Sincere, fair, honest, tolerant, they value ethical norms and principles.

Types of competencies	Description of competencies
1. Behavioral skills and personality trails (Soft skills)	Ability to critically analyze and evaluate modern scientific achievements, generate new ideas in solving research and practical problems of chemistry and chemical technology, including in interdisciplinary fields; readiness for communication in oral and written form in the state, Russian and foreign languages to solve the problems of professional activity; ability to design and carry out comprehensive research, in particular including interdisciplinary, based on a holistic systematic scientific worldview using knowledge in the field of chemistry and chemical engineering; willingness to participate in the work of Kazakhstani and international research teams to solve scientific and educational tasks in the field of chemistry and chemical engineering technology.
2. Digital competences (Digital skills):	The ability to confidently, effectively and safely choose and apply infocommunication technologies in various fields of professorial activity, based on the continuous mastery of knowledge, skills, motivation, responsibility (search for information, use of digital devices, use of social network functionality, critical perception of information, production of multimedia content).
3. Professional competences (Hard skills)	Evaluates various methods and approaches to solving technological problems and selects the optimal method, develops innovative and alternative technological schemes of real chemical production, applies methods for solving problems in unfamiliar situations; carries out scientific, innovative activities to obtain new knowledge in chemistry and chemical technology, creates new applied knowledge in the field of chemistry and chemical engineering; is able to transfer the results conducted research in the form of specific recommendations in terms of chemistry and chemical engineering; has the skills to work on modern educational and scientific equipment when conducting chemical experiments, has experience working on serial equipment used in analytical and physico-chemical research, has the methods of recording and processing the results of chemical and chemical-technological experiments; summarizes and critically evaluates the results of research on topical problems of chemistry and technology obtained by domestic and foreign researchers, substantiates the relevance, theoretical and practical significance of the chosen topic of scientific research, presents the results of the research in the form of a scientific report, article or bulletin board.

Developers: Candidate of Chemical Sciences, Associate Professor Ye.V. Minaeva

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
«7M07102-Chemistry and Chemical Engineering»

The purpose of the Plan is to contribute to improving the quality of the conditions for the implementation of the educational program, taking into account the current requirements of the labor market and the achievements of modern science.

Target indicators

№	Indicators	Units	2024-2025 (plan)	2025-2026 (plan)
1	**Human resources development**			
1.1	Increase in the number of teachers with academic degrees	Number of people.	1	1
1.2	Advanced training in the teaching profile	Number of people.	2	2
1.3	Involvement of practitioners in teaching	Number of people.	1	1
1.4	Other	Number of people.		
2	Promotion of the EP in the ratings			
2.1	IQAA	Position	2	2
2.2	IAAR	Position	2	2
2.3	Atameken	Position	2	2
3.	Development of educational and scientific-methodical literature, electronic resources for EP CCE			
3.1	Textbooks	Amount		
3.2	Training manuals	Amount	1	1
3.3	Methodological recommendations/instructions	Amount	1	1
3.4	Electronic textbook	Amount	1	1

3.5	Video/audio lectures	Amount	1	1
4.	**Development of educational and laboratory facilities**			
4.1	Purchase of software products	Amount	-	-
4.2	Purchase of equipment	Amount	1	1
4.3	Dishes and reagents		+	+
5.	**Updating the content of the EP**			
5.1	Updating the results of training and the list of disciplines taking into account the requirements of the labor market, scientific achievements, professional standards	Year		+
5.2	Introduction to the EP of academic disciplines in foreign languages*	Year	+	+
5.3	Introduction of new teaching methods	Year	+	+
5.4	Opening of a joint/two-degree program on the basis of the EP	Year	-	-

Head of the Department of Organic Chemistry and Polymers Zhumagalieva T.S.

Notes,

The educational program was reviewed and recommended at the Faculty Council form 29.09.2024 Protocol No. 10

The educational program was considered at the meeting of the AC and recommended for approval by 29.04.2024 Protocol No. 5

The educational program was reviewed and approved at a meeting of the Academic Council from 24.05.2024 Protocol No. 8

Board Member,	M.M.Umurkulova
Vice-Rector for Academic Affairs	T.M. Khasenova
Director of the Department of Academic Affairs	M.K. Ibrayev
Dean of the Faculty of Chemistry	