

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН  
РГП на ПХВ «ЮЖНО-КАЗАХСТАНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ ИМ.М.АУЭЗОВА» МОН РК



## ОБРАЗОВАТЕЛЬНАЯ ПРОГРАММА

📍 160012, город Шымкент, проспект Тауке хана, 5  
☎ (8-725-2) 21-01-41, факс: (8-725-2) 21-01-41  
✉ canselyarya@mail.ru, info@ukgu.kz  
📱 @official.ukgu.kz  
🌐 @auezov\_university

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC  
OF KAZAKHSTAN  
M.Auezov SOUTH KAZAKHSTAN UNIVERSITY

« APPROVED BY »  
The Rector  
d.h.s., academician Kozhamzharova D.P.  
« 25 » 03 2021



**EDUCATION PROGRAMME**

**7M07170 – «Chemical technology of organic substances»**

Registration number	7M07100004
Code and classification of the field of education	7M07- Engineering, manufacturing and construction industries
Code and classification of training areas	7M071- Engineering and engineering practice
Group of educational programs	M097 Chemical Engineering and processes
Type of EP	Acting
ISCE level	7
NQF level	7
SQF of education level	7
Language of learning	Russian
Typical duration of study	2 years
Form of study	Scientific-pedagogical
The complexity of the EP,	120 credits
Distinctive features of EP	Joint educational program
University Partner ( JEP )	Gubkin Russian State University of Petroleum and Gas Kuban State Technological University
University Partner ( TDEP )	-
Social Partner ( DE )	-

Shymkent , 2021

Developers:

Name	Position	Sign
Daurenbek N.M.	K.ch.s., Head of the PPaPCH Department	
Mamytova G.Zh.	Senior lecturer, OP&PCh Department	
Artykova Zh.K.	Senior lecturer, master OP&PCh Department	
Sarsenbayeva A.U.	Senior lecturer, master OP&PCh Department	
Kydyrali S.B.	Master student gr. MHT-19-7sr	
Eregenov B.T.	Production Director of "PetroKazakhstanOil Products" LLP	
Ospanov I.N.	Deputy director LLP "Neftehimstroi-Yug"	
Kubelekova U.D.	Director of quality LLP "Hill Corporation"	
Massalova V.P.	Deputy director LLP "Eco -Shina"	
Mamutbekov M.S.	Director LLP "Triuymf M.M.S."	

EP was considered by the Committee on Innovative Learning Technologies and Methodological Support of the Higher school of ChEaBT, protocol № 7 dated 22 02 2021.

Chairman of MC (Committee) \_\_\_\_\_

sign

Considered and recommended for approval at the meeting of Educational and Methodical Council of M. Auezov SKU, protocol № 5 dated 23 02 2021.

Approved by the decision of the Academic Council of the University protocol № 12 dated 25 02 2021.

## CONTENT

Introduction	5
1. Passport of the educational program	7
2. Learning outcomes for EP	8
3. Competences of the graduate of EP	8
4. Summary table showing the amount of credits mastered by the modules of the educational program	10
5. Information about the disciplines	11
Approval sheet	15
Appendix 1. Review from the employer	
Appendix 2. Expert opinion	

## Introduction

### 1. Scope

Designed for the implementation of magisters training by educational program (here in after - EP) 7M07170- "Chemical technology of organic substances" in Non-profit Limited Company "M.Auezov South Kazakhstan University" of RK MES.

### 2. Regulatory documents

Education Act of the Republic of Kazakhstan (as amended and supplemented on 04/07/2018);

Standard rules for the operation of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan from October 30, 2018 No. 595 (registered with the Ministry of Justice of the Republic of Kazakhstan on October 31, 2018 No. 17657);

State obligatory standards of higher and postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan, October 31, 2018 No. 604;

The rules for the organization of educational process on credit technology education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan on April 20, 2011 No. 152 as amended and supplemented of October 12, 2018 No. 563

The sectoral qualifications framework "Petroleum and gas, petroleum processing and petrochemical industries" was approved by the protocol of the Sectoral commission on social partnership and regulation of social and labor relations of the petroleum and gas industry dated March 30, 2017 No. 1-2017

The sectoral qualifications framework "Chemical Production" was approved by the protocol of the session of the sectoral commissions on social partnership and regulation of social and labor relations for mining and smelting, chemical, construction industry and woodworking, light industry and mechanical engineering of August 16, 2016 No. 1.

Professional standard "Pedagogue" (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of Kazakhstan "Atameken" No. 133 of June 8, 2017).

### 3. Educational programs concept

The goal of the educational program is coordinated with the mission of university and is aimed at preparing the intellectual elite of the country with possessing advanced knowledge, entrepreneurial skills, fluent in three languages, demonstrating conceptual, analytical and logical thinking skills, creative approach in professional activities, being able to work in national and international teams obtaining the lifelong learning strategy.

The educational program is harmonized with the 7th level of the National Qualifications Framework of the Republic of Kazakhstan, with Dublin descriptors, the 2nd cycle of the Qualification Framework of the European Higher Education Area, also with the 7th level of the European Qualification Framework for Lifelong Education.

The educational program is focused on professional and social order through the formation of professional competencies associated with the necessary types of research, practical and business activities, adjusted to meet the requirements of stakeholders.

#### **The uniqueness of EP 7M07170- "Chemical technology of organic substances":**

EP is focused on the integration of the educational process, scientific-research and innovation activities, which contributes to the high competitiveness of graduates in the labor market.

The study program focuses on the implementation of a master's dissertation commissioned by enterprises using material and intellectual resources, training from leading domestic and foreign specialists, production workers, the opportunity to work in research laboratories of relevant enterprises with unique equipment, participation in international

scientific and educational projects, internships in leading Russian and foreign companies and universities

Education at the I.M. Gubkin Russian State University of Petroleum and Gas, Kuban State Technological University in the framework of SOP with obtaining a state diploma of each of the partner universities.

EP of a scientific and pedagogical magistracy 7M07170- "Chemical technology of organic substances" is accredited by the Independent International Agency ASIIN (Germany) in 2014.

Program learning outcomes are achieved through the following training events:

- classroom lessons: lectures, seminars, practical and laboratory works are conducted using innovative learning technologies, the latest achievements of science, technology and information systems. Laboratory classes are held in the accredited laboratories of the university: Testing regional laboratory of engineering profile "Constructional and biochemical materials" and Laboratory of physical and chemical methods of analysis "SAPA", on the basis of educational and scientific-industrial complexes of LLP "Ecoshina", LLP "Hillcorporation" et al.;

- extracurricular activities: independent work of the student, including under the guidance of a teacher, individual consultations;

- carrying out pedagogical and research practices, the implementation of master's dissertation based on relevant enterprises;

- scientific- research work of a master student (SRWMS): the student's independent scientific work, including the implementation of a master's dissertation and research internship at leading Russian and foreign companies and universities.

The university has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination against students.

The quality of the EP is ensured by the involvement of stakeholders in its development and evaluation, systematic monitoring and review of its content.

#### **4. Entry Requirements**

Established according to the Model Rules for admission to studies in educational organizations that implement educational programs of higher and postgraduate education by order MES RK №600 on 31.10.2018

## **1. EDUCATION PROGRAMME PASSPORT**

### **1.1 The purpose and objectives of education program by specialty**

EP purpose: Preparation of highly qualified personnel, owning modern approaches to the organization of production and enterprise management, technological design, capable of carrying out scientific and educational activities.

EP objectives:

-providing conditions for acquiring a high intellectual level development, mastery of logical and critical thinking and scientific skills labor organization in scientific and educational activities;

-the formation of the competitiveness of graduates in the field of chemical technology of organic substances to ensure the possibility of their quickest employment in the specialty or continuing education in doctoral studies.

### **1.2 List of qualifications and positions**

The graduate of the educational program 7M07170 - "Chemical Technology of Organic Substances" is awarded the degree of "Master of Technical Sciences."

Masters in the educational program can continue their education in doctoral studies, occupy the positions of managing director, development director, department director, deputy department director, chief engineer, chief technologist, chief mechanic, general manager, research worker, teacher without making any requirements for with the qualification requirements of the "Qualification directory of positions of managers, specialists and other employees", approved by order the Minister of Labor and Social Protection of the Republic of Kazakhstan dated May 21, 2012 № 201-ө-м.

### **1.3 Qualification characteristics of the educational program graduate**

#### **1.3.1 Scope of professional activity**

The sphere of professional activity are enterprises for the production of organic substances, for the processing of petroleum, gas, coal and polymers, elastomers, paints and varnishes, research and project branch institutes, institutions, etc.

#### **1.3.2 Objects of professional activity**

The objects of professional activity are equipment, technological processes and industrial systems for the production of substances, materials, products, as well as their management and regulation systems; chemicals and materials; methods and devices for determining the composition and properties of substances and materials, methods and tools for assessing the state of the environment.

#### **1.3.3 Subjects of professional activity**

The subjects of professional activity are products of basic and fine organic synthesis, devices and equipment for the chemical technology of production and processing of organic substances and materials, various types of raw materials and auxiliary materials, petroleum, gas, coal, polymers, monomers, elastomers, chemical reagents and reagents, research instruments and equipment, educational and methodical documentation, technical means of training.

#### **1.3.4 Types of professional activity**

- scientific and research;
- production and technology;
- organizational and managerial;
- project;

-educational, pedagogical.

## 2. EP LEARNING OUTCOMES

**LO1** Analyze and summarize scientific and technical information using information resources, applying knowledge of a foreign language; summarize the results of research work in the form of a dissertation, research article, report.

**LO2** Design and implement integrated and interdisciplinary research based on a holistic, systematic scientific world view using knowledge in the field of history and philosophy of science.

**LO3** Apply knowledge of university psychology and pedagogy in practical activities, plan and carry out scientific and pedagogical work using new information and educational technologies.

**LO4** Lead a team of specialists, using the knowledge of university psychology with the use of entrepreneurial skills, making management decisions, showing creativity and logical thinking in non-standard production situations.

**LO5** Manage technological processes for the processing of hydrocarbon raw materials, the production of organic substances in compliance with life safety and environmental cleanliness, justify the optimal technological mode of production.

**LO6** Develop alternative options for upgrading and reconstructing existing plants that provide products that meet ecological quality standards.

**LO7** Independently carry out experimental studies, argue the data obtained, present their developments to a wide audience; commercialize research results.

**LO8** Perform technological calculations, develop technological schemes for deep processing of hydrocarbon raw materials, synthetic fibers, production of sulfur from natural gas; control the quality of raw materials and finished products

**LO9** Own the principles of selecting catalysts for the processes of deep processing of petroleum feedstock, additives, technical liquids, and developing formulations of polymer compositions.

**LO10** Apply knowledge and skills to analyze problems in interdisciplinary related fields of knowledge; to develop acquired knowledge and skills to a level that allows to study in a doctoral program, to improve their qualifications throughout their lives.

## 3. COMPETENCES OF EP GRADUATE

**3.1** Successful completion of training in EP " Chemical technology of organic substances " contributes to the formation of the following competencies of a graduate:

- core competencies (CC)
- professional competencies (PC).

### ***Core competencies:***

*(KK1) language and computer*

- the ability to apply basic communication skills in a foreign language in oral and written forms; the ability to use modern information and digital technologies for analyzing, evaluating and synthesizing new complex ideas necessary for professional activities;

*(KK2) fundamental mathematical, natural science and technical training*

-the ability and readiness to apply expand and rethink the educational potential acquired during the study of technical disciplines in the professional activity and continuing education in doctoral studies;

*(KK3) managerial, economic and entrepreneurial*



-the ability for management and entrepreneurial activities, to be responsible for planning, developing and the results of activity processes that can lead to significant changes or development of an enterprise, to manage personnel, to demonstrate entrepreneurial skills;

*(KK4) research*

- the ability to analyze scientific and technical information in the field of chemical technology of organic substances for the purpose of scientific, patent and marketing support of research; the ability to summarize the results of research work in the form of scientific publications, to defend their position during the discussion and make professional decisions under conditions of uncertainty and risk;

*(KK5) methodological*

- the ability to analyze and interpret the realities of modern theory and practice based on the methodology of natural science knowledge, to apply new methods of teaching specialized disciplines in teaching activities; develop new laboratory facilities for workshops, update and deepen the knowledge necessary for scientific and educational activities;

**Professional competencies:**

(PC1) the ability to improve chemical-technological processes, introduce new advanced technologies in production, develop measures for the integrated use of raw materials, replace scarce materials and find ways to recycle production waste, evaluate their economic efficiency and innovative-technological risks;

(PC2) the ability to expertly study the properties and real structure of materials of chemical technology, including the independent highly skilled operation of modern equipment and devices in the direction of research;

(PC3) the ability to develop and manage the implementation of research and technical projects, new energy- and resource-saving ecologically safe technologies with the achievement of maximum production efficiency.

(PC4) the ability to quickly and efficiently develop business plans and conduct preliminary marketing research to commercialize the products of activities in the field of chemical technology of organic substances.

### 3.2 Matrix of correlation of EP learning outcomes in general with modules formed by competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
CC1	+		+				+			
CC2			+			+	+			+
CC 3				+	+	+				+
CC 4	+	+	+			+	+			+
CC 5	+	+	+							+
PC1				+	+	+	+			
PC2		+				+	+	+		
PC3				+	+	+	+		+	
PC4				+		+	+			+

**4. SUMMARY TABLE REFLECTING THE VOLUME ASSIMILATED CREDITS OF EDUCATION PROGRAM MODULES**

Course of Study	Semester	The number of mastered modules	The number of studied disciplines		Number of KZ credits					Total hours	Total credits KZ	The number of	
			HSC	EC	Theoretical training	Teaching practice	Research practice	SRWMS	final examination			exam	dif. offset
1	1	5	5	2	29			1		900	30	6	2
	2	5	1	4	23	4		3		900	30	4	2
2	3	4	-	4	21		7	2		900	30	4	2
	4	1	-	-	-			18	12	900	30	-	1
Total		7	6	10	73	4	7	24	12	3600	120	14	7

## 5. INFORMATION ABOUT THE DISCIPLINES

Name of module	CYCLE	HSC/EC	Component name	Short description of discipline	Credits quantity	FormedLO(codes)
Module of scientific - pedagogical training	BD	HSC	History and philosophy of science	Considers the history and philosophy of the natural and technical sciences, modern European science in culture and civilization, the structure of scientific knowledge, philosophical problems of specific sciences. Determines the ways to solve modern actual methodological and philosophical problems of natural and technical sciences, develops critical thinking and logic.	4	LO2
	BD	HSC	Foreign language (professional)	Allows to develop oral communication skills in a foreign language, intercultural competence, business correspondence exchange skills, master the main types of reading foreign-language original sources, prepare written reports on scientific topics in the specialty: scientific report, presentation, discussions, abstracts and articles on scientific research on foreign language.	4	LO1
	BD	HSC	Psychology of management	Considers the basic principles of modern psychological science, necessary in the professional work of highly qualified specialists. Forms a scientific and theoretical worldview on fundamental psychological concepts, skills and abilities of psychological researches of a personality, introduces the main methods of experimental - psychological research and areas of psychocorrectional work.	4	LO3, LO4
Methodical bases of teaching	BD	HSC	Higher Education Pedagogy	Represents modern paradigms of higher education, the system of higher professional education in Kazakhstan. Considers the methodology of pedagogical science, professional competence of a higher school teacher. Allows seizing the credit system of training, new methods and forms of training in the preparation of future specialists.	4	LO3
	Ch.D	HSC	Methodology of Specialty Discipline Teaching	Considers the use of competence-based approach in education, technologies of individual, integrated and multimedia learning. Teaches teaching specialized disciplines by analyzing and solving problem situations, drawing up a group project, conducting a role-playing game; provides skills in organizing the educational process. Allows seizing the methodological features specialized disciplines study.	5	LO1, LO2, LO3
	PD	HSC	Pedagogical practice	Develops professional research culture in the field of chemical engineering, as a condition of pedagogical skills and pedagogical creativity, professional pedagogical skills, culture of scientific and pedagogical thinking. Develops skills in developing educational and methodical documentation on major disciplines, preparing and conducting practical and laboratory works in special disciplines.	4	LO1, LO2, LO3
Prospects of development of oil refining processes	BD	EC	Innovative Technologies of Oil Refining and Petrochemistry	Considers the development trends of the world and Kazakhstan petroleum processing and petrochemistry. Generates knowledge on new technologies that underlie the production of products that meet international standards. Allows acquiring the skills to develop alternative options for the modernization and	4	LO1, LO5, LO6, LO8

				reconstruction of existing plants.		
			Petrochemical synthesis technology	Considers new ways of obtaining organic products from petrochemical raw materials. Deepening knowledge of the chemistry and technology of producing initial hydrocarbons for petrochemical syntheses and the most important monomers for synthetic materials. Allows owning the production technology of oxygen-containing compounds, halogen- and nitro-derivatives, synthetic detergents, rubbers, plastics and fibers.		LO1, LO5 LO6, LO8
	Ch.D	EC	Chemistry and Technology of Additives to Petroleum Products	Considers the directions of synthesis and technology development of additives to oils and fuels. Generates knowledge about the mechanism of action of additives, research directions in the field of creation of additive compositions. Acquire research skills in finding ways to improve the performance properties of fuels and oils.	5	LO1 LO7 LO9
			Production of Sulfur from Natural Gas and Products based on it	Considers the current level of processes development for the processing of sulfur-containing hydrocarbon gases in world practice and Kazakhstan, especially the raw material base, the mechanisms for the conversion of hydrogen sulfide and other organic sulfur compounds into elemental sulfur. Allows acquiring skills in method selection and sulfuring analysis.		LO7 LO8
	Ch.D	EC	Industrial petrochemical processes	Considers the technological design of industrial petrochemical processes; structure of production and industry, mode of operation of technological objects, general principles of creation of technological processes, systemic laws of petrochemical processes. Instills the skills of creating models of technological installations and industrial production complexes.	6	LO1 LO2 LO7
			Chemical reactors	Considers modern chemical processes, basic models of chemical reactors, principles of their work; types of balanced, kinetic and auxiliary equations used to describe the operation of chemical reactors; Allows acquiring the skills of calculating the technological parameters for a given process; determine the optimal process parameters in a chemical reactor.		LO2 LO6 LO8
	Ch.D		Research practice	Instills skills of designing and implementing integrated and interdisciplinary research, analysis and synthesis of scientific and technical information with the involvement of information resources, applying knowledge of a foreign language; performing experimental studies, summarizing the results of SRW in the form of a report, a scientific article.	7	LO1, LO7
Oil refining products	Ch.D	EC	Commodity Oil Products. Standartization and Certification	Considers the legal and regulatory framework for the standardization and certification of petroleum products, the nomenclature, properties of petroleum products, control methods and ways to improve the quality of petroleum products. Allows acquiring skills of conducting laboratory and analytical studies of petroleum products, working with regulatory documents.	6	LO1 LO7
			Technological Basis for the Production of Motor Fuels	Considers the basic principles of deepening oil refining and flowcharts of petroleum processing plant of a fuel profile; instrumentation of technological installations. Allows acquiring skills in the petroleum study and based on the		LO1 LO5 LO7

			from Hydrocarbons	results recommend a version of its processing development of schemes for deep processing of oil for fuel.		LO8
	Ch.D	EC	Scientific Basis of Elastomeric Compositions Compounding	Considers the scientific basis for the formulation of rubber compounds; research in the field of search for new ingredients of rubber compounds; innovative technologies for the production of reinforced elastomer composites. Allows acquiring skills of conducting theoretical and experimental research in the field of creating new elastomers with desired properties.	6	LO1 LO5 LO7 LO8 LO9 LO10
			Technology of Tire Production	Considers the current state and development trends of tire production; scientific theoretical and chemical technological bases for the manufacture of tires for various purposes. Allows acquiring skills in managing technological processes of tire production; carrying out researches in the field of creating elastomeric materials for the production of tires.		LO1 LO5 LO8
Deep processing of hydrocarbon raw materials	BD	EC	Production and use of Technical Liquids and Special Products	Considers the technical, economic and ecological problems of production and practical application of technical fluids and special products, their impact on reliability and efficiency in the operation of equipment. Allows acquiring skills of selecting promising varieties and types of fuel, lubricants and special liquids in the laboratory.	5	LO9, LO5
			Elastomer Technology	Considers ways to intensify the production and processing of elastomers; requirements for ingredients of rubber compounds. Deepen knowledge of the processes and equipment for the production and processing of elastomers. Allows acquiring skills in calculating and compiling rubber compounding recipes; experimental studies in the field of creating elastomeric materials.		LO5, LO7, LO8, LO9
	BD	EC	Rational Ways of Processing Heavy Oils and Oil Residues	Considers the problems without residual processing of petroleum raw materials. Allows acquiring skills in the study of the physicochemical properties of the products of processing heavy petroleum and petroleum residues, carrying out technological calculations based on knowledge of the kinetics, thermodynamics and mechanism of chemical reactions.	5	LO5, LO7, LO8
			General Chemical Technology of Synthetic Fibers	Considers <b>the features of synthetic fibers production, general principles and methods for producing chemical fibers of all kinds, the fundamentals of chemistry and the technology of producing artificial fibers, the physico-chemical bases for the modification of chemical fibers. Forms skills of synthesis and recognition of synthetic fibers in the laboratory.</b>		LO1, LO7, LO8, LO9
Catalytic processes of oil refining	Ch.D	EC	Industrial Catalysts and Catalysts in Oil and Gas Processing	Considers the theoretical and technological foundations, advanced achievements in the field of development and application of industrial catalysts for the deepening of petroleum processing to produce high-quality products. Instills skills of applying fundamental knowledge to analyze and organize the work of catalytic processes; development and use of catalysts.	6	LO1, LO7, LO9
			Technology of	Considers the fundamentals of chemical-technological processes for obtaining		LO5, LO7,

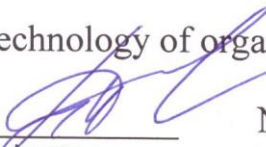
			Composite Polymeric Materials	polymer composite materials; physico-chemical properties of the main representatives of various classes of polymer composites, methods for their preparation and scope. Instills skills to develop recipes for polymer composites, to optimize prescription-technological modes for obtaining polymer composites.		LO8, LO9
	Ch.D	EC	Hydrocatalytic Refining Processes	Deepen knowledge of the theory and technologies of hydrocatalytic processes of petroleum processing; the laws of the transformations of hydrocarbons on various catalysts and the influence of process parameters; Instills skills of choosing a method for processing petroleum fractions of new place of birth.	5	LO5, LO6, LO7, LO8, LO9
			Industrial Ecology of Hydrocarbon Systems	Considers the environmental problems of processing hydrocarbon systems, environmental monitoring, production of hydrocarbon systems with improved ecological characteristics, environmental quality management. Instills skills of managing the technological processes of processing hydrocarbon raw materials, the production of organic substances in compliance with life safety and ecological cleanliness.		LO5, LO6, LO8
	BD	EC	Modeling of chemical and technological processes of oil refining in MatLab and ChemCad	Considers the environmental problems of processing hydrocarbon systems, environmental monitoring, production of hydrocarbon systems with improved ecological characteristics, environmental quality management. Instills skills of managing the technological processes of processing hydrocarbon raw materials, the production of organic substances in compliance with life safety and ecological cleanliness.	5	LO3, LO7, LO8, LO9, LO10
			Chemistry and Technology of biodispersions	Considers the environmental problems of processing hydrocarbon systems, environmental monitoring, production of hydrocarbon systems with improved ecological characteristics, environmental quality management. Instills skills of managing the technological processes of processing hydrocarbon raw materials, the production of organic substances in compliance with life safety and ecological cleanliness.		LO3, LO7, LO8, LO9, LO10
Module of Research Scientific Work and final certification			Master Research Scientific Work Including internship and master thesis (MRSW)	Forms the skills of analysis and synthesis of scientific and technical literature on materials of foreign and domestic publications with the involvement of information resources; generalization of research work results in the form of a report, dissertation sections, a scientific article. Allows acquiring skills of processing and interpreting the results.	24	LO1, LO7, LO8, LO10
			Registration and Defense of a master's thesis	Forms skills of generalization and systematization of research results in the form of a master's dissertation, presentation to a wide audience.	12	LO1, LO2, LO3, LO7, LO8, LO9, LO10
<b>Total educational program</b>					<b>120</b>	

## APPROVAL SHEET

### by educational program

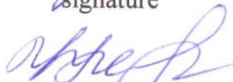
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Director of DAI

  
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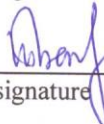
Naukenova A.S.

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Director of DE&K

  
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