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

« APPROVED BY»
Chairman of the Board-
Rector _____
academician Kozhamzharova D.P.
«25» 02 2021 y.

EDUCATION PROGRAMME

7M07190 - Chemical technology of infusible non-metallic and silicate materials

Registration number	7M07 1000 12
Code and classification of the field of education	7M07 Engineering, manufacturing and construction industries
Code and classification of training areas	7M071 Engineering and Engineering business
Group of educational programs	Chemical engineering and processes
Type of EP	*active*
ISCE level	7
NQF level	7
SQF of education level	7
Language of learning	English
Typical duration of study	2 years
Form of study	Scientific and pedagogical
The complexity of the EP, not less	120 credits

Shymkent, 2021

Drafters:

Name	Position	Sign
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Aidosov Sh.I	director of LLP " Sajramskij Kirpichnyj Zavod"	

EP was considered by the Committee on Innovational Technologies of Training and Methodological Support of Higher School «Chemical engineering and Biotechnology» _____, Protocol № 7 dated from _____ 02 _____ 20 21.

Chairman of the Committee _____ Aitkulova R.E.

EP considered and recommended for approval at the meeting of Educational and Methodical Council of the Non-profit Limited Company M. Auezov South Kazakhstan university

Protocol № 5 dated from 28.02.2021

Approved by the decision of the Academic Council of the University
protocol № 6 dated from 25. 02 20 21.

CONTENT

Introduction

1 Scope

Educational program (hereinafter - EP) «7M07190 - Chemical technology of infusible non-metallic and silicate materials» is intended for the preparation of masters of the scientific and pedagogical direction 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 07/04/2018);

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

Sectoral qualification frameworks of branch «Construction industry» has been approved by the protocol № 1 (dated from August 16, 2016) of the meeting of branch-wise commissions on social partnership and regulation of social and labor relations for the mining and metallurgical, chemical, construction industry and woodworking, light industry and mechanical engineering

Professional standard "Teacher" (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated 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 advanced 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 strategy.

The educational program is harmonized with the 6th level of the National Qualifications Framework of the Republic of Kazakhstan, with Dublin descriptors, 2 cycle of the Framework for Qualification of the European Higher Education Area, also with Level 7 of the European Qualification Framework for Lifelong Learning.

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

The uniqueness of the training of masters of technical sciences in EP 7M07190 - "Chemical technology of infusible non-metallic and silicate materials" is as follows:

- in the Republic of Kazakhstan, this master's degree program has been implemented only in M. Auezov SKU since 2015 on the basis of the state license of the Ministry of Education and Science of the Republic of Kazakhstan dated June 27, 2014, order No. 1065 i

– The EP passed specialized accreditation and was accredited by the Independent Kazakhstan Agency for Quality Assurance in Education in 2017.;

- The EP is focused on the training of professional specialists, managers, teachers in the direction of "Engineering and Engineering";

- the department has specialized laboratories equipped with modern equipment and instruments;

- productive creative relationships with industrial enterprises of the industry are maintained: «Shymkentcement» JSC, «Standardcement» LLP (Shymkent), «Sas-Tobe Technologies» LLP, «Semey Cement Plant» LLP, «Semipalatinsk Atsi Plant» LLP, «Almatinsky Ceramics Plant» PK LLP, «Zerde Keramika» LLP, «Brieks Line» LLP, «Rauan» LLP, «Euro Crystal» LLP (Shymkent), «SAF» «Glass Company»» OJSC (Taraz) and others.

- the scientific contacts of the department are wide: Bauhaus-Universität Weimar and Technische Universitat Munchen (Germany); D.I. Mendeleev Russian University of Chemical Technology (Moscow), National Research Tomsk Polytechnic University and V.G.Shukhova Belgorod State Technological University. (Russia); Tashkent Institute of Chemical Technology (Uzbekistan) and others.

- inviting foreign scientists and leading specialists from industry enterprises to give lectures and conduct scientific consultations is widely practiced;

The typical term of study in a master's program with a scientific and pedagogical direction of preparation is two years.

The educational program aims to achieve learning outcomes through the organization of educational process using the principles of Bologna process, student-centered learning, accessibility and inclusion.

Program learning outcomes are achieved through the following training events:

– classroom training: lectures, seminars, practical and laboratory classes - held in view of innovative teaching technologies, the use of the latest achievements of science, technology and information systems;

– extracurricular training: the independent work of the student, including under the guidance of a teacher, individual counseling;

– conducting professional practices, implementation of course and diploma works (projects).

– fulfillment of pedagogical and research practices, completion of master's theses

– research work of a master student (RWM): independent scientific work of a student, including the completion of a master's thesis and scientific internship, incl. and in foreign universities and scientific organizations

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 10.31.2018 (as amended on 08.06.2020 No. 237)

1. EDUCATION PROGRAMME PASSPORT

1.1 The purpose and objectives of education program by specialty

EP objectives: training of scientific and pedagogical personnel for the system of higher, postgraduate education and the scientific field in the field of technology of mineral binders, ceramics and glass

EP tasks:

- the formation of theoretical knowledge in the field of methodology of scientific knowledge, pedagogical science and activity; development of practical skills in teaching specialized disciplines using innovative educational technologies
- the formation of skills of planning, organization and management of educational, research, technological processes for professional activities in the field of chemical technology of infusible non-metallic and silicate materials in accordance with the list of qualifications and positions of a graduate of EP;
- the development of research thinking, the formation of research skills using modern methods of physico-chemical analysis, innovative technologies of silicate materials;
- the formation of theoretical knowledge and practical skills in the selection of raw materials, methods of production, regulation of the structure and properties of mineral binders, ceramics, glass, glass-ceramics, heat- and sound insulating materials; determination of physical and mechanical parameters of the finished product;
- preparation of competitive in the labor market masters of technical sciences who are able to think creatively, work effectively in the professional sphere individually and in the team, including in an international environment; successfully adapt to changing conditions, independently expand and deepen knowledge, continue education in doctoral studies;

1.2 List of qualifications and positions

A graduate of the educational program 7M07190 - Chemical technology of refractory non-metallic and silicate materials is awarded the degree "Master of Engineering"

In accordance with the "Qualification directory of positions of managers, specialists and other employees" (Order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ө-m, as amended on April 17, 2013, was approved and put into effect by the Order of the Committee technical regulation and metrology of the Ministry for Investments and Development of the Republic of Kazakhstan dated May 11, 2017 No. 130-od), a graduate of the EP can hold the following positions (without presenting requirements for work experience):

- specialist in organizations (in industrial enterprises of the industry): engineer, design engineer, laboratory engineer, quality engineer, engineer for scientific and technical information, engineer for the organization of production management, engineer for safety and labor protection, engineer for patent and inventive work , pre-production engineer, process engineer;
- leading, scientific and technical workers, common to research, design, technological, design and survey organizations: engineer; expert;

A graduate of the EP in accordance with «Branch-wise qualification frameworks» (has been approved by the protocol № 1 (dated from August 16, 2016) of the meeting of branch-wise commissions on social partnership and regulation of social and labor relations for the mining and metallurgical, chemical, construction industry and woodworking, light industry and mechanical engineering can hold the following positions of Branch «Construction industry»:

- head of production, lead designer, lead designer (related professions - artist, chemical engineer, environmental engineer, material science engineer);

- Technical Director; chief mechanical engineer; Director of Development
- enterprise President; General Manager;

A graduate of the EP in accordance with «Typical qualification characteristics of positions of pedagogical workers and persons equivalent to them " (№338 order of the Minister of Education and Science of the Republic of Kazakhstan from date 13.07.2009) can hold the following positions in organizations of higher and postgraduate education (system of technical and professional, post- secondary-level education), without making requirements for work experience: teacher of special disciplines; master of industrial training.

1.3 Qualification characteristics of the educational program graduate

1.3.1 Scope of professional activity

The scope of professional activity of graduate EP is:

- industrial enterprises of the industry;
- scientific centers, research and production associations, research, engineering, technological, design and prospecting organizations and other scientific organizations of the industry;
- expert analytical centers, accreditation body (examination) of industrial goods;
- organizations of higher and postgraduate education (system of technical and trade, post-secondary education); vocational educational institutions of the profile direction

1.3.2 Objects of professional activity

The objects of professional activity of graduates are:

- specialized databases, scientific and technical information in the professional sphere of activity;
- technical characteristics of silicate materials, the requirements of operating standards for them: cement, chrysotile asbestos cement, gypsum binders, lime binders, dry building mixtures; porcelain, electrotechnical porcelain, faience, refractories, acid-resistant materials, ceramic tiles, ceramic granite tiles, roof tiles, expanded clay, ceramic bricks and stones; container and sheet glass, crystal glass, liquid glass, fiberglass, foam glass, stone casting, sitalls; technical crystals, jewelry stones;
- raw material resources of silicate materials production (chemical and mineralogical composition, properties of mineral and technogenic raw materials)
- processes of chemical technology of infusible non-metallic and silicate materials;
- methods of designing of technological and production processes, management of resources and personnel in the production of silicate materials;
- management of the technological process organization of silicate materials production in industrial conditions;
- management of the organization of the educational and research process (research and pedagogical work.
- research activities in research institutes,
- learning process, students, innovative learning technologies in universities, educational organizations

1.3.3 Subjects of professional activity

Subjects of professional activity of the bachelor of EP are:

- study of the material composition and properties of mineral and technogenic raw materials in order to determine their suitability for the production (synthesis) of silicate materials;

– research on the selection of mass compositions (charge), optimization of technological processes for the production of silicate materials;

– determination of technical characteristics of silicate materials in accordance with the requirements of current standards;

– improvement of technological processes and equipment; modernization of existing industries in the industry;

– processing, generalization and analysis of the results of experimental studies;

– design and organization of the production process of silicate materials in industrial enterprises

– analysis and solution of problematic production situations;

– management and regulation of the production process;

– assessment of environmental safety of production of silicate materials;

– teaching of specialized disciplines

1.3.4 Types of professional activity

Master of Engineering Sciences EP "7M07190 - Chemical technology of infusible non-metallic and silicate materials " can do the following types of professional activity:

- organizational - managerial;
- production and technological;
- settlement and design;
- research;
- service and operational;
- pedagogical.

2. EP LEARNING OUTCOMES (LO)

LO 1 To apply the knowledge of the theoretical foundations of the methodology of scientific knowledge and pedagogical science in professional activities, including in English; organize and conduct training sessions using innovative and distance educational technologies.

LO2 To summarize the theoretical information about the mineral resources for the production of silicate materials, justify the choice of raw materials for specific types of production based on comprehensive studies of the chemical and mineralogical composition and properties of raw materials

LO3 To carry out patent research, reasonably choose and apply methods of physicochemical analysis and experimental studies of silicate materials

LO4 To apply innovative technologies, knowledge of the physical and chemical foundations of silicate materials technology in the professional field of activity

LO5 To manage manufacturing processes, adjust the structure for the purpose of synthesize mineral binders, ceramics, glass, glass, heat and sound insulation materials with predetermined properties

LO6 To justify the choice of direction of scientific research; to own skills in planning, organizing and performing research

LO7 Based on a critical analysis, to summarize the results of experimental research and analytical work in the form of a dissertation, article, report, expert opinion, publicly to defend the results of your own research.

LO8 To demonstrate creative thinking and creativity in solving new problems and situations, system-analytical thinking; work effectively in the professional sphere individually and in a team, incl. in an international environment; independently to expand and deepen the knowledge necessary for everyday professional activity and continuing education in doctoral studies.

3 COMPETENCES OF EP GRADUATE

3.1 Successful completion of EP training contributes to the formation of the following core competencies (CC)in the graduate

Core competencies (CC):

(CC1) *language and computer*

- the ability to master the basic skills of communication in a foreign language in the professional field, both orally and in writing, mediation and intercultural understanding; the ability to confidently and critically use modern information and digital technologies for work, leisure and communication, mastering the skills of using, recovering, evaluating, storing, presenting and exchanging information through a computer, participating in collaborative networks using the Internet in the field of professional activity;

(CC2) *technical*

- the ability to apply the educational potential, knowledge and experience acquired during the study of technical disciplines in professional activities and use them to analyze and solve non-standard problem situations; the ability to carry out chemical and technological processes, develop new methods of obtaining and testing them in production conditions; update and deepen the knowledge necessary for professional activities and continuing education in doctoral studies;

(CC3) *economic and entrepreneurial*

- the ability to master the skills of critical thinking, interpretation, creative analysis, conclusions, evaluation; manage scientific projects to achieve professional goals, manage personnel, demonstrate entrepreneurial skills; the ability to find compromises, to correlate one's opinion with the opinion of the team; own the norms of business ethics; strive for professional and personal growth; work in a team, correctly defend their point of view, offer new solutions; demonstrate tolerance towards other individuals;

(CC4) *Research*

- the ability to conduct a detailed analysis of scientific and technical information in the field of chemical technology of refractory non-metallic and silicate materials for the purpose of scientific, patent and marketing support for ongoing scientific research; the ability to summarize the results of research work in the form of scientific publications, defend one's position during the discussion and make professional decisions in the face of uncertainty and risk;

Professioanal competencies (PC)

PC1 The ability to organize and carry out training in specialized disciplines using innovative educational technologies, including the use of distance learning technologies

PC2 The ability to manage educational, organizational, teaching and educational processes, the process of scientific activity of students, organize and conduct professional practice of students.

PC3 The ability to plan, organize and carry out research independently or as part of a research team; to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies

PC4 The ability to control physical and chemical processes for the formation of the structure and properties of infusible nonmetallic and silicate materials, to carry out research on the synthesis of silicate materials with predetermined properties, to substantiate scientifically the choice of methods and research results

PC5 The ability of oratory, the correct and logical presentation of research results in oral and written form, to work effectively in the professional sphere, in the international environment; manage production, continue doctoral studies

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

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
CC1	+							+
CC 2	+	+	+	+	+	+	+	+
CC 3								+
CC 4		+	+	+	+	+	+	
PC1	+							
PC2	+							+
PC3		+	+	+	+	+	+	+
PC4		+	+	+	+	+	+	+
PC5							+	+

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 KZ credits	The number of	
			OC	HSC	EC	Theoretical training	Teaching practice	Research practice	SRMW	Final examination			exam	cr.test
1	1	4	-	5	2	28	-	-	2	-	900	30	7	1
	2	4	-	1	4	20	8	-	2	-	900	30	4	2
2	3	2	-	-	3	16	-	12	2	-	900	30	3	2
	4	1	-	-	-	-	-	-	18	12	900	30		1
Total				6	9	64	8	12	24	12	3600	120		6

5. INFORMATION ABOUT DISCIPLINES

Module name	Cycle	HSC /EC	Component Name	Brief course description (in 30-50 word)	Number of credits	Formed LO (codes)
Module of Scientific and Pedagogical Training	BD	VC	History and Philosophy of Science	Generalizes the history and philosophy of natural and technical sciences, new European science in culture and civilization, the structure of scientific knowledge, philosophical problems of specific sciences, communication technologies of the XXI century and their role in modern science. Determines ways to solve modern topical methodological and philosophical problems of natural and technical sciences, develops critical thinking and logic.	4	LO1
	BD	VC	Foreign Language (Professional)	Improves oral communication skills in a foreign language, intercultural competencies, business correspondence exchange skills, demonstrate reading foreign technical texts, preparing written reports on scientific topics in the specialty: scientific report, presentation, discussions, theses and articles on the topic of scientific research in a foreign language, scientific text annotation, summaries	4	LO1 LO8
	BD	VC	Psychology of Management	Summarizes the basic and principles of modern psychological science, necessary in the professional activities of highly qualified specialists. Forms a scientific and theoretical worldview on fundamental psychological concepts, skills and abilities of psychological research of a person, introduces the main methods of experimental psychological research and areas of psycho-correctional work, managing conflicts in a team, stress and methods for resolving them.	4	LO1, LO8
Methodical Bases of Teaching	BD	VC	Higher School Pedagogy	Generalizes the modern paradigms of higher education, the system of higher professional education in Kazakhstan. Describes the methodology of pedagogical science, the professional competence of a teacher of higher education. Forms the skills of applying the credit system of education, new methods and forms of education in the preparation of future specialists, education and formation of the personality of a specialist with leadership qualities.	4	LO1
	ChD	VC	Teaching Methods of Special Discipline	Forms theoretical knowledge in the field of methodological foundations for organizing training sessions in specialized disciplines, the ability to apply innovative and distant educational technologies for teaching specialized disciplines, and manage educational and methodological processes. Forms practical skills in organizing and conducting training sessions in specialized disciplines	5	LO1, LO4, LO8
	BD	VC	Pedagogical Practice	Participation of a master student in the preparation of a lecture; preparation and conduct of laboratory, practical classes; preparation of cases, materials for practical work, drawing up tasks; participation in the verification of term papers, practice reports. Forms and develops the professional skills of a teacher of higher education; allows you to master pedagogical skills, skills and abilities of independent conduct of educational and teaching work.	4	LO1, LO4, LO8
Research	BD	EC	Mineral and Raw Materials Supply of Silicate Production	Describes priority building materials for the Republic of Kazakhstan and their mineral and raw material supply - priority activities in the production of building materials; priority construction goods; mineral and raw material supply for the production of priority building materials. Forms the	4	LO2, LO4

Methodology				skills of analysis, generalization of reserves, quality indicators of raw materials, assessment of their suitability for the production of specific types of silicate materials		
			Complex Use of Mineral and Technogenic Raw Materials	Describes the main types of mineral and technogenic raw materials in order to provide the production of refractory non-metallic and silicate materials with high-quality and affordable raw materials; forms the skills of research thinking on the integrated use of raw materials and industrial waste in the production of silicate materials.		LO2, LO4
	BD	EC	Physical and Chemical Methods of Silicate Materials Analysis	Summarizes theoretical information about physicochemical methods of analysis of silicate materials - X-ray phase analysis; differential thermal analysis; methods of mineralogical and petrographic analysis of mineral raw materials, materials and products based on them; electron microscopy; spectroscopy. Forms the skills of a reasonable choice of FHMA methods. practical application of complex physical and chemical studies of mineral raw materials, materials and products based on them.	7	LO2, LO3, LO6
			Theoretical and Experimental Research Methods of Silicate Materials	Summarizes theoretical and experimental methods for the study of silicate materials - X-ray methods of study; thermal methods of analysis; optical microscopy; spectral research methods; electron microscopy; probe microscopy, X-ray optical research methods; methods for determining the dispersion of powdered materials; methods for studying the porosity of materials. Forms the skills of practical application of complex physical, physico-chemical methods for the study of silicate materials.		LO2, LO3, LO6
	BD	EC	Patent Researches of Silicate Materials	Summarizes theoretical information about scientific and technical information, classification indices, patent research, information content of materials in the preparation and execution of an application for an invention. Forms practical skills in determining classification indices, performing patent information search, selecting and analyzing patent and scientific and technical documentation; drafting and filing applications for inventions, reports on research work	4	LO3, LO4, LO6
			Organization and Implementation of SRW	Summarizes the general requirements for the organization and implementation of research work (RW); the procedure for the implementation and acceptance of RW; stages of RW implementation, rules for their implementation and acceptance; the procedure for the development, coordination and approval of documents in the process of organizing and performing research; the procedure for implementing the results of research; requirements for RW reports (structure and formatting rules). Forms skills for performing research		LO3, LO4, LO6
	ChD	EC	Physical and Chemical Bases of Binders Technology	Generalizes the production technology of gypsum, lime and magnesia binders; describes the processes of extraction and crushing of raw materials, preparation of charge, firing of clinker, gypsum and lime; lime slaking; modern schemes for the production of Portland cement, grinding of raw materials and preparation of raw meal, roasting, cooling of clinker, grinding of cement, production of dry building mixtures, finely ground binders, chrysotile cement and gypsum concrete products. Forms the skills of analysis and generalization of the physical and chemical foundations of the technology of binders	5	LO3, LO4, LO5
			Physical and Chemical Bases of Ceramics Technology	Summarizes theoretical information about state diagrams of heterogeneous systems that are essential for ceramics technology; the structure and properties of ceramics, thorium and the practice of grinding raw materials, methods of molding products, high-temperature processes during the heat treatment of ceramic materials. Forms skills in working with state diagrams of silicate systems, studying the structure and properties of ceramic materials		LO3, LO4, LO5

			Physical and chemical bases of glass and glass ceramics technology	Summarizes theoretical information about phase equilibria and crystallization in glasses, which are important for the technology of manufacturing glasses and glass-ceramic silicate systems; summarizes the physical and chemical foundations of glass technology processes, control of glass properties, physicochemical foundations of glassmaking. Forms skills in working with state diagrams of silicate systems, calculations of the composition of glass and charge, properties of glasses by their chemical composition		LO3, LO4, LO5
			Research Practice	Forms and develops professional knowledge, consolidates the received theoretical knowledge in the disciplines of the direction and special disciplines of the EP; allows you to master the necessary professional competencies in the chosen area of specialized training; collection of factual material for the preparation of a master's thesis. Expands and consolidates theoretical and practical knowledge, acquisition and improvement of practical skills, preparation for future professional activities.	7	LO2, LO3 LO4, LO5, LO6, LO7
Scientific and Technological Module	ChD	EC	Innovative Technologies of Binders	Describes innovative technologies for the production of Portland cement. Assesses the problems of energy and resource saving and considers ways and methods of waste disposal, coal-containing materials, methods of intensifying clinker formation processes, cement grinding processes, innovative technologies for the production of gypsum, lime, magnesia binders and products. Forms the skills of calculating innovative compositions and technologies for obtaining binders.	5	LO4, LO5, LO7
			Innovative Technologies of Ceramics	Generalizes theoretical information about nanotechnologies in ceramics (physical and chemical methods of synthesis of nanostructures), describes technologies of technical ceramics and bioceramics (biocompatible nanoceramics). Forms the skills to perform theoretical and experimental research in the field of the latest technologies of ceramic production		LO4, LO5, LO7
			Innovative Technology of Glass and Glass Ceramics	Summarizes theoretical information about nanotechnologies of glass and glass-ceramic materials (physical and chemical methods of synthesis of nanostructures), describes technologies of technical glass and bioceramics. Forms the skills to perform theoretical and experimental research in the field of the latest glass and ceramic glass technologies		LO4, LO5, LO7
	ChD	EC	Chemistry and Technology of Aluminosilicate Bonds and Phosphate Cements	Generalizes the regularities of the synthesis of binding properties in phosphate systems, analyzes the principles of managing technological and properties, demonstrates the possibility of expanding the material composition of phosphate systems, forms the skills for implementing the production process for obtaining aluminosilicate binders and phosphate cements with the participation of many polymineral objects of natural and technological origin.	5	LO4, LO5, LO6
			Physical Chemistry and Technology of Refractory	Generalizes physical and chemical processes of refractory technology, structure and properties of refractories. Describes the technologies of the most important types of refractory materials, technologies of heat-insulating and unshaped refractory materials. Forms skills in determining the main technical characteristics of refractories, performing research work in the field of chemical technology of refractories		LO4, LO5, LO6
			Chemistry and Technology of Glass	Summarizes theoretical information about the chemistry and technology of glass, the interaction of glass mass with refractory materials; analyzes the physical and chemical bases and technological reasons for the appearance of defects in glass and glass products; describes innovative technologies		LO4, LO5, LO6

				of sheet, hollow, architectural and construction glass. Forms the skills of determining the composition and properties of glasses, performing research work in the field of chemical technology of glass products		
Technology of Infusible Non-metallic and Silicate Materials	ChD	EC	Optimization of Technological Processes of Cement Production	Describes the possibilities of optimizing the processes of production of Portland cement, the use of raw materials and technology for the preparation of raw mixtures, optimization of the clinker firing process, technological violations of the firing process and ways to eliminate them, clinker grinding and grinding intensification. Forms the skills of researching the composition of raw materials and additives; selection, preparation of raw mixes, improvement of the quality of clinker and cements.	6	LO2 LO4, LO5, LO8
			Physical and Chemical Bases for the Regulation of the Structure of Ceramic Materials	Summarizes the theoretical information about the physical and chemical foundations of firing building ceramics (transformations during firing and the formation of the structure of products from refractory and refractory clays, regulation of the processes of formation of the structure and properties of ceramic products); Forms the skills of research work in the field of physical and chemical foundations of building ceramics technology		LO4, LO5, LO6
			Physicoal and Chemical Bases Regulation the Structure of Glass Ceramics	Summarizes theoretical information about the crystalline and amorphous state of substances, catalyzed crystallization; describes glass-ceramic technologies and their design, types of glass-ceramics, structure and properties of glass-ceramics; areas of application of technical glass-ceramics, glass-ceramics based on industrial waste and rocks. Forms practical skills in designing glass-ceramics, performing research work on the synthesis of glass-ceramics		LO3 LO4, LO5, LO6
	ChD	EC	Chemistry and Technology of Special Cements	Summarizes and analyzes the chemical and mineralogical characteristics, composition, properties, features of the technology of special, mixed cements, finely ground binders of low water demand. Forms skills in the development, implementation and testing of new technologies for especially fast-hardening and high-strength, white and non-ferrous, plugging, sulfate-resistant, hydrophobic and plasticized cements, road, aluminous, expanding, non-shrinking and dental cements.	7	LO4, LO5, LO6, LO7, LO8
			Chemistry and Technology of Fine Ceramics	Summarizes theoretical information about the chemical technology of fine ceramics (porcelain, semi-porcelain, fine-stone ceramics, faience, majolica). Describes methods for calculating ceramic masses; methods for calculating the compositions and basic properties of glazes. The skills of research work in the field of chemical technology of fine ceramics, examination of fine ceramic products are being formed		LO4, LO5, LO6, LO7
			Chemistry and Technology of Glass-like Materials, Glassware and Coatings	Summarizes theoretical information about the chemistry and technology of special glasses, frits, enamels and inorganic coatings, liquid and soluble glass. Forms the skills of research work in the field of chemical technology of glassy materials, products and coatings		LO4, LO5, LO6, LO7
	ChD	EC	Complex Research of Physical, Chemical and Technological Properties of Raw Materials and Silicate Materials	Summarizes classical and innovative methods for studying the properties of raw materials and silicate materials; forms an understanding of the need to conduct technological processes from the standpoint of modern ideas about the rational use of raw materials, ensuring high quality products, - Forms the skills of researching the physicochemical and technological properties of raw materials and silicate materials	4	LO2, LO4
			Complex Research of	Summarizes the methodology and techniques of scientific research, classification, types and tasks		LO3, LO6

			Physical, Chemical and Technological Properties of Raw Materials and Silicate Materials	of experimental research; information support of scientific research. Examines the means and methods of measurements, features of the design of research results. Forms the ability to analyze trends in modern science, to identify promising areas of scientific research in the silicate industry; skills of applying the acquired knowledge in conducting and organizing research activities		
	ChD	EC	Thermal and Sound Proofing Products Based on Binders	Considers the problems of energy and resource saving, ways and methods of waste disposal, development and implementation of new methods for the disposal of industrial waste from the mining and metallurgical complex and the chemical industry in the production of heat and sound insulation products; substantiates the optimal mode of production, forms the skills for the synthesis of heat and sound-proof binders, the ability to control the quality of finished products.	5	LO4, LO5, LO8
			Synthesis of Ceramic Thermal and Sound Proofing Insulators	Summarizes theoretical information about the chemical technology of sound and heat insulating building materials and products - gravel, crushed stone and artificial porous sand (expanded clay, shungizite, agloporite, slag-pumice); foam diatomite and diatomite heat-insulating products; expanded vermiculite. Forms the skills of research work in the field of chemical technology of heat and sound insulating ceramics, practical skills of synthesis and expertise		LO4, LO5, LO6, LO8
			Synthesis of Thermal and Sound Proofing Glass Materials	Summarizes theoretical information about the chemical technology of sound and heat insulating materials and products - expanded perlite sand and crushed stone; mineral wool; slabs of mineral wool on a synthetic binder; pierced mineral wool mats; foam glass. Forms the skills of research work in the field of chemical technology of heat and sound insulating glass products, practical skills in synthesis and expertise		LO4, LO5, LO6, LO8
Module of Research work and Final Attestation	CHD	EC	Research Work of Master Student, Including Passing an Intership and Completing Master's Thesis	Study planning; identification and formulation of topical scientific problems; search, collection, processing, analysis and systematization of information on the research topic; gaining experience in organizing scientific work; setting scientific and practical problems, finding methods for solving; the choice of research methods, their application, the solution of specific research problems; presentation of the results of NIRM. Forms skills of work in the professional field of activity	24	LO2, LO3 LO4, LO5, LO6, LO7
			Registration and Defense of a Master's Thesis	Independent scientific research, contains theoretical or practical developments of an actual problem in the field of EP, based on modern achievements of science; the result of the development is not the solution of a scientific problem, but the master's ability to conduct a scientific search, see professional problems and know the most common methods and techniques for solving. Forms skills of work in the professional field of activity	12	LO2, LO3, LO4, LO5, LO6, LO7, LO8
				TOTAL AMOUNT	120	

AGREEMENT SHEET

by Education Program code «7M07190 - Chemical technology of infusible non-metallic and silicate materials»

Director of the Institute of Postgraduate Education _____ *Konarbayeva Z.K*

Director of the department of academic science _____ *Nazarbek U.B.*

Director of department of production and commerce _____ *Bazhirov T.S.*,

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

« APPROVED BY»
Chairman of the Board -
Rector _____
academician Kozhamzharova D.P.
« 25 » 02 2021 y.

EDUCATION PROGRAMME

7M07192 - Chemical technology of infusible non-metallic and silicate materials

Registration number	7M07000113
Code and classification of the field of education	7M07 Engineering, manufacturing and construction industries
Code and classification of training areas	7M071 Engineering and Engineering business
Group of educational programs	Chemical engineering and processes
Type of EP	*active*
ISCE level	7
NQF level	7
SQF of education level	7
Language of learning	English
Typical duration of study	1 years
Form of study	Full time, Distance learning
The complexity of the EP, not less	63 credits

Shymkent, 2021

Drafters:

Name	Position	Sign
Yessimov B.O.	Doctor of geologic-mineralogical science, professor, head of the department of TCCand G	
Taymasov B.T.	Doctor of Technical Sciences, professor of the department of TCCandG	
Adyrbayeva T.A.	Candidate of technical science, assistant professor of the department of TCCand G	
Dubinina E.S.	Candidate of technical science, assistant professor of the department of TCCand G	
Shukhov R.V.	general director of LLP "EuroCrystal (Shymkent),	
Seitzhanov B.T.	director of LLP «StandartCement», Doctor of Technical Sciences (Shymkent)	
Bitemirov K.M.	general director of LLP " Zerde-Keramika", (Shymkent)	
Shiska Zbigniew	general director of JSC «ShymkentCement» of HeidelbergCement in Kazakhstan	
Aidosov Sh.I	director of LLP " Sajramskij Kirpichnyj Zavod"	

EP was considered by the Committee on Innovational Technologies of Training and Methodological Support of Higher School «Chemical engineering and Biotechnology» ____, Protocol № 7 dated from ____ 08 ____ 20 21.

Chairman of the Committee _____ Aitkulova R.E.

EP considered and recommended for approval at the meeting of Educational and Methodical Council of the Non-profit Limited Company M. Auezov South Kazakhstan university

Protocol № 5 dated from 28.02.2021

Approved by the decision of the Academic Council of the University

protocol № 6 dated from 25. 02 ____ 2021.

CONTENT

Introduction

1 Scope

Educational program (hereinafter - EP) «7M07192 - Chemical technology of infusible non-metallic and silicate materials» is intended for the preparation of masters in the profile direction (1 year) 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 07/04/2018);

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

Sectoral qualification frameworks of branch «Construction industry» has been approved by the protocol № 1 (dated from August 16, 2016) of the meeting of branch-wise commissions on social partnership and regulation of social and labor relations for the mining and metallurgical, chemical, construction industry and woodworking, light industry and mechanical engineering

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 advanced 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 strategy.

The educational program is harmonized with the 6th level of the National Qualifications Framework of the Republic of Kazakhstan, with Dublin descriptors, 2 cycle of the Framework for Qualification of the European Higher Education Area, also with Level 7 of the European Qualification Framework for Lifelong Learning.

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

The uniqueness of the training of masters of technical sciences in EP 7M07192 - "Chemical technology of infusible non-metallic and silicate materials" is as follows:

- in the Republic of Kazakhstan, this master's degree program has been implemented only in M. Auezov SKU since 2015 on the basis of the state license of the Ministry of Education and Science of the Republic of Kazakhstan dated June 27, 2014, order No. 1065 i
- The EP passed specialized accreditation and was accredited by the Independent Kazakhstan Agency for Quality Assurance in Education in 2017.;
- The EP is focused on the training of masters in the direction of "Engineering and Engineering";

- the department has specialized laboratories equipped with modern equipment and instruments;

- productive creative relationships with industrial enterprises of the industry are maintained: «Shymkentcement» JSC, «Standardcement» LLP (Shymkent), «Sas-Tobe Technologies» LLP, «Semey Cement Plant» LLP, «Semipalatinsk Atsi Plant» LLP, «Almatinsky Ceramics Plant» PK LLP, «Zerde Keramika» LLP, «Brieks Line» LLP, «Rauan» LLP, «Euro Crystal» LLP (Shymkent), «SAF» «Glass Company»» OJSC (Taraz) and others.

- the scientific contacts of the department are wide: Bauhaus-Universität Weimar and Technische Universitat Munchen (Germany); D.I. Mendeleev Russian University of Chemical Technology (Moscow), National Research Tomsk Polytechnic University and V.G.Shukhova Belgorod State Technological University. (Russia); Tashkent Institute of Chemical Technology (Uzbekistan) and others.

- inviting foreign scientists and leading specialists from industry enterprises to give lectures and conduct scientific consultations is widely practiced;

The typical term of study in a master's program with profile direction of preparation is one year.

The EP is focused on the preparation of masters for the branches of chemical engineering; ensures that graduates acquire the competencies of a master of engineering and technology, the ability to think outside the box and bold original solutions.

The educational program is aimed at achieving learning outcomes through the organization of the educational process using the principles of the Bologna process, student-centered learning, accessibility and inclusiveness

Program learning outcomes are achieved through the following training events:

– classroom training: lectures, seminars, practical and laboratory classes - held in view of innovative teaching technologies, the use of the latest achievements of science, technology and information systems;

– extracurricular training: the independent work of the student, including under the guidance of a teacher, individual counseling;

– conducting professional practices, implementation of master's projects.

– fulfillment of pedagogical and research practices, completion of master's theses

– experimental research work of a master student (ERWM): independent scientific work of a student, including the implementation of a master's project and scientific internship

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 10.31.2018 (as amended on 08.06.2020 No. 237)

1. EDUCATION PROGRAMME PASSPORT

1.1 The purpose and objectives of education program by specialty

EP objectives: training of competitive highly qualified management personnel for the silicate industry and the construction industry, with in-depth professional training, able to work effectively in an international environment

EP tasks:

- Providing conditions for the preparation of masters with high spiritual and moral qualities, capable of independent thinking and ensuring the progressive scientific, technical, socio-economic and cultural development of society, fluent in a foreign (English) language at a professional level;
- Training in the basics of organizational, managerial, production and technological activities within an industrial enterprise; providing knowledge about the methodology of joint analysis, design of enterprises for the production of silicate materials, decision-making in difficult social and professional situations, design and presentation of analytical and project documentation;
- Training in the basics of research activities; providing knowledge of the basics of the methodology of scientific research; development of abilities to perform experimental research work in the field of chemical technology of refractory, non-metallic and silicate materials, processing, analysis and presentation of research results;
- Creation of conditions for in-depth professional education, allowing the graduate to successfully work in industrial enterprises of the industry, as experts, in research organizations, continue his studies in doctoral studies, show social and professional mobility and competitiveness in the labor market.
- Development of self-study skills, constant updating of knowledge, expansion of professional skills and abilities, adaptation to changing conditions of professional activity;

1.2 List of qualifications and positions

A graduate of the educational program 7M07192 - Chemical technology of refractory non-metallic and silicate materials is awarded the degree " Master of Engineering and Technology"

In accordance with the "Qualification directory of positions of managers, specialists and other employees" (Order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-ө-m, as amended on April 17, 2013, was approved and put into effect by the Order of the Committee technical regulation and metrology of the Ministry for Investments and Development of the Republic of Kazakhstan dated May 11, 2017 No. 130-od), a graduate of the EP can hold the following positions (without presenting requirements for work experience):

- specialist in organizations (in industrial enterprises of the industry): engineer, design engineer, laboratory engineer, quality engineer, engineer for scientific and technical information, engineer for the organization of production management, engineer for safety and labor protection, engineer for patent and inventive work , pre-production engineer, process engineer;
- leading, scientific and technical workers, common to research, design, technological, design and survey organizations: engineer; expert;

A graduate of the EP in accordance with «Branch-wise qualification frameworks» (has been approved by the protocol № 1 (dated from August 16, 2016) of the meeting of branch-wise commissions on social partnership and regulation of social and labor relations for the mining and

metallurgical, chemical, construction industry and woodworking, light industry and mechanical engineering can hold the following positions of Branch «Construction industry»:

- production shift foreman, production shift foreman, dispatcher, senior dispatcher, quality engineer;
- process engineer, design engineer, design engineer
- head of production, lead designer, lead designer (related professions - artist, chemical engineer, environmental engineer, materials engineer);

A graduate of the EP in accordance with «Typical qualification characteristics of positions of pedagogical workers and persons equivalent to them " (№338 order of the Minister of Education and Science of the Republic of Kazakhstan from date 13.07.2009) can hold the following positions in organizations of higher and postgraduate education (system of technical and professional, post- secondary-level education), without making requirements for work experience: master of industrial training, specialist of the highest qualification level.

1.3 Qualification characteristics of the educational program graduate

1.3.1 Scope of professional activity

The scope of professional activity of graduate EP is:

- industrial enterprises of the industry;
- scientific centers, research and production associations, research, engineering, technological, design and prospecting organizations and other scientific organizations of the industry;
- expert analytical centers, accreditation body (examination) of industrial goods;
- organizations of higher and postgraduate education (system of technical and trade, post-secondary education); vocational educational institutions of the profile direction

1.3.2 Objects of professional activity

The objects of professional activity of graduates are:

– specialized databases, scientific and technical information in the professional field of activity;

– technical characteristics of silicate materials, requirements of current standards for them: cement, asbestos cement, gypsum binders, lime binders, dry building mixtures; porcelain, electrical porcelain, faience, refractories, acid-resistant, ceramic tiles, porcelain stoneware, tiles, expanded clay, ceramic bricks and stones; container and sheet glass, crystal, water glass, fiberglass, foam glass, stone casting, glass-ceramics; technical crystals, jewelry stones;

– raw materials for the production of silicate materials (chemical and mineralogical composition, properties of mineral and technogenic raw materials);

– processes of chemical technology of refractory non-metallic and silicate materials;

– methods of designing technological and production processes, management of resources and personnel in the production of silicate materials;

– management of the organization of the technological process for the production of silicate materials in industrial conditions

1.3.3 Subjects of professional activity

Subjects of professional activity of the bachelor of EP are:

– determination of technical characteristics of silicate materials in accordance with the requirements of current standards;

– study of the material composition and properties of mineral and technogenic raw materials in order to determine their suitability for the production (synthesis) of silicate materials;

– research on the selection of mass compositions (charge), optimization of technological processes for the production of silicate materials;

– processing, generalization and analysis of the results of experimental studies;

– design and organization of the production process of silicate materials in industrial enterprises

1.3.4 Types of professional activity

Master of Engineering Sciences EP "7M07192 - Chemical technology of infusible non-metallic and silicate materials " can do the following types of professional activity:

- organizational - managerial;
- production and technological;
- settlement and design;
- - research.

2. EP LEARNING OUTCOMES (LO)

LO 1 Demonstrate knowledge of a foreign language at a professional level, allowing for scientific research and professional activities.

LO2 Integrate knowledge gained within different disciplines, using them to solve analytical and managerial problems of an industrial enterprise in new unfamiliar conditions; put into practice new approaches to the organization of marketing and managemen

LO3 To make decisions in complex and non-standard situations in the field of organizing and managing the economic activities of an industrial enterprise for the production of cement, ceramics and glass products; think creatively and be creative in solving new production problems and situations

LO4 To apply scientific methods of cognition in professional activities; carry out information-analytical and information-bibliographic work with the involvement of modern information technologies

LO5 Independently carry out, summarize, formalize and publicly defend the results of experimental research and analytical work in the field of chemical technology of cement, ceramics and glass, solving standard scientific and professional tasks; demonstrating competence in research methodology in the chemical engineering of binders, ceramics and glass

LO6 Systematize and generalize theoretical information about the chemical technology of binders, ceramics and glass products, apply them in professional activities; manage the processes of technology, independently organizing technological control of production, determining the main technical characteristics of binders, ceramics and glass products

LO7 Critically analyze the results of experimental research in the field of chemical technology of binders, ceramics and glass products; demonstrate the ability to design and innovative, expert activities; prepare an expert opinion.

LO8 Independently expand and deepen the knowledge necessary for everyday professional activities and continuing education in doctoral studies.

3 COMPETENCES OF EP GRADUATE

3.1 Successful completion of EP training contributes to the formation of the following core competencies (CC)in the graduate

Core competencies (CC):

(CC1) *language and computer*

- the ability to master the basic skills of communication in a foreign language in the professional field, both orally and in writing, mediation and intercultural understanding; the ability to confidently and critically use modern information and digital technologies for work, leisure and communication, mastering the skills of using, recovering, evaluating, storing, presenting and exchanging information through a computer, participating in collaborative networks using the Internet in the field of professional activity;

(CC2) *technical*

- the ability to apply the educational potential, knowledge and experience acquired during the study of technical disciplines in professional activities and use them to analyze and solve non-standard problem situations; the ability to carry out chemical and technological processes, develop new methods of obtaining and testing them in production conditions; update and deepen the knowledge necessary for professional activities and continuing education in doctoral studies;

(CC3) *managerial and entrepreneurial*

- the ability to master the skills of critical thinking, interpretation, creative analysis, conclusions, evaluation; manage scientific projects to achieve professional goals, demonstrate entrepreneurial skills; the ability to find compromises, to correlate one's opinion with the opinion of the team; own the norms of business ethics; strive for professional and personal growth; work in a team, correctly defend their point of view, offer new solutions; demonstrate tolerance towards other individuals;

(CC4) *Research*

- the ability to conduct a detailed analysis of scientific and technical information in the field of chemical technology of refractory non-metallic and silicate materials for the purpose of scientific, patent and marketing support for ongoing scientific research; the ability to summarize the results of research work in the form of scientific publications, defend one's position during the discussion and make professional decisions in the face of uncertainty and risk;

(CC5) *Methodological*

- the ability to analyze and comprehend the realities of modern theory and practice based on the methodology of natural science knowledge, the ability to organize and conduct research work in the field of chemical engineering

Professioanal competencies (PC)

PC1 Ability to use a foreign language in professional activities, intercultural communication

PC2 Ability to organize and improve methods of managing the activities of an industrial enterprise for the production of cement, ceramics and glass; work effectively in the professional field, making decisions in complex and non-standard situations, creatively solving new problems and situations

PC3 The ability to apply scientific methods of cognition in professional activities, research methodology in the specialty; perform, summarize, formalize and publicly defend the results of experimental research and analytical work in the field of chemical technology of cement, ceramics and glass

PC4 The ability to systematize and generalize theoretical information about the technology of cement, composite materials, building ceramics, sheet and container glass, applying them in professional activities, managing technology processes

PC5 The ability to constantly update knowledge independently, expand professional skills and abilities for everyday professional activities and continue education in doctoral studies; adaptation to changing conditions of professional activity

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

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
CC1	+			+				
CC 2		+	+		+	+	+	+
CC 3		+	+				+	
CC 4	+	+		+	+		+	
CC5				+		+	+	
PC1			-					
PC2		+	+			+		
PC3				+	+		+	
PC4					+	+	+	+
PC5	+		+		+	+		+

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 KZ credits	The number of	
			HSC	EC	Theoretical training	Research practice	SRMW	Final examination			exam	cr.test
1	1	4	4	3	28	-	4	-	960	32	7	1
	2	2	-	-	-	10	9	12	930	31	-	2
Total			4	3	28	10	13	12	1890	63	7	3

5. INFORMATION ABOUT DISCIPLINES

Module name	Cycle	HSC /EC	Component Name	Brief course description (in 30-50 word)	Number of credits	Formed LO (codes)
Management and business communication module	BD	VC	Foreign Language (Professional)	Forms oral communication skills in a foreign language, intercultural competencies, information exchange skills, master the main types of reading foreign-language technical texts, preparing written reports on scientific topics in the specialty: scientific report, presentation, discussions, abstracts and articles on the topic of scientific research in a foreign language, scientific text annotation, summaries	3	LO1 LO8
	BD	VC	Management	Generalizes the systematic approach to management, the economic mechanism of management, planning in management; motivation as a function of management, strategic management of an organization, anti-crisis management, project management; decision making process; the theory of leadership, power and influence, the concept of personnel management; management ethics and organizational culture. Forms production management skills	3	LO2 LO3
	BD	VC	Psychology of Management	Summarizes the main approaches and principles of modern psychological science. Forms a scientific and theoretical outlook on fundamental psychological concepts, develops ideas about psychological science; skills and abilities of psychological research of personality. Introduces the main methods of experimental psychological research and the main directions of psycho-correctional work. Generalizes the features of managing conflicts, stresses and methods for their resolution	3	LO2 LO3
Research methodology	PD	EC	Cementology: structure, properties of cement and optimization of technological processes	Characterizes the structure and defectiveness of clinker minerals, their ability to triboactivation. It generalizes ways to optimize and increase energy efficiency, improve the environmental friendliness of cement production, the possibility of averaging and adjusting the raw mix, optimizing the operation of furnaces, grinding systems, fuel combustion, cyclone heat exchangers, refrigerators. Characterizes the physical and chemical processes occurring in the furnace. Demonstrates the prospects of energy-saving catalytic technologies for firing clinkers	5	LO6, LO7
			Technology of building ceramics	Forms professional knowledge in the field of technology of building ceramics. Summarizes the processes of technology, the structure and basic properties of ceramics: ceramic bricks and stones, tiles, ceramic pipes, acid-resistant products, ceramic tiles, porcelain stoneware, sanitary ware, electrical porcelain. Forms the skills of designing the optimal composition, calculating ceramic masses and glazes, determining the caking capacity and physical and chemical properties of ceramic products.		LO6, LO7
			Sheet glass technology	Deepens knowledge about the theoretical foundations of glass formation and glass properties: glassy state and glass structure; melt separation (crystallization) of glasses. Forms the results of predicting the physico-chemical properties of glasses; Invention and design of compositions, knowledge of technologies for the production of sheet glass and products from it. Develops skills in the design and synthesis of glasses with specified parameters.		LO6, LO7

	PD	VC	Method of Conducting the Experement	Forms ideas about the essence and methodological foundations of scientific research; skills and abilities in the field of methodology of scientific knowledge, theoretical principles of scientific research and deepening of knowledge about the methods of scientific knowledge and the application of logical laws and rules. Acquaints with the method of setting up the optimal experiment and processing the measurement results. Develops research thinking.	5	PO4, PO5, PO7
Scientific and technological module	BD	EC	Monitoring of production of silicate and construction materials	Summarizes the tasks of controlling the production of silicate materials; the essence of monitoring the quality of raw materials, materials and finished products. Develops the ability to formulate technical requirements for specific types of finished products. Forms skills in modern testing methods; using industry standards; generalization, analysis and ability to evaluate data on the state of technological processes, the quality of raw materials, semi-finished products and finished products	4	LO6
			Organization of technological control of ceramics production	It characterizes the organization of technological control of ceramic production, the technological discipline of production. Summarizes the possibilities of preventing violations of technological processes, eliminating manufacturing defects, increasing the stability of the quality of products, reducing production costs, improving the organization of production and environmental protection. Forms the skills of researching ceramic products in accordance with the requirements of design, technological and regulatory documentation.		LO6
			Organization of technological control of glasswares production	Demonstrates control over compliance with technological discipline. Describes the process of checking the technological processes of a glass production enterprise for compliance with the requirements established in the technological, design and other regulatory documentation. Forms the skills of researching glass products in accordance with the requirements of design, technological and regulatory documentation.		LO6
	PD	EC	Composite silicate materials	Describes the types, compositions, applications and main qualitative characteristics of composite silicate materials, the possibility of using state diagrams in order to create optimal compositions of composite silicate materials. Forms the skills of designing compositions and obtaining gypsum-cement composite materials, sulfo-lime-silica, sulfosilicate and other binder composite materials	5	LO6, LO7
			Fine ceramics technology	Summarizes the main theoretical provisions of the processes of synthesis and application of ceramic materials; sources of traditional and non-standard raw materials, the main technological processes in fine ceramics technology; principles for the selection of raw materials and technological solutions for the production of ceramic products. Forms skills in developing a rational production scheme, determining the physical and chemical properties of fine-ceramic materials.		LO6, LO7
			Container glass technology	Summarizes the chemical technology of container glass; raw materials for the production of glass containers, technological schemes of production, methods for the production and processing of glass products. Forms the skills to perform experimental research work to determine the quality indicators of glass containers, generalize and analyze the results, formulate conclusions and make informed decisions.		LO6, LO7
			Industrial practice	Summarizes the features of production technology; characteristics of raw materials, main and auxiliary technological equipment; norms of the technological mode of production; requirements for the quality of products; ecological problems; knowledge of safety, industrial sanitation; technical and economic indicators of production; provides for participation in commissioning,	10	LO2, LO3 LO6, LO7

				development of pilot and industrial technological regulations and analysis of the information received, preparation of a report on practice.		
Module of experimental research and final certification			Experimental and research work of a master's student, including the passage of an internship and the implementation of a master's project	Forms the ability to conduct scientific research, the synthesis of silicate materials, the ability to think outside the box, plan and carry out experimental research on the topic of the master's project, draw up and evaluate the results of scientific research, as well as the ability to present the results of the work done in the form of reports, abstracts, articles, designed in accordance with existing requirements.	13	LO2, LO3 LO4, LO5, LO6, LO7
			Registration and defense of a master's thesis	Provides for independent implementation of an analytical review and patent search; setting research objectives; implementation of the experimental (design) technological part; technological calculations of the process under study and economic evaluation of the results of the study; discussion of research results; forms knowledge of life safety and environmental protection, the ability to draw up a motivated, objective and complete expert opinion, design a master's project	12	LO1, LO2, LO3, LO4, LO5, LO6, LO7
				TOTAL AMOUNT	63	

AGREEMENT SHEET

by Education Program code «7M07192 - Chemical technology of infusible non-metallic and silicate materials»

Director of the Institute of Postgraduate Education _____ Konarbayeva Z.K

Director of the department of academic science _____ Nazarbek U.B.

Director of department of production and commerce _____ Bazhirov T.S.