

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

EDUCATIONAL PROGRAM 6B07216 – Technology of polymer production and processing the cipher and the name of the educational program

Code and classification of the field of education:

6B07 Engineering and manufacturing and construction industries

Code and classification of training areas: **6B072** Manufacturing and processing industries

Group of educational programs: B069 Production of materials (glass, paper, plastic, wood)

Level according to the NQF: 6 Level according to the IQF: 6 Duration of study: 4 years Volume of loans: 240

Almaty, 2022

The educational program 6B07216 – Technology of production and processing of polymers was approved at a meeting of the Scientific Council of KazNRTU named after K.I.Satpayev.

Protocol No. 13 of "_28_" _04_2022

Reviewed and recommended for approval at a meeting of the Educational and-Methodological Council of KazNRTU named after K.I.Satpayev.

Protocol No. _7_ of "_26_" _04_2022

Educational program 6B07216 – Technology of production and processing of polymers the cipher and the name of the educational program

developed by the academic committee in the direction "6B072 Manufacturing and processing industries"

Full name	Academic degree/academ ic title.	Post	Place of work	Signature
Chairman of the Acad	lemic Committee	:		11
Amitova Aigul Amantayevna	Doctor of Ph.D	Head of the Department	KazNRTU	d
Teaching staff:				
Chugunova Nina Ivanovna	Candidate of Chemical Sciences docent	Associate Professor	KazNRTU	Med.
Kerimkulova Aigul Zhadraevna	Candidate of C0hemical Sciences	Assistant Professor	KazNRTU	Als,
Nakan Ulantai	Doctor Ph.D.	Associate Professor	KazNRTU	Hit
Employers:			4	-10
Minzhulina Olga Vasilyevna		Head of Production	«Spira-Berga» LLP	Mag-
Rauken Kanat Kabdollauly		Acting Deputy Chief Technologist	"Atyrau Oil Refinery» LLP	Just-
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Students:				
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Table of contents

List of abbreviations and designations

- 1. Description of educational program
- 2. Purpose and objectives of educational program
- 3. Requirements for the evaluation of educational program learning outcomes
- 4. Passport of educational program
- 4.1. General information
- 4.2. Relationship between the achievability of the formed learning outcomes according to educational program and academic disciplines
- 5. Curriculum of educational program
- 6. Additional educational programs (Minor)

List of abbreviations and designations

1. Description of the educational program

2. The purpose and objectives of the educational program

Purpose of the educational program - Training of competitive specialists with theoretical knowledge and professional competencies capable of solving production problems, conducting design and research activities in the field of technology for the production and processing of polymers, elastomers and paints.

3. Requirements for the evaluation of learning outcomes of the educational program

4. Passport of the educational program

4.1. General information

N⁰	Field name	Note
1	1 Code and classification of the field of education	6B07 Engineering and manufacturing and construction industries
2	Code and classification of training areas	6B072 Manufacturing and processing industries
3	Group of educational programs	B069 Production of materials (glass, paper, plastic, wood)
4	Name of the educational program	Technology of polymer production and processing
5	educational program	The educational program of this profile allows you to master competencies in technological and production areas, equipment, materials, methods and means of testing and quality control in the field of polymer production for various purposes, and the program is also focused on the processing of polymer products, design, commissioning, operation of technical devices.
6		Training of competitive specialists with theoretical knowledge and professional competencies capable of solving production problems, conducting design and research activities in the field of technology for the production and processing of polymers, elastomers and paints.
7	Type of EP	New
8	Level according to the NQF	6
9	Level according to the IQF	6

10	D : .: .:	l
10	Distinctive features of the EP	no
	List of competencies of the educational program: Learning outcomes of the educational program:	CC 2.Basic literacy in natural sciences CC 3.General engineering competencies K 4. Professional competencies of KK 5. Engineering and computer competencies K 6.Engineering and working competencies KK7. Socio-economic competencies KK 8. Special professional competencies
13	Form of training	Daytime
-		4 years
	Volume of loans	240
	instruction	Kazakh, Russian, English
	awarded	Bachelor of Engineering and Technology in Engineering and Engineering
18	Developer(s) and	1. Head of the department Amitova A.A.
	1 17	2. Director of the Institute Syzdykov A.H.
		3. Assoc-Professor, Ph.D., Chugunova N.I.
		4. Assistant professor, Ph.D., Kerimkulova A.Zh.
L	L	

4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

N⁰	Name of the	Brief description of the	Numbe	Generated learning outcomes (codes)							
	discipline	discipline	r of	РО	PO	PO	PO	PO	PO	PO	PO
		-	credits	1	2	3	4	5	6	7	8
		Cyc	le of gene	eral educatio	n discipl	ines					
		-	Requi	red compone	ent						
	Foreign language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. During the transition from level to level, the prerequisites and post-prerequisites of discipline are observed.	10	v							
	Kazakh (Russian) language	The socio-political, socio- cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of scientific style in order to develop and activate professional and communicative skills and abilities of students, allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text.	10	v							

Information and communication technologies (in English)	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using text editors and tabular processors; to create databases and various categories of application programs.	5			v		
Modern history of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (XIII century), medieval states in the XIV-XV centuries. The epoch of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, during the formation of independence and at the present stage.	5	V			v	
Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical	5				v	

					1	1	1	I
Module of socio- political knowledge (sociology, political science)	issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self- esteem, awareness of the value of human existence. It teaches how to think and act correctly, develops practical and cognitive skills, helps to search and find ways and means of living in harmony with oneself, society, and the world around us. The study of the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political	3	v					
	aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary to understand political processes, to form a political culture, to develop a personal position and a clearer understanding of the measure of one's responsibility.							
Module of socio- political knowledge (cultural studies, psychology)	The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation and development of culture.	3		v				

	- [· · · · · · · · · · · · · · · · · · ·			1		1	1
	During the course of cultural									
	studies, general problems of the									
	theory of culture, leading									
	cultural concepts, universal									
	patterns and mechanisms of									
	formation and development of									
	culture, the main historical									
	stages of the formation and									
	development of Kazakh culture									
	are considered.									
	The regularities of the									
	emergence, development and									
	functioning of mental processes,									
	states, properties of a person									
	engaged in a particular activity,									
	the regularities of the									
	development and functioning of									
	the psyche as a special form of									
	vital activity are also studied.									
		vcle of	general educa	ation disc	vinlines	•	•	-		
	e e e	•	Iniversity con		PHILO -					
Fundamentals of art	i-The discipline studies the	5		1						
	essence, causes, causes of	3		v			v		v	
corruption culture	sustainable development of									
	corruption from both historical									
	and modern points of view.									
	Examines the prerequisites and									
	impact for the development of									
	an anti-corruption culture.									
	Studies the development of anti-									
	corruption on the basis of social,									
	economic, legal, cultural, moral									
	and ethical norms. Studies the									
	problems of the formation of an									
	anti-corruption culture based on									
	the relationship with various									
	types of social relations and									
	various manifestations.									
	Situations of conflict of interests									
	and moral choice are analyzed;									
	improving the anti-corruption									

				-					
		culture; actions in a conflict of							
		interest situation.anti-corruption							
		culture based on the relationship							
		with various types of public							
		relations and various							
		manifestations. Situations of							
		conflict of interests and moral							
		choice are analyzed;							
		improvement of anti-corruption							
		culture; actions in a situation of							
		conflict of interests.							
	Fundamentals of	Fundamentals of	5		v	v			
	Entrepreneurship and	Entrepreneurship and			·	•			
		Leadership							
4	Leadership	The discipline studies the basics							
		of entrepreneurship and							
		leadership from the point of							
		view of science and law;							
		features, problematic aspects							
		and prospects of development;							
		theory and practice of							
		entrepreneurship as a system of							
		economic, organizational and							
		legal relations of business							
		structures; readiness of							
		entrepreneurs for innovative							
		receptivity. The discipline							
		reveals the content of							
		entrepreneurial activity, career							
		stages, qualities, competencies							
		and responsibilities of an							
		entrepreneur, theoretical and							
		practical business planning and							
		economic expertise of business							
		ideas, as well as risk analysis of							
		innovative development,							
		introduction of new							
		technologies and technological							
		solutions							
	Ecology and life	Ecology and life safety The	5		v	v		v	
	safety	discipline studies the tasks of			٠.				
	Juivey	1		1					

	ecology as a science, environmental terms, laws of functioning of natural systems and aspects of environmental safety in working conditions. Environmental monitoring and management in the field of its safety. Sources of pollution of atmospheric air, surface,							
	groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made							
	emergencies	C	 /cle of basic d	iscipling	2	1		
			Jniversity con		3			
Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to explore elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course program includes differential calculus of functions of one variable, derivative and differentials, the study of the behavior of functions, complex numbers, polynomials. Indefinite integrals, their properties and methods of calculation. Definite integrals and their applications. Improper	5		V	v	V		
Physics	integrals. The course studies the basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics as a	5		v				

								1	n	
		science on the development of								
		technology; the relationship of								
		physics with other sciences and								
		its role in solving scientific and								
		technical problems of the								
		specialty. The course covers the								
		following sections: mechanics,								
		mechanical harmonic waves,								
		fundamentals of molecular								
		kinetic theory and								
		thermodynamics, electrostatics,								
		direct current,								
		electromagnetism, geometric								
		optics, wave properties of light,								
		laws of thermal radiation,								
		photoelectric effect.								
	Mathematics II	The discipline is a continuation	5		v	v	v		v	
		of Mathematics 1. The course			•	•	·		•	
		sections include elements of								
		linear algebra and analytical								
		geometry. The main issues of								
		linear algebra are considered:								
		linear and self-adjoint operators,								
		quadratic forms, linear								
		programming. Differential								
		calculus of a function of several								
		variables and its applications.								
		Multiple integrals. The theory of								
		determinants and matrices,								
		linear systems of equations, as								
		well as elements of vector								
		algebra. The elements of								
		analytical geometry on the plane								
		and in space are included								
			Су	cle of basic d	iscipline	S				
			(Component o	f choice					
	Engineering and	The discipline is aimed at				v	v	v		
	computer graphics	studying methods of object				•	v	v		
1	computer graphies	image and general rules of	5							
		drawing, using computer								
		graphics; studying the basic								

F KazNRTU 703-05 Educational program

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	principles and geometric							
	modeling approach and							
	methodology for developing							
	applications with a graphical							
	interface; developing skills in							
	the use of graphic systems for							
	the development of drawings,							
	using 2D and 3D modeling							
	methods							
	The purpose of the discipline is			v	v			
	to acquaint students who have							
	started studying at the university							
	with the basic and basic							
	provisions of the specialty and							
	the training program; the							
	development of interest in the							
	chosen profession, the formation							
	of students' competence and							
	understanding of the chosen							
	field of study, initial							
	professional knowledge about							
Introduction to the	the physico-chemical	4						
specialty	fundamentals of organic matter	4						
	technology; the formation of							
	technological and environmental							
	thinking among students. The							
	basic initial concepts of							
	chemical technology are							
	considered: kinetic patterns of							
	chemical transformations, types							
	of reactors and equations of							
	molar balances, technological							
	indicators of processes,							
	preparation of technological							
	schemes of chemical processes.							
	The purpose of the course is to		v	v				
	study the structure of the		v	v				
C 1 1 1	periodic system of elements and	~						
General chemistry	the main characteristics of	5						
	elements and their compounds							
	arising from it. The course is							
	missing from it. The course is		1		1		1	

			r				r	
	aimed at instilling the skills of							
	conducting chemical							
	experiments. The course covers							
	the nomenclature of chemical							
	compounds, basic chemical laws							
	and concepts, methods for							
	studying the physico-chemical							
	properties of substances and the							
	main classes of inorganic							
	compounds, as well as their							
	application in solving							
	professional problems. Upon							
	completion of the course, the							
	student must be able to apply the							
	acquired knowledge, skills,							
	skills and competencies in the							
	study of general scientific and							
	special disciplines related to							
	chemical disciplines, as well as							
	apply the acquired knowledge,							
	skills, skills and competencies in							
	solving production and							
	technological problems.							
	The purpose of the discipline is			V	v	v		
	to master the complex of			·	•	·		
	knowledge and scientific ideas							
	about the fundamental							
	theoretical and experimental							
	foundations of organic							
	chemistry of aliphatic							
	compounds; in obtaining							
I I I I I I I I I I I I I I I I I I I	students' knowledge of the basic	6						
1	concepts of theoretical organic	0						
	chemistry, mastering the skills							
	to characterize the structure,							
	physico-chemical properties of							
	organic substances, as well as							
	modern methods of synthesis of							
	organic substances. The course							
	forms the basis of chemical							
	reactions and methods of							

	armtheorie of one of a second second		[]				I
	synthesis of organic compounds						
	for the most important branches						
	of the chemical and biochemical						
	industry						
	Study of general patterns of			V	v	V	
	organic reactions of cyclic						
	compounds, such as						
	cycloalkanes, aromatic						
	hydrocarbons, and heterocyclic						
	compounds. Each class of						
	compounds is considered in						
	terms of their chemical						
	structure, isomerism and						
Organic Chemistry	nomenclature, method of	5					
II	preparation, physical and	3					
	chemical properties, and scope						
	of their application. In the						
	process of mastering this						
	discipline, the student forms and						
	demonstrates competencies that						
	allow applying the acquired						
	basic scientific and theoretical						
	knowledge to solve scientific						
	and practical problems.						
	The purpose of the course: the			v	v	v	
	formation of students' scientific			v	v	v	
	thinking, in particular, the						
	correct understanding of the						
	limits of applicability of various						
	physico-chemical concepts,						
Physical and	laws, theories. The course						
•	covers chemical						
colloidal chemistry	thermodynamics, the first	5					
	beginning of thermodynamics,	5					
	thermal effects, Hess's Law,						
	Kirchhoff equations, the second						
	beginning of thermodynamics.						
	Entropy. Chemical equilibrium.						
	The doctrine of solutions. Phase						
	equilibria. Electrochemistry.						
	Solutions of electrolytes.						
	polutions of electrolytes.					l	

	Galvanic cells. Chemical kinetics and catalysis. Surface phenomena. Dispersed systems. Methods of preparation and purification.						
Fundamentals of analytical chemistry of organic substances	The purpose of mastering the discipline is to master the theoretical foundations of modern chemical analysis of organic compounds. Summary: Fundamentals of qualitative and quantitative analysis of chemical compounds. Theory of gravimetric, titrimetric analysis. The method of analysis of organic compounds. Analysis of complex organic compounds.Distinguishing features of the analysis of organic compounds from the analysis of inorganic compounds. Qualitative elemental analysis. Determination of carbon, hydrogen and nitrogen. Quantitative elemental analysis. Semi-microanalysis. Microanalysis. Macro methods of organic elemental analysis. Determination of carbon and hydrogen.	5		v	v	V	
Fundamentals of quality control of organic compounds	The course summarizes data on the organization and conduct of elemental quantitative analysis of organic compounds. As well as the use of analytical chemistry methods to determine the elements of organogens, halogens and some heteroelements and organic compounds in other various	5		v	v	v	

	objects. The purpose of this course is: formation of students' active position and development of initiative in solving various problems arising in the process of analysis, development of the ability to present chemical analysis from sample selection to the final result as a single technological process using modern methodology.						
Fundamentals of chemistry and technology of monomers	The course is designed to study the method of obtaining and basic technological schemes for the synthesis of specific monomers, for the production of polyolefins as lower olefins (ethylene, propylene, isobutylene), halogen-containing monomers, styrene, acrylic monomers, esters and esters used for the further synthesis of various polymers and polymer materials based on them. An example of large-capacity production of expanded polystyrene is given. The issues of synthesis and production of polycondensation monomers for the production of esters, polyamides, phenol-, carbamide- and melamine-formaldehyde polymers, polyurethanes, polycabonates are disclosed.	5	v	v	V	v	v
Theoretical foundations of organic substances technology	The purpose of the discipline is for students to study modern trends in the creation of theoretical foundations of technology for processing oil, gas, coal, hydrocarbon raw	5	v	v	v	v	

				I			1	1	1	
	materials, monomers for the									
	synthesis of polymers and									
	synthetic rubbers, synthetic									
	detergents. The theoretical									
	foundations of preparation and									
	physical methods of separation									
	of oil, gas, coal and products of									
	their processing, various									
	processes (thermodestructive,									
	thermooxidative, catalytic)									
	transformations of combustible									
	minerals and products of their									
	processing are considered, the									
	theoretical foundations of									
	polymer production, which are									
	one of the main directions of									
	application of organic									
	substances, are touched upon.									
	The purpose of the course: to			v	v		v			
	study the general patterns of			•	•		•			
	chemical and technological									
	processes (CTP) of the most									
	important chemical industries.									
	The course examines the									
	patterns of chemical									
	transformations in industrial									
	production conditions; basic									
General chemical	chemical equipment. Calculation									
	of technical and economic									
technology	indicators of the process,									
	material and energy balances.									
	Industrial catalysis. Basic									
	mathematical models of									
	chemical reactors. Methods of									
	development of effective									
	chemical-technological									
	processes and systems, methods									
	of energy and resource									
	conservation, environmental									
	protection.									
CAD Chemical	The purpose of studying the	5	1		v	v	v	v		
Crib Chemiedi		5			۷	¥	₩	▼		

engineering I	discipline is to consider the basic concepts of computer graphics, the theoretical foundations of the description of geometric objects and their representation in a computer. The issues studied are theoretical and practical foundations for the creation of engineering technical documentation, the creation of graphical computer applications for image processing in the field of chemical technology of organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by means of computer graphics using the AutoCAD graphics package.							
Basic processes and devices of chemical technology I	Study of regularities and mathematical description of hydromechanical and heat exchange processes occurring in systems with several phases and several components and development of methods for calculating equipment, choosing a rational design and determining the size of devices. Classification of the main processes and devices of chemical technology. The method of calculating the devices. Equations of equilibrium of an ideal fluid. Equations of motion of ideal	5		v	v	v	V	

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	liquids. Separation of								
	heterogeneous systems. The								
	main regularities of the flow of								
	hydromechanical and heat								
	exchange processes, designs and								
	principles of operation of								
	devices used in these processes.								
		Cyc	le of profile (discipline	es				
		Ū	niversity con	nponent					
	The study of the course begins				v	v	v		
	with familiarization with the				•	v	v		
	concept of polymers and								
	polymeric materials.								
	Technological methods of								
	carrying out polymerization								
	processes of polymer synthesis								
	are revealed. Students get								
	acquainted with the principles of								
	creating polymer composite								
	materials. Then they study the								
	production of specific								
Polymer	polymerization monomers -								
production	unsaturated aliphatic	5							
technology	hydrocarbons, their halogen								
	derivatives and aromatic								
	monomers. The characteristic of								
	polyacrylate production is given.								
	Plastic masses based on								
	polymers obtained by								
	polycondensation reaction are								
	considered. Polymers based on								
	phenol and aldehydes.								
	Production of polyesters.								
	Properties and application of								
	polyesters. Polyethylene								
	terephthalate. Polycarbonates.								
Chemistry and	The purpose of the discipline is			v	V	v			v
physics of	to study by students the main			•	•	•			•
	directions of modern	5							
polymers	development of chemistry and								
	physics of polymers, their use								

·							T	1	
		and various sectors of the							
		economy. General concepts and							
		terminology in the field of							
		polymers. Regularities of the							
		chain and step mechanism of							
		polymer synthesis. Chemical							
		modification of polymers.							
		Molecular and supramolecular							
		structure of polymers.							
		Deformation properties of							
		polymers. Thermomechanical							
		method of polymer research.							
		Features of polymer dissolution.							
		In the process of mastering this							
		discipline, students develop							
		knowledge on the classification							
		and terminology of polymers.							
					v	14		74	
		The purpose of studying the			v	V		V	
		discipline is to form and							
		deepen knowledge in the field							
		of hydrocarbon chemistry.							
		Summary: The role of							
		hydrocarbon raw materials in							
		the economy of the Republic							
		of Kazakhstan. Oil and natural							
		gas. Chemical composition of							
		oil and gas. Hydrocarbons of							
	Chamistery of	oil and petroleum products, gas							
	Chemistry of	sources. Paraffin hydrocarbons							
h	hydrocarbons	(alkanes).Naphthenic							
		hydrocarbons (cycloalkanes) of							
		oil. Isolation of individual							
		substances and purification of							
		hydrocarbon compounds;							
		Unsaturated hydrocarbons,							
		basic properties. Alkenes and							
		alkynes are sources of							
		monomer synthesis.Aromatic							
		hydrocarbons.							
Τe	echnology of	Structure of surfactants,	5		v	V			v

F KazNRTU 703-05 Educational program

	production of	classification of surfactants							
	surfactants	(nonionic and anionic),							
	surractants	production of surfactants from							
		higher fatty alcohols, the effect							
		of surfactants on environmental							
		components, applications,							
		methods of determination							
		(surface tension method, method							
		of determining the edge angle							
		(wetting angle) with a solid or							
		liquid surface) the method of							
		rotating droplet.							
		The purpose of the discipline is			v	V	V		
		to study the modeling of							
		chemical and technological							
		processes using the AspenHysys							
		modeling software package. The							
		course studies the basic concepts							
		of the modeling method,							
	CAD Chemical	methods of constructing a technological scheme,							
		characteristics of the	5						
	Engineering II	technological scheme and flows,							
		calculation of parameters of all							
		flows and equipment. The							
		course forms the ability to							
		develop an optimal chemical							
		process technology with a high-							
		quality output of the target							
		product.							
r	The main processes	The purpose of studying the			v	v	v		
	and apparatuses of	discipline: is to study the			•	¥	•		
	chemical	patterns and mathematical							
		description of mass transfer							
1	technology II	processes occurring in systems							
		with the presence of several	4						
		phases and several components							
		and the formation of knowledge							
		and skills in the field of							
		processes and apparatuses of							
		chemical technology and							

	practical calculations of							
	processes and apparatuses. Mass							
	transfer processes, calculation							
	and selection of devices and							
	structures; comparative analysis							
	of the operation of devices,							
	finding optimal conditions for							
	technological processes.							
	To form a set of knowledge			v	v		v	
	among students about the			•	•		•	
	methods of conducting							
	production processes, scientific							
Tashaalaan of	thinking about understanding the							
Technology of	logical connection between the							
organic and	chemical structure and the							
petrochemical	reactivity of organic compounds,	5						
industries	the processes of their	3						
	processing, leading to a radical							
	change in their properties.							
	Creation of the basics of							
	theoretical training for students							
	to solve practical problems in							
	the field of basic organic and							
	petrochemical production.							
	The purpose of studying the			V	v	v		
	discipline is to acquire the			·	•	•		
	knowledge necessary for							
	effective use in the development							
	of modern automatic control							
Automation of	systems. Possession of sections							
	of containers necessary for							
control systems in	solving research and applied							
chemical and	tasks. The course "ASUHTP"	6						
technological	provides a presentation of the							
processes	sections of the basics of TAR,							
P10000000	measuring elements, functional							
	circuits. The study of this							
	discipline will allow the student							
	to acquire the skills to choose							
	the types of switching devices							
	and regulators depending on the							

r				r	r	r	1	r	1	r	1
		law of regulation, to develop a									
		functional and mathematical									
		model of the control system, to									
		analyze the operation of the									
		system based on qualitative									
		indicators of regulation.									
		The purpose of mastering the				v	v	v			v
		discipline is to prepare students									
		to solve the most important tasks									
		of rational nature management,									
		environmental protection and									
		human health. Summary: The									
		importance of environmental									
		education for the future									
		specialist in the production and									
	Ecology and	processing of polymers. Special									
	environmental	and extreme types of pollution	6								
	protection of	that occur in the production of	0								
	nolymer enterprises	products made of polymer									
	polymer enterprise.	materials. Scientific and									
		practical achievements in the									
		field of industrial ecology,									
		engineering environmental									
		protection. Methods of									
		development of new, more									
		effective processes of									
		neutralization, use of waste from									
		polymer production.									
	•	<u> </u>	Cvc	le of profile of	discipline	es	•	•	•	•	-
				niversity con							
		The purpose of the discipline is	U		Ponent						
		for students to study the basic				v	v		v		
		principles of polymer synthesis									
		and their physical and									
	Polymer processing	Smechanical properties. Free									
	technology	radical polymerization. Stepwise	4								
	teennology	processes of polymer synthesis.	4								
		Chemical reactions of polymers.									
		Oxidation and aging of									
		polymers. Structure and physical									
		states of polymers. The concept									

F KazNRTU 703-05 Educational program

				r		1			1	1
		of polydispersity and molecular								
		mass distribution; mechanical								
		properties of crystalline and								
		glassy polymers; the strength of								
		polymers. Classify and construct								
		possible structures of polymers								
		obtained by free radical								
		polymerization and								
		polycondensation; possess the								
		features of the behavior of								
		macromolecules and their								
		supramolecular structures; link								
		the physical characteristics of								
		polymers with their structure								
		and structure.								
		The number of the dissipline is				V	V	V		
		The purpose of the discipline is								
		to study the structures, the								
		principle of operation of basic								
		and special equipment for								
		chemical production, familiarization with its main								
		components and details. At the								
		end of the course, the student								
		must know the basic principles								
Fur	ndamentals of	of design and development of a								
	terprise design	feasibility study of production;								
Circ	terprise design	parameters and modes of	5							
		operation of standard								
		equipment; typical processes of								
		chemical technology,								
		corresponding devices and								
		methods of their calculation;								
		requirements for the technical								
		condition of equipment;								
		methods of technological								
		calculations of individual								
		components and parts of								
		chemical equipment.								
Do1	lycondensation	The purpose of the discipline is								
	•	for students to study the basic	4		v	v		V		
ma	aterials	is students to study the busic								

			•				
	provisions of polymer synthesis						
	by polycondensation						
	Summary: Methods of obtaining						
	synthetic polymers. Structure						
	and classification of						
	polycondensation polymers.						
	The main types of						
	polycondensation reactions,						
	their conditions and mechanism.						
	Monomers for polycondensation						
	resins. Functionality of						
	monomers. Cyclization as a						
	competing reaction. Kinetics and						
	MMR in polycondensation.						
	Patterns of reversible and						
	irreversible polycondensation.						
	Methods of polycondensation.						
	PC regularities in the melt, in						
	solution, technological features.						
	Emulsion polycondensation.						
	Interphase polycondensation and						
	its varieties.						
	The purpose of studying the			v	v	v	
	discipline: mastering the basics			•	•	·	
	of construction, analysis and						
	design of the petrochemical						
	industry. the main stages and						
	design of petrochemical						
	productions are considered. The						
	main stages of designing						
Fundamentals of	enterprises of the petrochemical						
industrial	industry. Introduction to	6					
construction	construction design. Selection						
	and development of the						
	technological scheme of the						
	industry. The choice of						
	technological construction of						
	petrochemical plants. After						
	mastering this discipline, the						
	student must: know: the basics						
	of the industry of the						

		petrochemical industry based on						r		
		the production method, the main								
		types of construction and its								
I		technological calculation;;	0	1 6 61	1 1.					
			•	le of profile of	-	S				
			0	Component of	f choice					
	condary ymer processes	Familiarization of students with the basics of secondary polymer processes. Recycling of secondary polymers. Problems of waste disposal. The composition of household waste. Methods of waste disposal. Disposal of polymer waste. Sources of polymer waste. Isolation of polymers from household waste. Methods of disposal of polymer waste. Features of secondary polymers. Recycling of secondary polymers into products. The use	5			v	V			v
		of recycled polymers. Chemical								
		processing of polymer waste.								
Rec	cycling of	The purpose of mastering the discipline is to form knowledge about the importance of waste recycling for solving environmental problems of polymer waste recycling plants. Summary: Analysis of the state of recycling of polymer materials, waste classification, waste recycling system in the world, features of recycling of polymer waste. The main methods of recycling polymer production waste. Methods of				v	V			v
poly	ymer materials	production waste. Methods of processing waste products for the production and processing of								
		thermoplastic materials.								

						1		
	The purpose of teaching the			V	v			V
	discipline is to form students'							
	basic theoretical knowledge and							
	practical skills in chemistry and							
	technology of film-forming							
	polymers and coatings.							
	Summary:							
	Classification of paint and							
	varnish materials. Theoretical							
	regularities and physico-							
	chemical foundations of the							
	development of paint and							
	varnish materials (LCM) and							
Chemistry and	coatings. Synthetic film-forming							
technology of	substances. Technology of							
paints and coating	s production and properties of							
	coatings based on various							
	synthetic polymers, petroleum							
	polymer resins. Film-forming							
	substances based on natural							
	compounds.							
Fundamentals of	Mastering the basics of the			V	v			v
ionite production	theory of ionites, analysis in the							
and application	study by students of the basic							
and appreadon	provisions of the synthesis of							
	ionites and their physical and							
	mechanical properties. Chemical							
	and technological issues of ion							
	exchange sorption and							
	desorption of ionites are							
	considered. The main stages of	5						
	obtaining complex ion-exchange	5						
	electroneutral substances, highly							
	concentrated electrolyte							
	solutions. Fundamentals of the							
	production and application of							
	ionites, the main types of							
	construction and its							
	technological calculation; Be							
	able to: build a kinetic model of							
	the process and a technological							

I						1		
		scheme for the production and						
		use of ionites based on the						
		knowledge and information						
		obtained from technical						
		literature, including original						
		sources						
	Economic aspects of organic matter technology	The purpose of the discipline is to form a set of knowledge among students about the methods of conducting production processes, scientific thinking about understanding the logical connection between the chemical structure and reactivity of organic compounds, the processes of their processing, leading to a radical change in their properties. Creation of the basics of theoretical training for students to solve practical problems in the field of basic organic and petrochemical production.	6		v	V		v
	Principles of chemical	Familiarization of students with the basics of physico-chemical processes of chemical technology and familiarization with the principles of the device and calculation methods of devices designed to carry out these processes. The main processes of chemical technology. The absorption process. Hydrodynamic modes of packing columns. Formation of highly qualified specialists with general scientific and professional training, capable of	5		v	V		
	engineering	independent creative work, to						

		introduce the latest and							
		progressive results into the							
		production process and having							
		an integrated knowledge system.	_						
		The course is designed to	5		v	V		V	
		understand the principles of							
		research and experimental work							
		on modern analytical tools and							
		practical use of the results and							
		the data obtained. The purpose							
		of the course is to teach students							
		how to use FHMA to study the							
		properties and composition of							
		new organic materials and							
		substances. Theoretical principles							
		of methods, methods of							
		computer processing of							
		experimental results are							
		described. Mass spectrometric							
		methods. Electronic							
	Physico-chemical	paramagnetic resonance (EPR)							
	•	method. Nuclear magnetic							
	methods of	resonance (NMR) method.							
	analysis	Radiometric methods.							
		The purpose of the discipline is	5		v	v		v	
		to form the theoretical and			•	•		 Image: A set of the set of the	
		practical basis necessary for a							
		chemical technologist in terms							
		of conducting input, technical							
		control of polymers and polymer							
		products. Summary: The							
	Technical analysis	theoretical foundations of							
	of polymers and	analytical control of production							
		are considered; General							
	Porymer products	information about metrology,							
		standardization in the system of							
		technical control in chemical							
		industry enterprises. Physical							
		quantities as a measurement							
		object. Methods for determining							
		the physical parameters of							
L		ne physical paralleters of		1			l		

	polymers. General methods of analytical control; the main elements and objects of environmental control of production; chemical, physical and physico-chemical methods of analysis.						
Quality control of polymer materials production	The main provisions for the creation of high-quality polymer materials for large-scale production of samples of new material using technological equipment and processes that meet all requirements with inexpensive raw materials, easy separation of clean products and the absence of environmental problems. This course is designed to familiarize with the basic concepts of chemical engineering for bachelors, the theory of quality control of polymer materials production; the theory of the theoretical basis of new standards; apply the acquired skills to solve questions on new materials.	5		v	v	v	
Physical and mechanical testing of plastics	The purpose of studying the discipline is to instill in students the skills of conducting physical and mechanical testing of plastics. Summary: Examines the physical and mechanical properties of plastics, standardization and certification of plastic testing methods, standard test methods, the relationship of loading conditions of polymers	5		v	v	v	

F KazNRTU 703-05 Educational program

						1	1	
	and products made of them							
	with their mechanical behavior							
	and mechanical properties.							
	Methods of testing polymer							
	materials. Mechanical tests.							
	Strength, deformation and							
	tensile modulus of elasticity.							
	The course is designed to		v	v				v
	provide training for students		•	v				•
	(bachelors in the discipline							
	"Nanocomposites and							
Nanocomposites	nanomaterials") in accordance							
and nanomaterials	with the requirements in the							
	areas of polymer production and							
	processing technology. The							
	purpose of studying the	5						
	discipline "Nanocomposites and							
	nanomaterials" is to study the							
	main classes of nanomaterials							
	and nanotechnologies used in the							
	manufacture of photonics and							
	optoinformatics devices and the							
	development of disciplinary							
	competencies.							
	The purpose of the study is to			v	v			v
	give an in-depth understanding			v	v			•
	of the principles of creating							
	polymer composite materials							
	(PCM) with an improved							
	complex of physico-chemical							
Fundamentals of	properties. Formation of							
obtaining	students' ability to understand							
composite	the physico-chemical essence of	5						
materials	the processes of obtaining PCM							
	and use the basic theoretical							
	patterns in complex production							
	and technological activities.							
	Classification of composite							
	materials according to materials							
	science, structural, technological							
	and operational principles.							

				 	-	 ·		
	Mastering this course allows you							
	to expand your understanding of							
	the principles of creating							
	composite materials based on							
	thermo- and reactoplasts, the							
	theoretical foundations for							
	choosing plastics to create							
	products for a specific process of							
	study to give an in-depth							
	understanding of the principles							
	of creating polymer composite				1			
	materials (PCM) with an							
	improved complex of				1			
	physicochemical properties.							
	Formation of students' ability to							
	understand the physico-chemical							
	essence of the processes of							
	obtaining PCM and use the basic							
	theoretical patterns in complex				ĺ		ļ ļ	
	production and technological							
	activities. Classification of							
	composite materials according to							
	materials science, structural,						ļ l	
	technological and operational							
	principles. Mastering this course							
	allows you to expand your							
	understanding of the principles							
	of creating composite materials							
	based on thermo- and							
	reactoplasts, the theoretical						ļ l	
	foundations for choosing plastics							
	to create products for a specific							
	purpose		L		<u> </u>	 ļ		
Equipme	nt of The purpose of studying the			V	v			
polvmer	production discipline is: students receive							
and proc	professional training in the							
_	- design of polymer production	5						
enterpris	and processing enterprises, stady	5						
	of standard equipment used for				1			
	the production of polymers and							
	their processing into products,						Į	

				1			1	1	
1		substantiation of methods of							
1		production of plastic products,							
		consumer goods. Study of the							
		composition of the project							
		(working draft), design and							
		estimate documentation, the							
		grounds for its development, the							
		organizational foundations of the							
		design of organic synthesis							
		enterprises, the study of							
		structures, the principle of							
		operation of basic and special							
		equipment for the production							
		and processing of organic							
		substances, familiarization with							
		its main components and details,							
		the development of methods and							
		features of calculating the							
		strength of elements of							
		apparatuses and							
		machines.Requirements for the							
		design of chemical equipment							
					v	v			
		Study of the			v	v			
		composition of the project							
		(working draft), design and							
		estimate documentation, the							
		grounds for its development, the							
		organizational foundations of the							
	Fundamentals of	design of organic synthesis							
	design and	enterprises, the study of							
	equipment of	structures, the principle of	5						
	organic synthesis	operation of basic and special	C						
		equipment for the production							
	enterprises	and processing of organic							
		substances, familiarization with							
		its main components and details,							
		the development of methods and							
		features of calculating the							
		strength of elements of							
		apparatuses and machines.							
L	1	apparation and machines.		1		L			

Clas	sification of equipment.				
	erials used for the				
man	ufacture of equipment.				
Desi	gn, technical projects,				
tech	nological, mechanical				
calc	ulations. Calculation of				
elem	nents of devices.				

N⁰	Name of the discipline	Brief description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)
	The cycle of gene	ral education disciplines is a mandato	ry compon	ent
	Foreign language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. During the transition from level to level, the prerequisites and post-prerequisites of	10	КК1
	Kazakh (Russian) language	discipline are observed. The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of scientific style in order to develop and activate professional and communicative skills and abilities of students, allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text.	10	КК1
	Information and communication technologies (in English)	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using text editors and tabular processors; to create databases and various categories of application programs.	5	КК5
	Modern history of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (XIII century), medieval states in the XIV-XV centuries. The epoch of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, during the formation of independence and at the present stage.	5	КК7
	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self-esteem, awareness of the value of human existence. It teaches	5	КК7

4.4. Information about disciplines

Approved by the decision of the Management Board from «____»____ 2022 y. №
П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 37 of 56
11 027 03 02.1.01 2022		1450 37 01 30

Module of socio- political knowledge (sociology, political science)	 how to think and act correctly, develops practical and cognitive skills, helps to search and find ways and means of living in harmony with oneself, society, and the world around us. The study of the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary to understand political processes, to form a political culture, to develop a personal position and a clearer understanding of the measure of one's responsibility. 	3	КК7
Module of socio- political knowledge (cultural studies, psychology)	The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation and development of culture. During the course of cultural studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture are considered. The regularities of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, the regularities of the development and functioning of the psyche as a special form	3	КК7
Fundamentals of anti- corruption culture	of vital activity are also studied. The discipline studies the essence, causes, causes of sustainable development of corruption from both historical and modern points of view. Examines the prerequisites and impact for the development of an anti- corruption culture. Studies the development of anti-corruption on the basis of social, economic, legal, cultural, moral and ethical norms. Studies the problems of the formation of an anti-corruption culture based on the relationship with various types of social relations of conflict of interests and moral choice are analyzed; improving the anti- corruption culture; actions in a conflict of interest situation.anti-corruption culture based on the relationship with various types of public relations and various manifestations. Situations of conflict of interests and moral choice are analyzed; improvement of anti-corruption culture; actions in a situation of conflict of interests.	5	КК6

Fundamentals of	Fundamentals of Entrepreneurship and	5	ККб
Entrepreneurship and	Leadership	-	
Leadership	The discipline studies the basics of		
Leadership	entrepreneurship and leadership from the		
	point of view of science and law; features,		
	problematic aspects and prospects of		
	development; theory and practice of		
	entrepreneurship as a system of economic,		
	organizational and legal relations of business		
	structures; readiness of entrepreneurs for innovative receptivity. The discipline reveals		
	the content of entrepreneurial activity, career		
	stages, qualities, competencies and		
	responsibilities of an entrepreneur,		
	theoretical and practical business planning		
	and economic expertise of business ideas, as		
	well as risk analysis of innovative		
	development, introduction of new		
	technologies and technological solutions		
Ecology and life safety	Ecology and life safety The discipline studies	5	КК4, КК7
	the tasks of ecology as a science,		
	environmental terms, laws of functioning of		
	natural systems and aspects of environmental		
	safety in working conditions. Environmental		
	monitoring and management in the field of its safety. Sources of pollution of		
	atmospheric air, surface, groundwater, soil		
	and ways to solve environmental problems;		
	life safety in the technosphere; natural and		
	man-made emergencies		
	Cycle of basic disciplines		·
	University component		
Mathematics I	The course is based on the study of	5	кк 2, кк5
	mathematical analysis in a volume that		
	allows you to explore elementary functions and solve the simplest geometric, physical		
	and other applied problems. The main focus		
	is on differential and integral calculus. The		
	course program includes differential calculus		
	of functions of one variable, derivative and		
	differentials, the study of the behavior of		
	functions, complex numbers, polynomials.		
	Indefinite integrals, their properties and		
	methods of calculation. Definite integrals		
	and their applications. Improper integrals.		
Physics	The course studies the basic physical	5	КК 2, ККЗ
	phenomena and laws of classical and modern		
	physics; methods of physical research; the		
	influence of physics as a science on the		
	development of technology; the relationship of physics with other sciences and its role in		
	solving scientific and technical problems of		
	the specialty. The course covers the		
	following sections: mechanics, mechanical		
	harmonic waves, fundamentals of molecular		
	kinetic theory and thermodynamics,		
	electrostatics, direct current,		
	electromagnetism, geometric optics, wave		
	properties of light, laws of thermal radiation,		
	properties of right, laws of thermal radiation,		
Mathematics II	photoelectric effect. The discipline is a continuation of		

П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 39 of 56

	Mathematics 1. The course sections include		
	elements of linear algebra and analytical		
	geometry. The main issues of linear algebra		
	are considered: linear and self-adjoint		
	operators, quadratic forms, linear		
	programming. Differential calculus of a		
	function of several variables and its		
	applications. Multiple integrals. The theory		
	of determinants and matrices, linear systems		
	of equations, as well as elements of vector		
	algebra. The elements of analytical geometry		
	on the plane and in space are included		
	Cycle of basic disciplines		
Γ	Component of choice		1
Engineering and computer	The discipline is aimed at studying methods		кк 2, кк3
graphics	of object image and general rules of drawing,		
	using computer graphics; studying the basic		
	principles and geometric modeling approach		
	and methodology for developing applications	5	
	with a graphical interface; developing skills		
	in the use of graphic systems for the		
	development of drawings, using 2D and 3D		
	modeling methods		
	The purpose of the discipline is to acquaint		КК4
	students who have started studying at the		
	university with the basic and basic provisions		
	of the specialty and the training program; the		
	development of interest in the chosen		
	profession, the formation of students'		
	competence and understanding of the chosen		
	field of study, initial professional knowledge		
	about the physico-chemical fundamentals of	4	
Introduction to the specialty	organic matter technology; the formation of	4	
	technological and environmental thinking		
	among students. The basic initial concepts of		
	chemical technology are considered: kinetic		
	patterns of chemical transformations, types		
	of reactors and equations of molar balances,		
	technological indicators of processes,		
	preparation of technological schemes of		
	chemical processes.		
	The purpose of the course is to study the		кк 2
	structure of the periodic system of elements		
	and the main characteristics of elements and		
	their compounds arising from it. The course		
	is aimed at instilling the skills of conducting		
	chemical experiments. The course covers the		
	nomenclature of chemical compounds, basic		
	chemical laws and concepts, methods for		
	studying the physico-chemical properties of		
1	substances and the main classes of inorganic	~	
Constant in the		5	
General chemistry	compounds, as well as their application in		
General chemistry	compounds, as well as their application in solving professional problems. Upon		
General chemistry	solving professional problems. Upon		
General chemistry	solving professional problems. Upon completion of the course, the student must be		
General chemistry	solving professional problems. Upon completion of the course, the student must be able to apply the acquired knowledge, skills,		
General chemistry	solving professional problems. Upon completion of the course, the student must be able to apply the acquired knowledge, skills, skills and competencies in the study of		
General chemistry	solving professional problems. Upon completion of the course, the student must be able to apply the acquired knowledge, skills, skills and competencies in the study of general scientific and special disciplines		
General chemistry	solving professional problems. Upon completion of the course, the student must be able to apply the acquired knowledge, skills, skills and competencies in the study of general scientific and special disciplines related to chemical disciplines, as well as		
General chemistry	solving professional problems. Upon completion of the course, the student must be able to apply the acquired knowledge, skills, skills and competencies in the study of general scientific and special disciplines		

II 029-03-02.1.01-2022 Editorial Office № 1 from «»2022 y Page 40 of 56	П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 40 of 56
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	The purpose of the discipline is		кк 2, кк4
	to master the complex of		,
	knowledge and scientific ideas		
	about the fundamental theoretical		
	and experimental foundations of		
	organic chemistry of aliphatic		
	compounds; in obtaining		
	students' knowledge of the basic		
	concepts of theoretical organic		
Organic Chemistry I	chemistry, mastering the skills to	_	
8	characterize the structure,	6	
	physico-chemical properties of		
	organic substances, as well as		
	modern methods of synthesis of		
	organic substances. The course		
	forms the basis of chemical		
	reactions and methods of		
	synthesis of organic compounds		
	for the most important branches		
	-		
	of the chemical and biochemical		
	industry		
	Study of general patterns of		кк 2 , кк4
	organic reactions of cyclic		
	compounds, such as		
	cycloalkanes, aromatic		
	hydrocarbons, and heterocyclic		
	compounds. Each class of		
	compounds is considered in		
	terms of their chemical structure,		
	isomerism and nomenclature,		
Organic Chemistry II	method of preparation, physical	5	
Organic Chemistry II		5	
	and chemical properties, and		
	scope of their application. In the		
	process of mastering this		
	discipline, the student forms and		
	demonstrates competencies that		
	allow applying the acquired basic		
	scientific and theoretical		
	knowledge to solve scientific and		
	practical problems.		
	The purpose of the course: the		кк 2, кк3, кк4
	formation of students' scientific		
	thinking, in particular, the correct		
	understanding of the limits of		
	applicability of various physico-		
	chemical concepts, laws,		
	theories. The course covers		
	chemical thermodynamics, the		
	first beginning of		
Developl and colloidal	thermodynamics, thermal effects,		
Physical and colloidal	Hess's Law, Kirchhoff equations,	_	
chemistry	the second beginning of	5	
	thermodynamics. Entropy.		
	Chemical equilibrium. The		
	doctrine of solutions. Phase		
	equilibria. Electrochemistry.		
	Solutions of electrolytes.		
	Galvanic cells. Chemical kinetics		
	and catalysis. Surface		
	phenomena. Dispersed systems.		
	phenomena. Dispersed systems.		

П 029-03-02.1.01-2022	Editorial Office № 1 from «»	2022 y	Page 41 of 56
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Fundamentals of analytical chemistry of organic substances	The purpose of mastering the discipline is to master the theoretical foundations of modern chemical analysis of organic compounds. Summary: Fundamentals of qualitative and quantitative analysis of chemical compounds. Theory of gravimetric, titrimetric analysis. The method of analysis of organic compounds. Analysis of complex organic compounds.Distinguishing features of the analysis of organic compounds from the analysis of inorganic compounds. Qualitative elemental analysis. Determination of carbon, hydrogen and nitrogen. Quantitative elemental analysis. Semi-microanalysis. Microanalysis. Macro methods of organic elemental analysis. Determination of carbon and hydrogen.	5	КК4
Fundamentals of quality control of organic compounds	The course summarizes data on the organization and conduct of elemental quantitative analysis of organic compounds. As well as the use of analytical chemistry methods to determine the elements of organogens, halogens and some heteroelements and organic compounds in other various objects. The purpose of this course is: formation of students' active position and development of initiative in solving various problems arising in the process of analysis, development of the ability to present chemical analysis from sample selection to the final result as a single technological process using modern methodology.	5	КК4
Fundamentals of chemistry and technology of monomers	The course is designed to study the method of obtaining and basic technological schemes for the synthesis of specific monomers, for the production of polyolefins as lower olefins (ethylene, propylene, isobutylene), halogen- containing monomers, styrene, acrylic monomers, esters and esters used for the further synthesis of various polymers and polymer materials based on them. An example of large- capacity production of expanded polystyrene is given. The issues of synthesis and production of	5	ККЗ, КК4

F			
	polycondensation monomers for the production of esters, polyamides, phenol-, carbamide- and melamine-formaldehyde		
	polymers, polyurethanes, polycabonates are disclosed.		
Theoretical foundations of organic substances technology	The purpose of the discipline is for students to study modern trends in the creation of theoretical foundations of technology for processing oil, gas, coal, hydrocarbon raw materials, monomers for the synthesis of polymers and synthetic rubbers, synthetic detergents. The theoretical foundations of preparation and physical methods of separation of oil, gas, coal and products of their processing, various processes (thermodestructive, thermooxidative, catalytic) transformations of combustible minerals and products of their processing are considered, the theoretical foundations of polymer production, which are one of the main directions of application of organic substances, are touched upon.	5	ККЗ, КК4
General chemical technology	The purpose of the course: to study the general patterns of chemical and technological processes (CTP) of the most important chemical industries. The course examines the patterns of chemical transformations in industrial production conditions; basic chemical equipment. Calculation of technical and economic indicators of the process, material and energy balances. Industrial catalysis. Basic mathematical models of chemical reactors. Methods of development of effective chemical-technological processes and systems, methods of energy and resource conservation, anvironmental antention		
CAD Chemical engineering I	environmental protection. The purpose of studying the discipline is to consider the basic concepts of computer graphics, the theoretical foundations of the description of geometric objects and their representation in a computer. The issues studied are theoretical and practical foundations for the creation of engineering technical	5	ККЗ, КК4

П 029-03-02.1.01-2022	Editorial Office № 1 from «»	2022 y	Page 43 of 56
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		graphical computer applications for image processing in the field of chemical technology of organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by means of computer graphics			
		of chemical technology of organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		organic substances. Theoretical foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		foundations of constructing images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		images of points, lines, planes and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		and certain types of lines and surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		surfaces with the conventions of the ESCD standards; fundamentals of drawing by			
		the ESCD standards; fundamentals of drawing by			
		fundamentals of drawing by			
		means of computer graphics			
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		using the AutoCAD graphics			
		package.		TATAS	TATA TATA
		Study of regularities and		ккз,	КК4, КК5
		mathematical description of			
		hydromechanical and heat			
		exchange processes occurring in			
		systems with several phases and			
		several components and			
		development of methods for			
		calculating equipment, choosing			
		a rational design and determining			
		the size of devices. Classification			
		of the main processes and devices	5		
	Basic processes and devices	of chemical technology. The	5		
	of chemical technology I	method of calculating the			
	of chemical technology f	devices. Equations of equilibrium			
		of an ideal fluid. Equations of			
		motion of ideal liquids.			
		Separation of heterogeneous			
		systems. The main regularities of			
		the flow of hydromechanical and			
		heat exchange processes, designs			
		and principles of operation of			
		devices used in these processes.			
		The study of the course begins		ККЗ,	КК4
		with familiarization with the		-)	
		concept of polymers and			
		polymeric materials.			
		Technological methods of			
		carrying out polymerization			
		processes of polymer synthesis			
		are revealed. Students get			
		acquainted with the principles of			
		creating polymer composite			
		materials. Then they study the			
		production of specific			
	Polymer production	polymerization monomers -			
	technology	unsaturated aliphatic	5		
	termology	hydrocarbons, their halogen			
		derivatives and aromatic			
		monomers. The characteristic of			
		polyacrylate production is given.			
		Plastic masses based on polymers			
		obtained by polycondensation			
		reaction are considered. Polymers			
		based on phenol and aldehydes.			
		Production of polyesters.			
		Properties and application of			
		polyesters. Polyethylene			
\rightarrow	~	terephthalate. Polycarbonates.		*****	TATA 4
	Chemistry and physics of	The purpose of the discipline is	5	ККЗ,	КК4

П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 44 of 56
11 027-03-02.1.01-2022		1 age ++ 01 50

polymers		to study by students the main directions of modern development of chemistry and				
		physics of polymers, their use				
		and various sectors of the				
		economy. General concepts and				
		terminology in the field of polymers. Regularities of the				
		chain and step mechanism of				
		polymer synthesis. Chemical				
		modification of polymers.				
		Molecular and supramolecular				
		structure of polymers. Deformation properties of				
		polymers. Thermomechanical				
		method of polymer research.				
		Features of polymer dissolution.				
		In the process of mastering this				
		discipline, students develop				
		knowledge on the classification and terminology of polymers.				
		The purpose of studying the	L			
		discipline is to form and deepen				
		knowledge in the field of				
		hydrocarbon chemistry.				
		Summary: The role of				
		hydrocarbon raw materials in the economy of the Republic of				
		Kazakhstan. Oil and natural gas.				
		Chemical composition of oil				
		and gas. Hydrocarbons of oil				
		and petroleum products, gas	5			
		sources. Paraffin hydrocarbons	5			
		(alkanes).Naphthenic hydrocarbons (cycloalkanes) of				
		oil. Isolation of individual				
		substances and purification of hydrocarbon compounds;				
		Unsaturated hydrocarbons,				
		basic properties. Alkenes and				
Chemistry of	hydrocarbons	alkynes are sources of monomer synthesis.Aromatic				
		hydrocarbons				
		Structure of surfactants, classification of surfactants		ККЗ, К	К4	
		(nonionic and anionic),				
		production of surfactants from				
		higher fatty alcohols, the effect of				
		surfactants on environmental	_			
		components, applications,	5			
		methods of determination (surface tension method, method				
		of determining the edge angle				
Technology of	production of	(wetting angle) with a solid or				
surfactants		liquid surface) the method of rotating droplet.				
		The purpose of the discipline is to s			ККЗ,	КК
	.	modeling of chemical and technolo			КК5	
CAD Chemical	Engineering	processes using the AspenHysys m		5		
II		software package. The course studi basic concepts of the modeling met				
		Tousie concepts of the modeling met	110u,	1	1	

П 029-03-02.1.01-2022 Editorial Office № 1 from «	»2022 y	Page 45 of 56
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	scheme, characteristics of the technological		
	scheme and flows, calculation of parameters of all flows and equipment. The course forms		
	the ability to develop an optimal chemical		
	process technology with a high-quality		
	output of the target product.		
The main processes and	The purpose of studying the discipline: is to		ККЗ, КК4
apparatuses of chemical	study the patterns and mathematical		
technology II	description of mass transfer processes		КК5
	occurring in systems with the presence of		
	several phases and several components and		
	the formation of knowledge and skills in the		
	field of processes and apparatuses of	4	
	chemical technology and practical	4	
	calculations of processes and apparatuses.		
	Mass transfer processes, calculation and		
	selection of devices and structures;		
	comparative analysis of the operation of		
	devices, finding optimal conditions for		
	technological processes.		
	To form a set of knowledge among students		ККЗ, КК4
	about the methods of conducting production		КК7
	processes, scientific thinking about		
Technology of organic and	nd understanding the logical connection		
petrochemical industries	between the chemical structure and the	5	
	reactivity of organic compounds, the	5	
	processes of their processing, leading to a radical change in their properties. Creation of		
	the basics of theoretical training for students		
	to solve practical problems in the field of		
	basic organic and petrochemical production.		
	The purpose of studying the discipline is to		ККЗ, КК4
	acquire the knowledge necessary for		,
	effective use in the development of modern		КК5,КК6
	automatic control systems. Possession of		
	sections of containers necessary for solving		
	research and applied tasks. The course		
	"ASUHTP" provides a presentation of the		
Automation of control	sections of the basics of TAR, measuring		
systems in chemical and	elements, functional circuits. The study of	6	
technological processes	this discipline will allow the student to		
	acquire the skills to choose the types of		
	switching devices and regulators depending		
	on the law of regulation, to develop a		
	functional and mathematical model of the		
	control system, to analyze the operation of the system based on qualitative indicators of		
	the system based on qualitative indicators of regulation.		
	The purpose of mastering the discipline is to		
	prepare students to solve the most important		KK3, KK4
	tasks of rational nature management,		КК5,КК6
	environmental protection and human health.		
	Summary: The importance of environmental		
	education for the future specialist in the		
Ecology and environmen	tal production and processing of polymers.	-	
protection of polymer	Special and extreme types of pollution that	6	
enterprises	occur in the production of products made of		
	polymer materials. Scientific and practical		
	achievements in the field of industrial		
	ecology, engineering environmental		
	ecology, engineering environmental protection. Methods of development of new,		

Editorial Office Nº 1 from «___»____2022 y

Page 46 of 56

	use of waste from polymer production.			
	Cycle of profile disciplines			-
	University component			
	The purpose of the discipline is for students		ККЗ,	ккл
	to study the basic principles of polymer		KK5,	NN4
	synthesis and their physical and mechanical			
	properties. Free radical polymerization.			
	Stepwise processes of polymer synthesis.			
	Chemical reactions of polymers. Oxidation			
	and aging of polymers. Structure and			
	physical states of polymers. The concept of			
Polymer processing	polydispersity and molecular mass			
technology	distribution; mechanical properties of	4		
	crystalline and glassy polymers; the strength			
	of polymers. Classify and construct possible			
	structures of polymers obtained by free			
	radical polymerization and			
	polycondensation; possess the features of the			
	behavior of macromolecules and their			
	supramolecular structures; link the physical			
	characteristics of polymers with their			
	structure and structure.			
			ККЗ,	КК
	The purpose of the discipline is to study the		КК5	
	structures, the principle of operation of basic			
	and special equipment for chemical			
	production, familiarization with its main			
	components and details. At the end of the			
Fundamentals of enterprise	course, the student must know the basic			
design	principles of design and development of a	5		
design	feasibility study of production; parameters	5		
	and modes of operation of standard equipment; typical processes of chemical			
	technology, corresponding devices and			
	methods of their calculation; requirements			
	for the technical condition of equipment;			
	methods of technological calculations of			
	individual components and parts of chemical			
	equipment.			
Polycondensation materials	The purpose of the discipline is for students		ККЗ,	КК
-	to study the basic provisions of polymer		КК6	
	synthesis by polycondensation		KRU	
	Summary: Methods of obtaining synthetic			
	polymers. Structure and classification of			
	polycondensation polymers.			
	The main types of polycondensation			
	reactions, their conditions and mechanism.	4		
	Monomers for polycondensation resins.	4		
	Functionality of monomers. Cyclization as a			
	competing reaction. Kinetics and MMR in			
	polycondensation. Patterns of reversible and			
	irreversible polycondensation. Methods of			
	polycondensation. PC regularities in the melt, in solution, technological features.			
	Emulsion polycondensation. Interphase			
	polycondensation and its varieties.			
	The purpose of studying the discipline:		L.I.J	LUL
	mastering the basics of construction, analysis		ККЗ,	КК
		6	КК6	
Fundamentals of industrial	and design of the netrochemical industry the	n –		
Fundamentals of industrial construction	and design of the petrochemical industry. the main stages and design of petrochemical	6		

П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 47 of 56
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of designing enterprises of the petrochemical industry. Introduction to construction design. Selection and development of the technological scheme of the industry. The choice of technological construction of petrochemical plants. After mastering this discipline, the student must know: the basics of the industry of the petrochemical industry based on the production method, the main types of construction and its technological calculation;: Cycle of profile disciplines Component of choice Secondary polymer. Profile disciplines Cycle of profile disposal. Disposal of polymer processes. Recycling of secondary polymers. Profile disposal. Disposal of polymer waste. Sources of polymer waste. Isolation of polymers from boushold waste. Methods of disposal of polymer waste. The purpose of mastring the discipline is to form knowledge about the importance of waste recycling polymer processing of polymer waste. 5 Recycling of polymer materials The purpose of mastring the discipline is to form knowledge about the importance of waste recycling polymer production, waste recycling of polymer materials. Summary: Analysis of the state of recycling of polymer materials, waste classification, waste recycling of polymer shate classification, waste recycling system in the world, features of recycling of polymer materials. Summary: Classification of paint and varish materials. The purpose of teaching the discipline is to form students' hasis theoretical knowledge and practical skills in chemistry and technology of paints and coatings. Summary: Classification of paint and varish materials. Theoretical modulations of the development of paint and varish materials. CMM and coatings. Summary: Classification of paint and varish materials. Theoretical and technological askills in chemistry and technology of pol					
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Technology of production and properties of coatings based on various synthetic polymers, petroleum polymer resins. Film- forming substances based on natural compounds.KK3, KK4Fundamentals of ionite production and applicationMastering the basics of the theory of ionites, analysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties. Chemical and technological issues of ion exchange sorption and desorption of ionitesKK3, KK4			1		
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polymers, petroleum polymer resins. Film- forming substances based on natural compounds.KK3, KK4Fundamentals of ionite production and applicationMastering the basics of the theory of ionites, analysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties. Chemical and technological issues of ion exchange sorption and desorption of ionitesKK3, KK4					
forming substances based on natural compounds.forming substances based on natural compounds.Fundamentals of ionite production and applicationMastering the basics of the theory of ionites, analysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties.KK3, KK4Chemical and technological issues of ion exchange sorption and desorption of ionites5					
compounds.KK3, KK4Fundamentals of ionite production and applicationMastering the basics of the theory of ionites, analysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties.5Chemical and technological issues of ion exchange sorption and desorption of ionites5					
Fundamentals of ionite production and applicationMastering the basics of the theory of ionites, analysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties. Chemical and technological issues of ion exchange sorption and desorption of ionitesKK3, KK4			-		
production and applicationanalysis in the study by students of the basic provisions of the synthesis of ionites and their physical and mechanical properties.5Chemical and technological issues of ion exchange sorption and desorption of ionites5		Free doments 1 C			TOTOS TOTOS
provisions of the synthesis of ionites and their physical and mechanical properties.5Chemical and technological issues of ion exchange sorption and desorption of ionites5					ккз, кк4
their physical and mechanical properties.5Chemical and technological issues of ion exchange sorption and desorption of ionites5		production and application			
Chemical and technological issues of ion exchange sorption and desorption of ionites				_	
exchange sorption and desorption of ionites				5	
	i				
are considered. The main stages of obtaining					

□ Π 029-03-02.1.01-2022 Editorial Office № 1 from «»2022 y Page 48 of 56	П 029-03-02.1.01-2022	Editorial Office № 1 from «	»2022 y	Page 48 of 56
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Economic aspects of organic	for the production and use of ionites based on the knowledge and information obtained from technical literature, including original sources The purpose of the discipline is to form a set of knowledge among students about the methods of conducting production processes, scientific thinking about understanding the logical connection between the chemical structure and reactivity of organic	6	
matter technology	compounds, the processes of their processing, leading to a radical change in their properties. Creation of the basics of theoretical training for students to solve practical problems in the field of basic organic and petrochemical production.		
Principles of chemical	Familiarization of students with the basics of physico-chemical processes of chemical technology and familiarization with the principles of the device and calculation methods of devices designed to carry out these processes. The main processes of chemical technology. The absorption process. Hydrodynamic modes of packing columns. Formation of highly qualified specialists with general scientific and professional training, capable of independent creative work, to introduce the latest and progressive results into the production process and having an integrated knowledge system	б	
engineering Physico-chemical methods of analysis	system. The course is designed to understand the principles of research and experimental work on modern analytical tools and practical use of the results and the data obtained. The purpose of the course is to teach students how to use FHMA to study the properties and composition of new organic materials and substances. Theoretical principles of methods, methods of computer processing of experimental results are described. Mass spectrometric methods. Electronic paramagnetic resonance (EPR) method. Nuclear magnetic resonance (NMR) method. Radiometric methods.		
Technical analysis of polymers and polymer products	The purpose of the discipline is to form the theoretical and practical basis necessary for a chemical technologist in terms of conducting input, technical control of polymers and polymer products. Summary: The theoretical foundations of analytical control of production are considered; General information about metrology, standardization		

П 029-03-02.1.01-2022 Editorial Office № 1 from «»2022 y Page 49 of 56	1 029-03-02.1.01-2022	Editorial Office № 1 from «»2	2022 y	Page 49 of 56
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	in the system of technical control in chemical industry enterprises.Physical quantities as a		
	measurement object. Methods for determining the physical parameters of polymers. General methods of analytical control; the main elements and objects of		
	environmental control of production; chemical, physical and physico-chemical methods of analysis.		
	The main provisions for the creation of high- quality polymer materials for large-scale production of samples of new material using technological equipment and processes that meet all requirements with inexpensive raw		
Quality control of polymer materials production	materials, easy separation of clean products and the absence of environmental problems. This course is designed to familiarize with the basic concepts of chemical engineering		
	for bachelors, the theory of quality control of polymer materials production; the theory of the theoretical basis of new standards; apply the acquired skills to solve questions on new materials.		
	The purpose of studying the discipline is to instill in students the skills of conducting physical and mechanical testing of plastics. Summary: Examines the physical and		
	mechanical properties of plastics, standardization and certification of plastic testing methods, standard test methods, the		
	relationship of loading conditions of polymers and products made of them with their mechanical behavior and mechanical properties. Methods of testing polymer		
Physical and mechanical testing of plastics	materials. Mechanical tests. Strength, deformation and tensile modulus of elasticity.		
Nanocomposites and	The course is designed to provide training for students (bachelors in the discipline "Nanocomposites and nanomaterials") in accordance with the requirements in the		ККЗ, КК4
nanomaterials	areas of polymer production and processing technology. The purpose of studying the discipline "Nanocomposites and nanomaterials" is to study the main classes of	5	
	nanomaterials and nanotechnologies used in the manufacture of photonics and optoinformatics devices and the development of disciplinary competencies.		
	The purpose of the study is to give an in- depth understanding of the principles of creating polymer composite materials (PCM) with an improved complex of physico-		
Fundamentals of obtaining composite materials	chemical properties. Formation of students' ability to understand the physico-chemical essence of the processes of obtaining PCM and use the basic theoretical patterns in	5	
	complex production and technological activities. Classification of composite materials according to materials science, structural, technological and operational		

П 029-03-02.1.01-2022 Editorial Office № 1 from «»2022
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Study o project (working documentation, th development, the of the design of o enterprises, the st principle of operate equipment of organic	f the composition of the draft), design and estimate ne grounds for its organizational foundations organic synthesis udy of structures, the ation of basic and special e production and processing nces, familiarization with its	ККЗ, КК6	КК4,
 to expand your un principles of creat based on thermotheoretical foundation to create products study to give an i the principles of of materials (PCM) of physicochemic students' ability to chemical essence obtaining PCM at patterns in complite chnological actic composite materials based on the theoretical for plastics to create purpose Equipment of polymer production and processing enterprises Equipment of polymer design of polymer production and processing enterprises The purpose of statuents active production and processing enterprises 	brofessional training in the r production and processing r of standard equipment uction of polymers and their roducts, substantiation of action of plastic products, Study of the composition of ing draft), design and intation, the grounds for its organizational foundations organic synthesis udy of structures, the ation of basic and special e production and processing inces, familiarization with its	ККЗ, КК6	KK4,

П 029-03-02.1.01-2022	Editorial Office № 1 from «»2022 y	Page 51 of 56

devices.

Curriculum of the educational program

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after KLSATANEY





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CURRICULUM	
of Educational Program on enrollment for 2022-2023 ac	ademic yea

Educational program 6B07216 - "Technology of the production and processing of polymers" Group of educational programs B095 — «Chemical engineering and processes»

	Form of study: full-time		f study: 4		0	0.0	E C	Academic degree: Bachelor of Engineering and Technology Allocation of face-to-face training based on courses and semesters							
	Name of disciplines	Cycle	Total amount	Total hours	Classroom amount	SIS (includin	Form of control			face-to-face training II course					
Discipline code			in credits	nours	lec/lab/pr	g TSIS) in hours	control	1 semester	2 semester	3 semester	4 semester	5semester		7 semeste	ourse 8 semest
CYCLEO	F GENERAL EDUCATION DISCIP	LINES (CEI							Semester	Semester	semester		r	r	r
CTCDE OI	GENERAL EDUCATION DISCH	LINES (GEI	<u>)</u>		M-1. Moc	lule of lang	uage traini	ng					-		
LNG 108	English language	GED, RC	10	300	0/0/6	210	E	5	5	1			T	[
LNG 104	Kazakh (Russian) language	GED, RC	10	300	0/0/6	210	Е	5	5						
					M-2. Mo	dule of phy	sical trainir	ıg							
KFK 101-	Physical Culture	GED, RC	8	240	0/0/8	120	Difcredit	2	2	2	2		1		
104					M-3. Module	1000									
CSE 677	Information and communication	GED, RC	5	150	1						1	1	1		
CSE 0//	technologies (in English)	GED, KC	3		2/1/0	105	E			5					
	No. I. W. CK. II.	1			-4. Module o	T T				1					
HUM 100	Modern History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE	5						-	
HUM 132	Philosophy	GED, RC	5	150	1/0/2	105	E			5					
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	Е			3					
HUM 134	Socio-political knowledge module		5	150	2/0/1	150	E				5				
110101151	(culturology, psychology)							L	L				1		
	Fundamentals of anti-approximitio-	1	M-5.	Module	of anti-corru	ption cultu	re, ecology	and life safe	ty base	1			1		
HUM 133	Fundamentals of anti-corruption culture														
MNG 488	Fundamentals of Entrepreneurship and Leadership	GED, CCH	5	150	2/0/1	150	E				5				
CHE 656	Ecology and life safety	1													
CYCLE OF	F BASIC DISCIPLINES (BD)														
		1			Iodule of ph					r					
MAT 101 PHY 468	Mathematics 1	BD, UC	5	150	1/0/2	105	E	5							
MAT 102	Physics Mathematics II	BD, UC BD, UC	5	150	1/1/1 1/0/2	105	E		5						
				the local sector with	odule of b			cal trainin	1						
0001 400	Engineering and computer graphics								5	1	1	[1		
GEN 429		BD, UC	5	150	1/0/2	105	Е		2						
CHE692 CHE494	Introduction to the specialty Chemistry	BD, UC BD, UC	4	120	2/0/1	75 105	E	4	5						
CHE665	Organic Chemistry II	BD, UC	6	180	2/1/1	103	E		3	6					
CHE639	Organic Chemistry I	BD, UC	5	150	1/1/1	105	E				5				
CHE869	Physical and colloidal chemistry	BD, UC	5	150	1/1/1	105	Е			5					
2201	Elective	BD, CCH	5	150	2/0/1	105	E			5					
CHE831	Surface phenomena and dispersed systems	BD, UC	5	150	2/0/1	105	E				5				
CHE637	Theoretical foundations of organic substances technology	BD, UC	5	150	2/0/1	105	E					5			
CHE649	Fundamentals of Chemistry and	BD, UC	5	150	2/0/1	105	E				5				
CHE695	Monomer Technology	BD, UC	5	150	0/1/2	105	E					5			
	CAD Chemical engineering I Basic processes and apparatus of														
CHE816	chemical technology I	BD, UC	5	150	2/0/1	105	E					5			
CHE818	Technology for the production of polymers	BD, UC	5	150	2/0/1	105	E					5			
CHE652	Chemistry and Physics of Polymers	BD, UC	5	150	2/1/0	105	E				_	5			
3201	Elective	BD, CCH	5	150	2/0/1	105	E					5			
CHE699	CAD Chemical and Biological Engineering II	BD, UC	5	150	0/1/2	105	Е						5		
CHE817	Basic processes and apparatus of chemical technology II	BD, UC	4	120	2/0/1	75	Е						4		
CHE634	Technology of organic and petrochemical production	BD, UC	5	150	2/0/1	105	E						5		
4201	Elective	BD, CCH	6	180	2/1/1	120	E							6	
CIV784	Educational practice	BD, UC	2						2	I	1				L
CYCLEO	F PROFILE DISCIPLINES (PD)		Mer		· · ·		and a state	-	al anti-tr						
CHE819	Technolom of not mar argan	PD, UC	M-8. M	odule of	profession	nal chemi	E E	chnologie	at activity	1	Γ		4		1
	Technology of polymer processing														
CHE560	Fundamentals of enterprise design	PD, UC	5	150	2/0/1	105	E						5		-
CHE820	Polycondensation materials	PD, UC	4	120	2/0/1	75	E	ļ					4		
CHE821	Fundamentals of industrial construction	PD, UC	6	180	2/0/2	120	E							6	
4301	Elective	PD, CCH	5	150	2/0/1	105	E							5	1

							1	60		60		60		60	
	Total based on UNIVERSITY:							31	29	31	29	30	30	33	27
AAP500	Military affairs	ATT	0										T		
				M-1	10. Module o	of additiona	d types of t	raining							0
ECA103	Defense of the thesis (project)	FA	6												6
ECA003	Preparation and writing of a thesis (project)	FA	6												6
					M-9. Mo	dule of fina	l attestation	n					5		
CIV786	Production practice II	PD, UC	3										3		
CIV785	Production practice 1	PD, UC	2								2				5
4307	Elective	PD, CCH	5	150	2/0/1	105	E								5
4306	Elective	PD, CCH	5	150	2/0/1	105	E					-			5
4305	Elective	PD, CCH	5	150	2/0/1	105	E								5
4304	Elective	PD, CCH	5	150	2/0/1	105	E							6	
4303	Elective	PD, CCH	6	180	2/0/2	120	E								
4302	Elective	PD, CCH	5	150	2/0/1	105	E							5	

	Number of credits for the entire p	eriod of s	tudy						
	Cycles of disciplines	Credits							
Cycle code		required component (RC)	university component (UC)	component of choice (CCH)	Total				
GED	Cycle of general education disciplines	51		5	56				
BD	Cycle of basic disciplines		96	16	112				
PD	Cycle of profile disciplines		24	36	60				
	Total for theoretical training:	51	120	57	228				
FA	final attestation	12			12				
	TOTAL:	63	120	57	240				

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol No13 or "28" 04 20 27y.

Decision of the Educational and Methodological Council of	Kazntu named after K.Satpayev. Protocol Nº 4 or "26 " 09 20 12
Decision of the Academic Council of the Institute	. Protocol Nº 4 or "30" 12 2021 y.
Vice-Rector for Academic Affairs	Zhautikov B.A.
Director of IGaOGB	Syzdykov A.H.
Head of the Department of Chemical and Biochemical Engineering	Amitova A.A.
Specialty Council representative from employers	Kalmuratova A.A.
	Color Color



MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY FROM K. SATBAYEV



MAJOR ELECTIVE DISCIPLINES educational program for the 2022-2023 academic year admission Educational program 6B07216 - "Technology of the production and processing of polymers" Group of Educational programs B069-"Production of materials (glass, paper, plastic, wood)"

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Year of study	Code of elective	Code of discipline	Name of discipline	ademic degree b Semestr	Cycle	Credits	Total hours	lec/lab/pr	(including SIWT) in	Prerequisites
			M-7. Module of basic gener	al technical tra	ining					
	-	CHE870	Fundamentals of analytical chemistry of organic substances					2/0/1		
	2201	CHE454	Fundamentals of quality control of organic compounds	3	В	5	150	2/0/1	105	
3	3201	CHE871	Chemistry of hydrocarbons	-	D		150	2/0/1	105	
	3201	CHE877	Technology of production of surfactants	5	В	5	150	2/0/1	105	
	4201	AUT434	Automation of control systems in chemical engineering processes	7	В	6	180	2/1/1	120	
	4201	CHE872	Ecology and environmental protection of polymer enterprises	,	Б	0	100	2/1/1	120	
			M-8. Module of professional chemic	al and technolo	gical activ	vity				
	4301	CHE405	Secondary polymer processes	7	S	5	150	2/0/1	105	
	4301	CHE873	Recycling of polymeric materials		5	5	150	2/0/1	105	
	4302	CHE874	Chemistry and technology of paints and varnishes and coatings	7	S	5	150	2/0/1	105	
	4302	CHE822	Basics of production and application of ion exchangers	/	5	2	150	2/0/1	105	
	4303	CHE833	Economic aspects of the technology of organic subsstances	7	S	6	180	2/0/2	120	
	4305	CHE829	Principles of chemical engineering	/	5	0	180	2/0/2	120	
· ·	4304	CHE893	Physico-chemical methods of analysis	7	S	5	150	2/1/0	105	
4	4304	CHE875	Technical analysis of polymers and polymer products	/	5	2	150	2/0/1	105	
	4305	CHE824	Quality control of the production of polymeric materials	- 8	S	5	150	2/0/1	105	
	4305	CHE876	Physical and mechanical testing of plastics	8	5	2	150	2/0/1	105	
	4306	CHE825	Nanocomposites and Nanomaterials	- 8	S	5	150	2/0/1	105	
	4300	CHE823	Fundamentals of obtaining composite materials	0	3	5	150	2/0/1	105	
		CHE826	Equipment for polymer production and processing enterprises					2/0/1		
	4307	CHE485	Basics of designing and equipment of enterprises of organic synthesis	8	S	5	150	2/0/1	105	

Credits numbers of elective disciplines over	the entire period of study
Cycle of disciplines	Credits
Cycle of basic disciplines (B)	16
Cycle of special disciplines (S)	36
Overall:	52

Head of the Department of Chemical and Biochemical Engineering jkuf-

Representative of Specialty council

Amitova A.A.

Kalmuratova A.A.

Name of additional educational programs (Minor) with disciplines	Total number of credits	Recommended semesters of study	Documents on the results of the development of additional educational programs (Minor)

6. Additional educational programs (Minor)

CHANGE REGISTRATION SHEET

Sequence	Section,	Type of change	Number and	The change has been made	
number of	paragraph	(replace,	date of		
the change	of the document	cancel, add)	notification	Date	Surname and initials, signature, position
					•