Ф.7.02-09

MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»
Chairman of the Board-Rector
_____
Doctor of historical sciences,
Academician Kozhamzharova D.P.
«23» 02 2023

EDUCATION PROGRAMME

7M07180 – Technological machines and equipment (on branch)

Registration number	7M07100306
Code and Classification of Education	7M07 - Engineering, proccessing and contruction branches
Code and Classification of Areas of Training	7M071 - Engineering and engineering business
Group of educational programs (EP)	M103 - Mechanics and metalworking
Type of EP	current
ISCE level	7
NQF level	7
SQF level	7
Language of learning	Kazakh, Russian
The complexity of EP	120 credits
Distinctive features of EP	-
Partner University (JEP)	-
University partner (DDEP)	-

Shymkent, 2023

Drafters:

Name	Position	Sign
Seitkhanov N.T.	Candidate of Technical Sciences, Head of the department "Technological machines and equipment"	
Khusanov A.E.	Candidate of Technical Sciences, Senior Lecturer of the Department "Technological Machines and Equipment"	
Sabyrkhanov M.D.	Candidate of Technical Sciences, Senior Lecturer of the Department "Technological Machines and Equipment"	
Volnenko A.A.	Doctor of Technical Sciences, professor of the department "Technological machines and equipment"	
Zhumadullaev D.K.	PhD, Senior Lecturer of the Department "Technological Machines and Equipment"	
Abilkhamitov R.	Group master student MNG-22-4nr1	
Khairov A.N.	Director of the SKF of JSC "NGSK KazStroyService"	LS
Torskiy A.O.	Technical Director of LLP "Kazmontazhstroykonstruktsiya"	LS

The EP was considered in the direction of training "Engineering and Science in Engineering", at a meeting of the academic committee, Minutes № 6 «19» 02 2023.

Chairman of the Committee _____ Aitureev M.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU

Minutes № 7* from «23» 02 2023.

Chairman of the EMM _____ Abisheva R.D.

The EP was approved by the decision of the Academic Council of the University

Minutes № 13 from «23» 02 2023.

CONTENT

1 CONCEPT EP

Mission of the University	We are focused on generating new competencies, training a leader who translates research thinking and culture.
University Values	– Openness - open to change, innovation and cooperation. – Creativity - generates ideas, develops them and turns them into values – Academic freedom - free to choose, develop and act. – Partnership - creates trust and support in a relationship where everyone wins. – Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Graduate Model	– Deep subject knowledge, their application and continuous expansion in professional activity – Information and digital literacy and mobility – Research skills, creativity and emotional intelligence – Entrepreneurship, independence and responsibility for their activities and well-being – Global and national citizenship, tolerance to cultures and languages
Uniqueness of the EP	the program was developed in accordance with the Atlas of New Professions and Competencies, and is aimed at training competent specialists for transport and logistics and scientific and pedagogical structures who are able to organize and manage the activities of a structural enterprise, independently determine the goals of professional activity, choose and justify methods and means to achieve them.
Academic Integrity and Ethics Policy	The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination: • Rules of academic integrity (Order No. 212-нқ dated 10.10.2022); • Anti-Corruption Standard (Order No. 221-нқ dated 07.12.2021). • Code of Ethics (order No. 212-нқ dated 10.10.2022). • Anti-Corruption Policy of the NJSC “M. Auezov South Kazakhstan University.” (order No. 144 нқ dated 07.14.2022).
Regulatory and legal framework for the development of EP	1. Law of the Republic of Kazakhstan "On Education" No. 319-III dated July 27, 2007; 2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated July 20.2022 No. 2; 4. Rules for the organization of the educational process on credit technology of training, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; 5. Qualification directory of positions of managers, specialists and other employees, approved by the Order of the Minister of Labor and Social

	Protection of the Population of the Republic of Kazakhstan on December 30, 2020 No. 553. 6. Guidelines for the use of ECTS. 7. Guidelines for the development of educational programs of higher and postgraduate education, Appendix 1 to the order of the Director of the Central Research Institute No. 45 o/d dated June 30, 2021.
Organization of the educational process	– Implementation of the principles of the Bologna Process – Student-centered learning – Availability – Inclusivity
Quality assurance of EP	– Internal quality assurance system – Involvement of stakeholders in the development of the EP and its evaluation – Systematic monitoring – Updating the content (updating)
Requirements for applicants	They are established according to the Standard Rules of admission to training in educational organizations implementing educational programs of higher and postgraduate education Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS).For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2. PASSPORT EP

Purpose of the EP	Training of competent scientific and pedagogical personnel with the skills to conduct scientific research and educational activities in the field of technological machines and equipment.
Tasks of the EP	• to provide an individual educational trajectory of study in accordance with the specialty chosen by master's student; • to provide a full-fledged and high-quality scientific and pedagogical education, to form professional competence, to deepen theoretical and practical, as well as individual training of master's students in the field of technological machines and equipment. to contribute to the acquisition by master's student of the most important and sustainable knowledge, ensuring a holistic perception of the world; • to develop the ability of learners to self-improvement and mastering new knowledge; • to prepare specialists with a high level of professional culture (including professional communication culture), having a civil position, able to formulate and solve modern scientific and practical problems, teach at universities, successfully carry out research and management activities, ensure the development of disciplines guaranteeing professional mobility of fundamental courses at the junction of sciences, • to promote the acquisition of skills to participate in scientific events at various levels, the continuation of scientific training in doctoral studies, to ensure the receipt of the required amount of knowledge in the field of university pedagogics and psychology and the acquisition of teaching experience at the university.
Harmonization of EP	• **7** th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin descriptors of the 7th level of qualification; • 2 cycle of a Framework for Qualification of the European Higher Education Area); • • 7^{th} Level of European Qualification Framework for Life long Learning).
Connection of EP with the professional sphere	• Professional standard. Testing of innovative products / services - Appendix No. 2. NCE RK "Atameken", 12/24/2019. No. 259. • Professional standard. Organization of interaction between science and innovators - Appendix No. 1. NCE RK "Atameken", 12/24/2019. No. 259. • Professional standard. Technical design of innovative products / services - Appendix No. 12. NCE RK "Atameken", 12/24/2019. No. 259. • Professional standard. Development of working documentation for innovative products / services - Appendix No. 8. NCE RK "Atameken", 12/24/2019. No. 259. • Professional standard. Development and transformation of innovative ideas - Appendix No. 9. NCE RK "Atameken", 12/24/2019. No. 259. • Sectoral Qualifications Framework "Education" - Astana, 2019
Name of the degree awarded	After the successful completion of this EP, the graduate is awarded the degree of Master master of technical sciences on the Educational Program 7M07180 - «Technological Machines and Equipment (on branch)»
List of qualifications and positions	Innovation Development Manager; executor of scientific projects; innovation manager; chief mechanic; positions in higher educational institutions and research institutions, as well as design and design organizations without presenting requirements for work experience in accordance with the

	qualification requirements of the Qualification Directory for the positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated 30 December 2020 No. 553.
Field of professional activity	• pedagogical activity, production activity in experimental research, design organizations and at the production; experimental research activities in the field of education and in the production in the field of advanced training of workers in accordance with the specialization; • educational, management and planning activities in accordance with the qualification of the Master of Technical Sciences; • Master of this profile is prepared for activities in the field of material production, which includes a set of tools, methods and ways of human activity aimed at solving complex problems associated with the design, operation and repair of processing equipment.
Objects of professional activity	• enterprises and organizations working on the Industrialization Map; • higher education institutions; • enterprises and organizations that train and retrain specialists; • experimental research, design organizations; • machine engineering plants producing technological equipment; enterprises and organizations that operate technological equipment: design, project and technological organizations; branded and dealer centers of machine-building and repair plants; marketing and transport-expediting services; logistics systems.
Subjects of professional activity	• technological machines and equipment; power equipment; running equipment; work equipment; drive systems of technological machines and equipment; traffic control systems; life support systems; • equipment for the manufacture, testing and disposal of technological machines and equipment; • equipment for maintenance and repair of technological machines and equipment; • control and measurement instruments for the manufacture and operation of technological machines and equipment; • equipment for work process automation of technological machines and equipment.
Types of professional activity	• production-technology; • organizational-managerial; • research; • pedagogical; • design and engineering
Learning outcomes	**LO1.** Have an understanding of the main scientific and technical problems of the development of technological machines for various industrial purposes and the skills of rational methods of searching and using scientific and technical information. **LO2.** Solve the problems of efficient operation of mechanical equipment using modern methods, and organizing and controlling the performance of the main types of routine maintenance and repair of machinery and equipment in accordance with the requirements of technological processes. **LO3.** Participate in the development of structures of production and technological, service and maintenance and installation and commissioning departments and be ready to acquire new knowledge and technologies in the professional sphere, setting goals and formulating tasks related to the

	implementation of professional functions. **LO4.** Implement effective monitoring of compliance with regulatory requirements for quality, standardization and certification of products and production safety. **LO5.** Perform a feasibility study of innovative technologies, identifying and assessing the risks of their use, compiling initial data for the design of new technological equipment. **LO6.** Make optimal decisions on the modernization of existing equipment, on the selection and design of new equipment, having an understanding of the system of legislative acts, ways and means to ensure healthy and safe working conditions in industrial enterprises. **LO7.** Work individually and in a team, showing sociability and psychological readiness in practical activities in the specialty, in working with specialists from related industries, making managerial and technical decisions. **LO8.** Demonstrate leadership qualities and initiative in solving current production and technological, research, design, and environmental and economic problems. **LO9.** Improve individual qualifications throughout the entire period of professional activity, having a foreign language proficiency in the professional field at a level that allows you to work in an international environment. **LO10.** Apply the knowledge of University psychology and pedagogy in practice, planning and performing scientific and pedagogical work with the demonstration of in-depth professional knowledge using new information and educational technologies.

3. COMPETENCIES OF A GRADUATE OF THE EP

GENERAL COMPETENCIES (SOFTSKILLS). Behavioral skills and personal qualities	
GC 1. Competence in managing one's literacy	GC1.1. Strive for professional and personal growth throughout your life. GC1.2. Constantly update their knowledge within the chosen trajectory and in the conditions of interdisciplinarity, carry out further training with a high degree of independence and self-regulation. GC1.3. Be capable of reflection, objective assessment of their achievements, awareness of the need to form new competencies and continue their education in doctoral studies.
GC 2. Language competence	GC2.1. Ability to possess a sufficient level of communication in the professional field in the state, Russian and foreign languages for negotiations and business correspondence. GC2.2. Ability to possess mediation skills and cross-cultural understanding.
GC 3. Mathematical competence and competence in the field of science	GC3.1. Ability to interpret methods of mathematical analysis and modeling for solving applied problems in the field under study. GC3.2. Ability to plan scientific experiments, integrate and implement the results of scientific research in the professional field. GC3.3. Ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity.
GC 4. Digital competence, technological literacy	GC4.1. Ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communication. GC4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices. GC4.3. The ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities.
GC 5. Personal, social and educational competencies	GC5.1. Knowledge of the norms of business ethics, social and ethical values and focus on them in professional activities. GC5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement. GC5.3. Ability to work in a team, correctly, clearly and argumentatively defend your position during discussions and make professional decisions. GC5.4. The ability to adequately navigate in various social spheres of activity and in conditions of uncertainty. GC5.5. The ability to find compromises, correlate your opinion with the opinion of the team.
GC 6. Entrepreneurial competence	GC6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team. GC6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team. GC6.3. Ability to work in the mode of uncertainty and rapid change of task conditions, make decisions, respond to changes in working conditions, allocate resources and manage your time. GC6.4. Ability to work with customer requests.
GC 7.Cultural	GC7.1. Ability to show ideological, civic and moral positions.

awareness and self-expression	GC7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to possess high spiritual qualities.
PROFESSIONAL COMPETENCIES (HARDSKILLS).	
Theoretical knowledge and practical skills specific to this field	PC1. The ability to professional exploitation of modern technological equipment and scientific instruments in accordance with the direction of training and to independently learn new research methods, to change the scientific and scientific-production profile of their professional activities.
	PC2. Skills of planning, organizing and conducting research in the field of chemical technology and proficiency in programming and calculating basic processes and equipment.
	PC3. The ability to conduct a detailed analysis of scientific and technical information in the field of technological machines and equipment and related disciplines for the purpose of scientific, patent and marketing support of the conducted fundamental research and technological developments.
	PC4. The ability to analyze and comprehend the realities of modern theory and practice based on the methodology of natural science knowledge and apply these teaching methods in practice and to develop a quality management system in the creation of technological machines and equipment in accordance with the requirements of Kazakhstan and international quality standards.
	PC5. The ability to assess the public and environmental impacts of practical activities based on in-depth knowledge of safety and environmental protection requirements, as well as legislative foundations, and apply the principles of rational usage of natural resources and environmental protection in practice.
	PC6. The ability to implement technological processes of chemical production and show the skill of analytical thinking in solving problems and their proper documentation.

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

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
GC1	+								+	
GC2	+						+			
GC3		+		+		+				
GC4							+			+
GC5		+	+							
GC6			+			+				
GC7			+							+
PC1		+		+	+	+	+	+	+	
PC2		+	+	+	+		+			+
PC3			+	+	+		+		+	
PC4				+	+		+	+		
PC5	+	+		+	+	+		+	+	+
PC6		+			+			+		

4. MATRIX OF THE INFLUENCE OF MODULES AND DISCIPLINES ON THE FORMATION OF LEARNING OUTCOMES AND INFORMATION ON LABOR INTENSITY

№	Module name	Cycle	Component	Component Name	Brief course description	Number	Generated learning outcomes (codes)									
							LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10
1	Module of Scientific and Pedagogical Training	BD	UC	History and Philosophy of Science	Purpose: To study the problems of the phenomenon of science as a subject of special philosophical analysis, the patterns and trends in the development of special activities for the production of scientific knowledge, taken in a sociocultural context. Contents: Identification of the specifics and interrelationships of the main problems of the history and philosophy of science. The study of the laws of development of science and the structure of scientific knowledge, methods of scientific research. Knowledge of the main concepts and directions of the non-classical and post-non-classical stages of the development of science. Analysis of the realities of modern theory and practice based on understanding the methodology of natural science, socio-humanitarian and technical knowledge. Critical thinking as a prerequisite for the development and functioning of modern society. Technologies for the development of critical thinking: consideration and study of the logic of arguments. Formation of critical	4	v		v	v						

					reflective thinking and metacognitive abilities.											
		BD	UC	Foreign Language (Professional)	Purpose: systemic deepening of communicative competence within the framework of international standards of foreign language education based on the further development of skills and abilities of active language proficiency in the professional activities of the future undergraduate. Content: Levels B2, C1 are presented in the form of a pragma-professional orientation for professional and academic purposes at an advanced level: scientific information base, interpretation of scientific information, argumentation, beliefs, scientific controversy, academic writing. Use of innovative methods and technologies, and attraction of modern means (Internet resources). Demonstration of knowledge of language material in any related discipline.	4	v		v	v						
		BD	UC	Psychology of Management	Purpose: to ensure the competence of a psychologist by mastering his knowledge in the field of psychological management, developing skills in managing the organization's human resources. Contents: methodological foundations of management psychology. Development of psychological theories of management. General theoretical questions of management psychology. Psychology of managerial communication. Psychological	4	v		v	v						

					characteristics of the staff. Psychology of employee motivation. Technologies of human resource management of the organization. Psychological support of the personnel policy of the organization. Psychology of conflict in the organization. Technologies for preventing professional deformation of personality. Practical implementation in the form of creating diagnostic tools, developing digital methods for training leaders, and management consulting.											
		BD	UC	Higher School Pedagogy	Purpose: formation of the foundations of the professional and pedagogical culture of a university teacher, general pedagogical competencies, familiarization of undergraduates with the theoretical and methodological foundations of higher education pedagogy, technologies for planning, organizing and managing the educational process at a university. Contents: Modern paradigms of education, history and latest trends in the development of higher professional education in the world and in Kazakhstan. Genesis and methodology of pedagogy of higher education, the competence of a university teacher. Problems of university didactics, problems of organizing educational work with students, management of a modern university. Modern approaches and methods of teaching and organization of educational	4	v		v	v							

					activities of students, evaluation of educational achievements.											
2	Methodical Bases of Teaching	PD	UC	Teaching Methods of Special Disciplines	Purpose: Formation of knowledge among undergraduates on the general methodology of teaching - didactics, methodology of the educational process in higher educational institutions, conducting lectures, practical and laboratory classes, exams. Contents: Rules for the organization of the educational process on the credit technology of education. Educational program. Curriculum of the specialty. Organization of the educational process at the university. Form and methods of control of students' knowledge. Methodology for conducting training sessions. Features of the teacher's activity in the study of specialized disciplines. Methodology for the development of an educational and methodological complex of special disciplines.	5	v		v	v		v				
		BD	UC	Pedagogical Practice	Purpose: the formation of practical teaching skills in higher education. Contents: Preparation of documents on the organization of classes, preparation for classes and conducting classes using methods of activating students. Setting up and laboratory work of workshops, acquiring the skills of conducting training sessions, applying new educational technologies, managing the research work of students.	4			v		v		v		v	

3	Design and Methodology of Scientific Research	PD	EC	Design of Technological Machines and Equipment in the Chemical Industry	Purpose: Formation of skills for the effective design of technological machines and equipment in the chemical industry, taking into account modern requirements and standards. Contents: Fundamentals of chemical production design: the study of the principles and methods of designing technological processes and equipment. Technical aspects of the chemical industry. Development of engineering solutions aimed at improving production processes and equipment. Equipment design. The study of methods and approaches to the design of various types of technological machines, devices and installations. Use of modern software.	5	v	v			v		v			
		PD	EC	Technological Machines and Equipment - Development Prospects	Purpose: To provide undergraduates with up-to-date knowledge about the prospects and trends in the development of technological machines and equipment. Contents: Analysis of existing technological machines and equipment. Innovative technologies and trends. Automation and digitalization of production. Energy saving and environmental efficiency. Technological innovations in industries. Study of modern developments and innovations in the field of technological machines and equipment for various industries. Analysis and forecasting of development. Assessment of the current	5	v	v			v		v			

					state and making forecasts for the development of technological machines and equipment.											
		BD	EC	The Methodology of Scientific Research in Chemical Engineering	Purpose: Formation of undergraduates in the basics of scientific research, the development of their research skills and the formation of a systematic approach to conducting scientific research in the field of chemical technology. Contents: The study of the main stages of scientific research. Formulation of a scientific problem. Setting goals and objectives of the study. Search and analysis of scientific information. Choice of research methods. Planning and organization of research. Collection and analysis of data. Implementation of experiments. Interpretation and presentation of results. Acquaintance with the principles of scientific ethics.	4		v	v				v	v		
		BD	EC	Methods of Empirical and Theoretical Research	Purpose: Formation of undergraduate skills and knowledge necessary for conducting empirical and theoretical research, analysis and interpretation of data. Content: The study of the basic concepts and principles of scientific research. Empirical research methods. Theoretical research methods. Planning and conducting research. Organization of data collection, their processing and analysis, interpretation of research results. Critical analysis and evaluation of the study. Assessment of the	4		v	v				v	v		

					reliability and reliability of the results obtained, assessment of the internal and external validity of the study. Ethical aspects of the study.											
				Research Practice	Purpose: familiarization with the latest theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of scientific research. Content: Practical study of the latest theoretical, methodological and technological achievements of domestic and foreign science. Modern methodology of scientific research; analysis of the state of development of technological machines and equipment in the world and Kazakhstan; the role of science and innovation in the improvement and modernization of technology; modern trends in the development of technological machines. The study of the most pressing problems in technological machines, the production of modern equipment and machines. Performing theoretical and experimental research on the topic of the dissertation.	6				v	v			v		v
4	Design Principles in Environmental Safety	BD	EC	Engineering and Environmental Safety of Equipment in Chemical Technology	Purpose: Formation of undergraduates' competencies in ensuring the engineering and environmental safety of equipment in chemical technology, which will allow them to develop and implement measures to prevent accidents and minimize the impact on the environment.	4			v		v			v		v

					Contents: Fundamentals of engineering safety. Fundamentals of principles and approaches to ensuring safety in chemical technology. Environmental Safety. Methods for monitoring and managing environmental risks. Design of safe equipment. Methods for ensuring the safe operation and maintenance of equipment. Emergency management. Acquaintance with the current laws, regulations and standards related to safety and environmental safety in chemical technology.											
		BD	EC	Calculation and Design of Environmentally Safe Equipment in Chemical Technology	Purpose: Formation of undergraduates' competencies in the development of environmentally friendly equipment in chemical technology, which will allow them to apply engineering solutions to minimize the negative impact on the environment. Contents: Environmental aspects in design. Methods for calculating equipment parameters. Mastering the methods of mathematical modeling and calculating the parameters of environmentally friendly equipment, including calculations of strength, stability, energy efficiency and other characteristics. Designing systems for cleaning and capturing emissions. Calculation of waste and emission treatment systems, including the use of filters, sorbents, devices for trapping and neutralizing harmful substances.	4			v		v			v		v
		BD	EC	Chemical	Purpose: Formation of undergraduates' deep	7					v			v		v

				Resistance of Materials and Corrosion Protection	knowledge and skills in the field of chemical resistance of materials and corrosion protection. Contents: Chemical corrosion of materials. gas corrosion. Methods of protection against chemical gas corrosion. Chemical corrosion of non-metallic building materials. Influence of structure on corrosion processes. Electrochemical corrosion of metals. Protection of metals from corrosion. Methods for testing metallic materials for resistance to various types of corrosion. Basic methods for testing materials. Strength tests of materials against local types of corrosion. Electrochemical methods of research and testing. Tests of materials for strength under corrosion-mechanical effects. Analysis of wear resistance of surfaces made of various materials.											
		BD	EC	Equipment Based on Basic Technological Processes Combination	Purpose: Formation of scientific thinking among undergraduates, understanding of the physical and chemical essence of the main processes that are common to many industries. Contents: General patterns of technological processes. Characteristics of dispersed systems. Mixing and dispersion. Characteristics of dispersed systems. Mixing and dispersion. Grinding of materials. Fundamentals of the theory of grinding. Pressing. Essence and process assignment. Thermal processes. Drying. The physical	7					v			v		v

					essence of the process, moisture and thermal moisture conductivity. dissolution and crystallization. Devices and the principle of operation of apparatuses of processing industries.											
5	Modeling and calculation of equipment based on the main processes of chemical technology and their combinations	PD	EC	Modern Industrial Equipment of Chemical Enterprises	Purpose: Formation of the basics and methods for calculating mass-transfer equipment processing technologies, principles of equipment design for undergraduates. Contents: Familiarization with various types of equipment used in the chemical industry. Principles of operation of the equipment. Analysis of various technological processes in which industrial equipment is used. Design and selection of equipment, study of design methods and selection of equipment for chemical processes. Methods for optimizing processes and upgrading equipment. Principles of service and maintenance of industrial equipment. Trend and innovation in the field of industrial equipment for chemical plants.	6			v	v					v	
		PD	EC	Equipment for New Processes of Chemical Technology	Purpose: Formation of the basics and methods for calculating mass transfer, hydromechanical, heat exchange equipment of chemical technology, principles of equipment design for undergraduates. Contents: Equipment for hydromechanical processes of chemical technology. Equipment for carrying out thermal and mass transfer processes of chemical	6			v	v					v	

					technology. Classification of heat exchangers, mass transfer apparatuses and their calculation methods. Information on the operation of absorption, distillation, adsorption and drying plants. Designs of machines for carrying out mechanical processes. Classification and dosing of solid materials.											
		PD	EC	Methods Optimization of Energy Resource Efficiency of Chemical Technological Systems	Purpose:.Studies - chemical-technological process and its engineering design Contents: The conceptual apparatus of industry. Elements of general systems theory. Chemical-technological systems. Performing experimental work in order to determine the parameters of the technological regime and remove the material balance of a particular chemical reaction. Development of chemical reaction technology in the chemical transformation subsystem. Fundamentals of industrial kinetics (theory of a chemical reactor). Statistical planning of experiment. Statistical models of technology). Basic resources Chemical-technological systems. Ecologization subsystem Chemical-technological systems. Synthesis of the general structure Chemical-technological systems. Chemical engineering analysis systems.	7		v			v	v		v		
		PD	EC	System Approach to the Creation of	Purpose: Formation of a systematic approach among undergraduates to solving the problems of designing and analyzing the	7		v			v	v		v		

				Machines and Apparatus of Chemical Industry	effectiveness of resource-saving complexes, developing creative thinking of undergraduates, increasing their intellectual level. Contents: Definition of system analysis. Basic principles of system analysis. System approach-ideology of creation of computer-aided design systems. Structure and functioning of systems. Types and form of representation of structures. Classification of systems. Regularities of systems. Methods and models of systems theory. The relationship of phenomena in individual processes and apparatuses. Hierarchy of phenomena and their subordination in the study of processes and apparatus Hierarchical structure of chemical production; mutual influence of devices; decomposition											
		PD	EC	Methods of Ensuring and Methods of Optimization of Reliability of the Chemical Industry	Purpose: Preparation of undergraduates for production and research activities in the field of operation and improvement of technological equipment to improve reliability and durability. Contents: Basic provisions of the theory of reliability. Qualitative criteria of reliability. The concepts of failure and failure. Classification of failures: sudden (instant) and gradual (wear). Dangerous, urgent, non-urgent, compatible, complete, authorized, erroneous, intermittent, minor. Mathematical apparatus of the theory of	8					v	v		v	v	

					reliability. Random events. The relative magnitude of a random event. The classic definition of probability. Basic properties of probability. Numerical characteristics of the probability distribution, mathematical expectation, mode, median, initial and central moments. Operational reliability of technological machines and equipment.											
		PD	EC	Theoretical Strength Calculations of Chemical Industry Equipment Elements	Purpose: Formation of undergraduates with the theory of complex stress states and normative methods for calculating thin-walled and thick-walled vessels and apparatuses of the chemical industry and related industries. Contents: Theoretical foundations of the strength calculation of shells and plates. Norms for calculating the strength of equipment and power plants and equipment of related industries. Normative calculation of typical units, parts and structures. Normative calculation for strength and stability under conditions of complex non-stationary loading. Fundamentals of automated calculation of stress states.	8					v	v		v	v	
		PD	EC	Technological Calculations in CAPR in the Engineering of Energy and Recource Saving in Chemical	Purpose: Formation of knowledge and skills of undergraduates in the use of modern software systems to solve the problems of technological design of chemical engineering processes in the development of new and modernization of existing industries. Contents: Technological design of chemical	8			v		v			v		v

				Technology	production using CAD. Definition of properties-constants and properties-dependencies for individual substances. Calculation of properties of multicomponent and multiphase mixtures. Calculation of kinetic parameters and thermal effects of homogeneous and heterogeneous chemical transformations. Calculation of reactor processes taking into account the conversion of key reagents. Calculation of absorption and rectification processes in tray and packed columns. Calculation of liquid-phase extraction processes in column apparatuses. Estimated calculation of heat exchangers of various types. Structural calculation of shell-and-tube and plate heat exchangers, as well as tube-in-pipe heat exchangers and air coolers. Calculation of energy-resource-saving recyclical (reverse) material and heat flows of technological schemes of chemical production. Determination of optimal parameters of technological processes.											
		PD	EC	Machines and Apparatus for Basic Processes of Chemical Technology	Purpose: Forms the basics of production, design and research activities in the field of creation and operation of technical equipment for chemical production among undergraduates. Contents: Apparatuses of capacitive type with mixing devices. Capacitive type devices with fixed devices. Filters. Centrifuges. Liquid separators. Crystallizers. Granulators. Heat exchangers.	8			v		v			v		v

					Evaporators. Column devices. Dryers. Apparatus with rotating drums for roasting, drying and crystallization. Electrolyzers. Paint machines. Industrial ovens. High pressure apparatus. Enamelled hardware. Devices made of non-metallic materials.											
		PD	EC	Modeling and Optimization of Processes in Chemical Technology	Purpose: Forms the application of methods for optimizing and organizing energy- and resource-saving chemical-technological systems, multi-criteria analysis of chemical production, as well as ways to improve the efficiency of oil refining plants for undergraduates. Contents: Methodology for optimizing reactor systems for multicomponent oil refining processes. Problems of multiobjective optimization. Compromise solution. Methods for solving multicriteria problems. Problems of solving problems of resource saving in production and classification of optimization methods. Evaluation of criteria for optimal operation of an industrial process. Optimization and resource saving of reactor systems in oil refineries.	8			v		v	v		v		
		PD	EC	Hydrodynamic and Mathematical Models in Chemical Technology	Purpose: Forms a methodology for constructing mathematical models of chemical-technological processes among undergraduates; mathematical models of the structure of flows, kinetics of chemical reactions, homogeneous chemical reactors, thermal and mass transfer processes are	8			v		v	v		v		

					given. Contents: General principles of modeling. Classification of models. Methodology for constructing mathematical models of chemical-technological processes. Deterministic mathematical models of chemical-technological processes. Mathematical description of the hydrodynamic structure of flows. Experimental-statistical methods for constructing mathematical models. Optimization methods in chemical technology. Statistical optimization methods.											
6	Module research work and Final Certification			Research work of a master student, including passing an internship and completing a master's thesis	Purpose: Acquisition of skills for conducting scientific research and obtaining results for a master's thesis. Contents: An analytical review of well-known design and technological solutions, the choice and justification of the technological scheme of production in accordance with the topic of the dissertation. Conducting theoretical and experimental research. Application of information technologies and computer programs in the design and development of technological processes. Determination of the economic efficiency of design and technological solutions. Formation of conclusions, modeling, processing and interpretation of the results.	24			v		v			v	v	v
				Execution and	Purpose: To present and defend a	8			v		v		v		v	v

				Defense of Master`s Thesis	dissertation in accordance with the topic of the dissertation and the requirements for them. Content: When performing, preparing and defending a master's thesis, a master's thesis demonstrates knowledge about the current state, problems and prospects for the development of technological machines, the development of methods for theoretical and experimental research, processing, analysis and generalization of results, the use of computer programs for modeling static and dynamic processes, and competent provision of scientific and design products. Master's thesis defense.											

5. SUMMARY TABLE ON THE VOLUME OF LOANS DISBURSED BY MODULES OF THE EDUCATIONAL PROGRAM

Course of Study	Semester	The number of mastered modules	The number of studied disciplines		Number of credits KZ					Total hours	Total credits KZ	The number of	
			UC	CC	Theoretical training	Pedagogical training	Research practice	MIRW	Theoretical training			exams	Dif.of set
1	1	5	5	2	29			1		900	30	6	2
	2	4		3	22	4		4		900	30	3	2
2	3	2		2	11		6	3		600	20	2	2
	4	2		2	16			4		600	20	2	1
	5	1						12	8	600	20		1
Total			5	9	78	4	6	24	8	5400	120	13	8

6. LEARNING STRATEGIES AND METHODS, MONITORING AND EVALUATION

Learning strategies	**Student–centered learning:** The student is the center of teaching/learning and an active participant in the learning and decision-making process. **Practice-oriented training:** orientation to the development of practical skills.
Teachingmethods	Conducting lectures, seminars, various types of practices: • *using innovative technologies:* • problem-based learning; • case study; • group work; • discussions and dialogues, quizzes; • presentations; • lecture with analysis of specific situations; • lecture-visualization; • lecture-consultation; • round table; • situational analysis; • analysis of production documentation; • solving situational problems • *rational and creative use of information sources:* • multimedia training programs; • electronic textbooks; • digital resources. Organization of independent work of students, individual consultations.
Monitoring and evaluation of the achievability of learning outcomes	**Current control** on each topic of the discipline, control of knowledge in classroom and extracurricular classes (according to syllabus). Assessment forms: • survey in the classroom; • testing on the topics of the discipline; • control works; • protection of independent work; • discussions; • colloquiums; • essays, etc. **Boundary control** at least twice during one academic period within the framework of one academic discipline. Intermediate certification is carried out in accordance with the working curriculum, academic calendar. **Forms of holding:** • exam in the form of testing; • oral examination; • written exam; • protection of practice reports; • differentiated credit **Final certification.**

7. EDUCATIONAL AND RESOURCE SUPPORT OF THE EP

Information Resource Center	The structure of the Educational Information Center includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The basis of the network infrastructure of the Educational and Information Center is 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners, JIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on-line 24 hours 7 days a week. Thematic databases of their own generation: "Almamater", "Proceedings of SKSU scientists", "Electronic archive" have been created. Online access from any device 24/7 via the external link http://articles.ukgu.kz/ru/pps. Catalogs are processed electronically. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKGU in Print", "Readers" and "SKU". The EIC provides its users with 3 options for accessing its own electronic information resources: from the “Electronic Catalog” terminals in the catalog hall and in the EIC subdivisions; through the information network of the university for faculties and departments; remotely on the library website http://lib.ukgu.kz/. Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet", Digital library "Aknurpress", "Smart-kitar", "Kitar.кz", etc. For people with special needs and disabilities, the library website has been adapted to the work of visually impaired users
Material and technical base	• Educational and research, scientific laboratory named after O.S.Balabekov; • Educational and research, scientific Laboratory of mechanical tests named after A.Ainabekov. **Specializedlaboratories:** • Informationandcommunicationtechnologies; • Engineeringcomputergraphics; • Standardization, certificationandmetrology; • Educational and Research Laboratory of cutting theory; • Educational laboratory "Theory of machines and mechanisms"; • Materials Science Training Laboratory; • Educational laboratory "Technology of mechanical engineering"; • Training laboratory "Machine parts"; • Educational laboratory "Materials Science and Foundry processes". **UNPC base** • SHF JSC "NGSK Kazstroyservice". **Practicebases:** • LLP « SOUTHS-OIL» • LLP « KAZNIIHIMPROJECT» • LLP « KazNIIPPP» • SHF JSC "NGSK Kazstroyservice" and so on.

AGREEMENT SHEET

according to the Educational program 7M07180 – «Technological machines and equipment (on branch)»

Director of IPE _____ Z. Konarbayeva
sign

Director of ASD _____ U.Nazarbek
sign

Director of DEK _____ T.Bazhirov
sign