

MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC
OF KAZAKHSTAN
M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

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



EDUCATION PROGRAMME

7M07123 – 3D-MODELLING IN MECHANICAL ENGINEERING

Registration number	7M07100418
Code and Classification of Education	7M07 Engineering, Manufacturing and Civil engineering
Code and Classification of Areas of Training	7M071 Engineering and engineering trades
Group of Educational Programs (EP)	7M103 Mechanics and Metal Working
Type of EP	Innovative
ISCE level	7
NQF level	7
IQF level	7
Language learning	Kazakh, Russian
The complexity of EP	120 credits
Distinctive features of EP	-
Partner University (JEP)	-
University Partner (DDEP)	-

Shymkent, 2023

Drafters:

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The EP was considered in the director of training «Engineering and Engineering business» at a meeting of the academic committee, Minutes # 4 «24» 01 2023.

Chairman of the Committee Ayturayev M.Zh.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU, Minutes # 4 «21» 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.

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1. CONCEPT OF THE PROGRAM

University Mission	We are focused in generating new competencies, training a leader who translates research thinking and culture
University Values	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Deep subject knowledge, their application and continuous expansion in professional activity. • Information and digital literacy and mobility in rapidly changing conditions. • 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.
The uniqueness of the educational program	<ul style="list-style-type: none"> • Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders • Practical orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow to be functionally literate and competitive in any life situation and be in demand in the labor market • Independence in setting and solving tasks of professional, scientific, innovative and pedagogical activities.
Academic Integrity and Ethics Policy	<p>The University has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination:</p> <ul style="list-style-type: none"> • Rules of academic integrity (Minutes of the Academic Council No. 3 dated 30.10.2018); • Anti-Corruption Standard (Order No. 373 n/k dated 27.12.2019). • Code of Ethics (Protocol of the Academic Council No. 8 dated 31.01.2020).
Regulatory and legal framework for the development of EP	<ol style="list-style-type: none"> 1. Law of the Republic of Kazakhstan "On Education"; 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 with amendments and additions dated December 29, 2021 No. 614 3. State obligatory standards of higher and postgraduate education, approved by order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2; 4. Rules for organizing the educational process on credit technology of education, approved by 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 order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553. 6. Guidelines for the use of ECTS. 7. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the Center for the Bologna Process and Academic Mobility No. 45 o /

	d dated June 30, 2021
Organization of the educational process	<ul style="list-style-type: none"> • Implementation of the principles of the Bologna Process • Student-centered learning • Availability • Inclusivity
Quality assurance of the Educational program	<ul style="list-style-type: none"> • Internal quality assurance system • Involvement of stakeholders in the development of the Educational Program and its evaluation • Systematic monitoring • Actualization of the content (updating)
Requirements for applicants	It is established according to the Model Rules for 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)	<p>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.</p> <p>An individual differentiated approach is provided for all types of classes and in the organization of the educational process.</p>

2. PASSPORT of the Educational program

Purpose of the EP	Preparation of masters with professional skills in the field of 3D modeling and design of automated technological processes and mechanical engineering products, conceptual analytical and logical thinking, able to determine strategy and plan production, scientific and pedagogical activities.
Tasks of the EP	<ul style="list-style-type: none"> - providing conditions for the acquisition of a high intellectual level by undergraduates, the development of logical and critical thinking, the skills of the scientific organization of labor in scientific and pedagogical activities in the field of higher education and modern machine-building industries; - development of the ability to apply knowledge in professional activities to solve scientific, managerial and technological problems, prompt decision-making in problem situations; - the formation of skills for self-study and continuous professional development throughout the entire professional activity, allowing masters to successfully adapt to changing conditions; - the formation of the competitiveness of graduates in the field of higher education and modern machine-building and mechanical assembly industries, to ensure the possibility of their fastest possible employment in their specialty or continuing their studies in doctoral studies.
Harmonization of EP	• 7 th level of the National Qualifications Framework of the Republic of Kazakhstan;

	<ul style="list-style-type: none"> • Dublin descriptors of the 7th level of qualification; • 2 cycle of a Framework for Qualification of the European Higher Education Area); • 7thLevel of European Qualification Framework for Life long Learning).
Connection of the EP with the professional sphere	<ul style="list-style-type: none"> • Industry qualification framework for the "Mechanical Engineering" industry, (approved by the Protocol of the Meeting of the Sectoral Commissions on Social Partnership and Regulation of Social and Labor Relations for the mining and metallurgical, chemical, construction and woodworking, light industry and mechanical Engineering on August 16, 2016, Protocol No. 1). • Professional standard "Teacher" (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of Kazakhstan "Atameken" No. 133 of June 8, 2017). • Professional standards "Engineering and metalworking" (Appendix No. 13 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of Kazakhstan "Atameken" No. 269 of December 30, 2019). • Professional standard "Technical design of innovative products/services" № 259 of December 24, 2019. • Atlas of new professions and competencies in the Republic of Kazakhstan https://www.enbek.kz/atlas/.
Name of the degree awarded	After successful completion of this OP, the graduate is awarded the degree of Master of Technical Sciences in the educational program «7M07123 -3D modeling in mechanical engineering».
List of qualifications and positions	Masters of EP <i>7M07123-3D-modeling in mechanical engineering</i> can occupy the following positions: Researcher, Director (General Director, Executive Director, President, Chairman of the Board, Manager) of an organization, Chief Engineer, Chief Designer, Chief Metallurgist, Chief Technologist, Deputy Director (Director, Vice President) for Production, Deputy Director for General Issues (Administrative Director), Head of the Instrumentation Department, Head of the Research Laboratory, Head of the Production Laboratory (for production control), Head of the Laboratory (Bureau) for Labor Organization and Production Management, Head of the Automation Department and mechanization of production processes, Head of the equipment procurement department, Head of the quality control department, Head of the marketing department, Head of the production department, Head of the repair shop, Shift manager, Head of the equipment operation service, Head of the welding service, Head of t of the technical department, Head of the central plant laboratory, Head of the shop (section), Head of the pilot production shop, Project manager, Innovation development manager, Teacher of higher educational institutions in accordance with the qualification requirements of the "Qualification handbook of positions of managers, specialists and other employees", approved by order of the Minister of Labor and Social Protection population of the Republic of Kazakhstan (Order No. 553 dated December 30, 2020).
Field of professional activity	The sphere of professional activity is mechanical engineering, education and science.
Objects of professional activity	universities and research institutions, government bodies, state and non-state institutions, including machine-building enterprises, enterprises of the oil and gas production and processing industry, agriculture and communal services, the military-industrial complex, and other enterprises in the sphere of production and consumption.
Subjects of professional activity	educational process, production and technological processes of engineering enterprises, as well as enterprises working with equipment

	in various sectors of the economy, related to ensuring the continuous operation of production.
Types of professional activity	all types of professional activity: Research, experimental research, pedagogical, design, production and technological, organizational and managerial, design and technological, work in IT companies.
Learning outcomes	<p>LO1 Analyzes the main worldview and methodological problems, incl. of an interdisciplinary nature, arising in science at the present stage of its development, assesses various factors and phenomena, based on the provisions and categories of the philosophy of science, showing the ability for pedagogical activity and self-education.</p> <p>LO2 Analyzes and plans the development and effective use of personnel in the organization and management of machine-building production, based on socio-psychological technologies for managing mass behavior.</p> <p>LO3 Owns the methodology of scientific research, effective teaching methods in the field of technical disciplines, critically evaluates the scientific organization of the work of a teacher of higher education, applying methods to enhance the activities of students, knowledge of a foreign language in interpersonal communication, professional activities, writing scientific articles.</p> <p>LO4 Forms the tasks of technical design, taking into account the implementation of design, modeling and engineering calculations using standard software packages of CAD / CAM / CAE systems and computer-aided design of engineering products and the use of technologies and equipment of the engineering complex.</p> <p>LO5 Develops and approves a technical project for the creation of an innovative development, system, new products based on 3D modeling of the structures of machine parts and assemblies and technological processes for their manufacture, using automated systems for the development of design documentation in research, inventive, innovative activities, prototyping methods and 3D printing.</p> <p>LO6 Conducts analytical work involving information databases; summarizes the results in the form of 3D models, design documentation, reports, patents and scientific articles on the use of new structural materials, nanomaterials and nanotechnologies, methods of mathematical and physical modeling and predicting the durability and integrity of structures.</p> <p>LO7 Develops plans and procedures for the technical design of production under conditions of uncertainty and risk, based on flexible production modules and robotic systems using the benefits of computer-aided design.</p> <p>LO8 Analyzes problems in interdisciplinary related areas of knowledge while performing experimental research independently, substantiates research results when discussing with specialists and a wider audience.</p>

3. COMPETENCES OF THE GRADUATE OF EP

SOFTSKILLS. Behavioral skills and personality qualities	
SS1. Competence in managing one's own literacy	<p>SS1.1.The ability of self-learn, self-develop and constantly update their knowledge with in thechosen trajectory and in an interdisciplinary environment.</p> <p>SS1.2. The ability to express houghts, feelings, facts and opinions in the professional field.</p> <p>SS1.3. The ability formobility in the modern world and critical thinking.</p>
SS 2. Language competence	SS2.1.The ability to build communication programs in thestate, Russian and foreign languages.

	SS2.2. The ability for interpersonal social and professional communication in the condition so finite cultural communication.
SS 3. Mathematical Competence and Competence in the field of Science	SS3.1. The ability and willingness to apply the educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university to solve professional problems.
SS 4. Digital competence, technological literacy	SS4.1. The ability to demonstrate and develop information literacy through the mastery and use of modern information and communication technologies in all areas of their lives and professional activities. SS4.2. The ability to use various types of information and communication technologies: Internet resources, cloud and mobile services for searching, storing, protecting and disseminating information.
SS 5. Personal, social and academic competencies	SS5.1. The ability for physical self-improvement and focus on a healthy lifestyle to ensure full-fledged social and professional activities through the methods and means of physical culture. SS5.2. The ability to social and cultural development based on the manifestation of citizenship and morality. SS5.3. The ability to build a personal educational trajectory throughout life for self-development, career growth and professional success. SS5.4. The ability to successfully interact in a variety of socio-cultural contexts during study, work, home and leisure.
SS 6. Entrepreneurial competence	SS6.1. The ability to be creative and entrepreneurial in a variety of environments. SS6.2. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, allocate resources and manage your time. SS6.3. The ability to work with consumer requests.
SS 7. Cultural awareness and ability to express yourself	SS7.1. The ability to show world view, civil and moral positions. SS7.2. The ability to be tolerant of the tradition and culture of other peoples of the world, to have high spiritual qualities.
HARD SKILLS	
Theoretical knowledge and practical skills specific to this field	HS1. Ability to perform design, modeling and engineering calculations using standard software packages of CAD/CAM / CAE systems and computer-aided design of mechanical engineering products; submit design documentation in accordance with ISO, USDD and USTD standards; use the capabilities according to the rules of operation of computer-measuring systems, control of the main technological parameters of 3D printing; HS 2. The ability to master and apply modern methods of organizing, planning and managing machine-building production, to manage the development of design and technological documentation, control programs for machine tools with program control and metalworking centers; HS3. The ability to implement the results of scientific research in the design and implementation of technological

	<p>processes of mechanical and thermal processing, to solve basic metric and positional problems and layout solutions based on 3D modeling of products and technological processes of mechanical engineering;</p> <p>HS4. the ability to improve technologies, robotic systems and means of machine-building production, to model and design types of basic equipment, tools, tooling, to independently choose the optimal technology and equipment for the production of products;</p> <p>HS5. the ability to apply modern teaching methods in the field of technical disciplines, to critically assess the scientific organization of the work of a teacher of higher education, to use methods of enhancing the activity of students, to own professional terminology in a foreign language.</p>
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3.1 Matrix of correlation of EP learning outcomes in general with modules formed by competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8
SS1	+	+	+	+		+	+	
SS 2		+	+					+
SS 3			+			+		+
SS 4				+	+	+	+	
SS 5	+	+	+		+		+	
SS6	+	+		+	+		+	+
SS7	+		+			+		+
HS 1				+	+		+	
HS 2		+		+		+		
HS 3	+				+	+	+	+
HS 4		+		+			+	
HS 5	+		+					+

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

№	Module name	Cycles	UC/EC	Component Name	Brief course description	Number of credits	Generated learning outcomes (codes)											
							LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10		
1	Module of Scientific and Pedagogical Training	BD	UC	History and philosophy of science	<p>Purpose: To study the problems of the phenomenon of science as a subject of special philosophical analysis, patterns and trends in the development of special activities for the production of scientific knowledge taken in a socio-cultural context.</p> <p>Content: Identification of the specifics and interrelation of the main problems of the history and philosophy of science. The study of the laws of the development of science and the structure of scientific knowledge, methods of scientific research. Knowledge of the basic 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 the understanding of 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 reflexive thinking and metacognitive abilities.</p>	4	v		v									
2		BD	UC	Foreign language (professional)	<p>Purpose: systematic deepening of communicative competence within the framework of international standards of foreign language education on the basis of</p>	4			v			v						

				<p>further development of skills and abilities of active language proficiency in the professional activity of the future graduate student.</p> <p>Content: Levels B2, C1 are presented in the form of a pragmatic professional orientation for professional and academic purposes at an advanced level: scientific information base, interpretation of scientific information, argumentation, beliefs, scientific polemics, academic writing. The use of innovative methods and technologies, and the involvement of modern means (Internet resources). Demonstration of knowledge of language material in any related discipline.</p>												
3		BD	UC	Psychology of management	<p>Purpose: to ensure the competence of a psychologist by mastering his knowledge in the field of psychological management, the development of human resource management skills of the organization.</p> <p>Contents: methodological foundations of management psychology. Development of psychological management theories. General theoretical issues of management psychology. Psychology of managerial communication. Psychological characteristics of the staff. Psychology of employee motivation. Human resource management technologies of the organization. Psychological support of the personnel policy of the organization. Psychology of conflict in the organization. Technologies for preventing professional deformation of the personality. Practical implementation in the form of creation of diagnostic tools, development of digital methods of training managers, management consulting.</p>	4		v	v		v					

4	Methodical Bases of Teaching	BD	UC	Higher school pedagogy	<p>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 school pedagogy, technologies of planning, organization and management of the educational process at the university.</p> <p>Contents: Modern paradigms of education, history and the latest trends in the development of higher professional education in the world and in Kazakhstan. Genesis and methodology of higher school pedagogy, competence of a university teacher. Problems of university didactics, problems of organization of educational work with students, management of a modern university. Modern approaches and methods of teaching and organization of students' learning activities, assessment of academic achievements.</p>	4		v	v							
5		PD	UC	Methods of Teaching Engineering Disciplines	<p>Purpose: to acquire the skills of organizing the educational process of teaching technical disciplines</p> <p>Content: General questions of the methodology of teaching engineering disciplines of higher education. Objectives and content of higher education. General didactic principles of teaching in relation to the higher education system. The system of higher education. The main organizational forms of higher education. Structure and types of higher education classes. Methods of higher education. Innovative technologies in higher education. Planning of educational work and preparation of a teacher of vocational training for classes. Educational and</p>	5			v					v		

					material base of higher education. Control, assessment of knowledge, skills, and accounting of students' progress.												
6		BD	UC	Pedagogical practice	<p>Purpose: formation of practical teaching skills in higher education.</p> <p>Content: Preparation of documents on the organization of classes, preparation for classes and conducting classes using methods of activating students. Setting up and laboratory work workshops, acquiring the skills of conducting training sessions, applying new educational technologies, directing the research work of students.</p>	4	v		v							v	
7	Research Methodology	PD	EC	Qualimetry in Mechanical Engineering	<p>Purpose: formation of knowledge of the assessment of the quality of engineering facilities, its quantitative expression and the use of the results obtained to solve the problems of quality management, certification and certification of products.</p> <p>Content. The history of the origin of qualimetry. Principles of qualimetry. Objects of qualimetry. Theory of qualimetry. Methods of product quality assessment. Quality management in the organization. Quality control. The index of defects and quality. Nomenclature of quality indicators of industrial products. Problems of qualimetry of technical indicators.</p>	4					v	v					
8		PD	EC	Reliability and Durability of Machines	<p>Purpose: formation of basic knowledge on the analysis of reliability and durability of equipment, the main directions for improving their reliability indicators at the stage of design, manufacture, operation of equipment.</p> <p>Content. The main indicators of reliability and durability. Physical foundations of reliability theory. Physics of failure occurrence. The laws of distribution of</p>					v	v					v	

					failures. The main factors affecting the mechanical characteristics of products obtained by 3D printing. Mechanics of destruction. The influence of printing modes on the properties of products. Ensuring the reliability and durability of parts obtained by 3D printing. Technological methods for ensuring reliability. Quality and reliability. Reliability tests.												
9		BD	EC	Systems of Management Mechanical Engineering	<p>Purpose: to give undergraduates knowledge of control systems in mechanical engineering, the patterns of technological processes, the identification of those parameters, the impact on which is most effective for the management and intensification of production.</p> <p>Contents: Composition and classification of standards of USDD,USTD and organization of production, classification signs of mechanical workshops, designations of technological documents, rules for the development of approval, storage of documentation. Information processing systems, The use of flexible production systems and modules (GPS, GPM). Management systems of machine-building enterprises.</p>	4		v		v							
10		BD	EC	Computer-aided Design Systems for Production	<p>Purpose: to acquire computer-aided design skills of machine-building industry enterprises in higher educational institutions and research organizations.</p> <p>Contents: Computer-aided design: a systematic approach to design. International CAD classification. Stages of designing complex products. Integrated CAD systems. Levels of designing complex products. Economic efficiency of computer-aided design. Methods of</p>					v	v	v					

					synthesis and evaluation of design decisions, decision-making: principles of optimal decision-making, mathematical methods of multi-criteria optimization, methods of expert assessments, optimality criteria. Project Management Systems (PDM).												
11		PD	EC	Process of Forming and Tools	<p>Purpose: to instill the necessary knowledge, skills and abilities in the theory and methods of design and operation of cutting tools.</p> <p>Contents: purpose and classification of cutting tools. The specifics of metal-cutting equipment. Technological methods of production of blanks. Methods of mechanical processing of surfaces of machine parts Metal cutting. Metal-cutting machines. Production of standard parts on machine tools. Study of relationships and patterns (mechanical, electromechanical, physical and technical processes, as well as dimensional, informational, economic, etc.) in order to create and improve processing processes and related equipment.</p>	6				v		v					
12		PD	EC	Processing of New Construction Materials	<p>Purpose: to teach the undergraduate to solve in the future many practical issues related to STP in various fields of technology, modern progressive methods of production of metals, new structural materials.</p> <p>Contents: structural materials and their classification. New construction materials and their properties. Light alloys. Materials for mechanical structures. Conductor materials. Magnetic materials. Dielectric materials. Information about ceramic materials. Types of ceramic materials. Ceramic composites.</p>					v		v					

					Production, molding and joining of ceramic materials. Fibrous, dispersed-filled and foamed composites. Composites with a metal matrix. Composites with polymer and carbon matrices.											
13		BD	EC	Database Infrastructure Administration	<p>Purpose: to acquire database management skills at various levels of administration.</p> <p>Content: Databases. Database management systems. Database management in various levels of administration. Performing the duties of an Administrator. Connection in INTERNAL mode. Organization of User access to databases, data blocks, extents to segments. Implementation of user management, audit. Methods of ensuring database integrity, backup. Creating object-oriented databases.</p>	6			v		v					
14		BD	EC	Organization and Planning of Research and Innovation Activities	<p>Purpose: to acquire the skills of conducting research and innovation activities, to master the methods of experimental work and work with scientific and technical literature.</p> <p>Content: the importance of research and innovation activities at industrial enterprises, research institutes and design organizations. Basic concepts and definitions of the theory of planning and organization of scientific, pedagogical and innovative activities. Economic efficiency of forecasting, programming of scientific research. The place of organization and planning in the creation of progressive technology and technology. Targeted programs as an important link in the long-term plan of scientific and practical activities. Program-target planning in scientific and practical activities. Information basis and tasks of justification</p>			v					v			

					of target programs. Experimental studies. Forecasting methods.											
15				Research practice	<p>Purpose: to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of scientific research.</p> <p>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 mechanical engineering in the world and Kazakhstan; the role of science and innovation in the improvement and modernization of technology; current trends in the development of mechanical engineering technology. Research of the most urgent problems of mechanical engineering technology, production of modern equipment and machines. Performing theoretical and experimental research on the topic of the dissertation.</p>	6		v	v	v					v	
16	Modern Technological Processes and Production	BD	EC	Technologies and Equipment for Mechanical and Physical-technical Treatment	<p>Purpose: to gain an understanding of technologies and equipment for mechanical and physical-technical processing.</p> <p>Content: Processing of materials by cutting and physical and technical methods. The physical basis of tool wear. Physical and technical methods of processing. Manufacturing of a part by removing a layer of material from the workpiece as a result of all possible types of exposure in mechanical, thermal, electrical and chemical environments and their combinations. Electron beam processing and laser processing, principles of operation and physical circuits,</p>	5				v	v					

				installations, applications.												
17		BD	EC	Development of Technological Processes for the Manufacture of Parts on CNC machines.	<p>Purpose: Mastering the processing methods and technology of software control of machines when processing materials by cutting.</p> <p>Content: Organization of management and preparation of technological equipment for processing centers. Tooling of CNC machines. The specifics of technological transitions for turning machining centers. Tooling for turning machining centers. The specifics of technological transitions for milling machining centers. Machine tools and tooling for milling machining centers. The specifics of technological transitions for CNC machines.</p>				v	v		v				
18		PD	EC	Surface and Sheet Metal Modeling	<p>Purpose: acquisition of skills of three-dimensional modeling and construction of working documentation for surface and sheet type products.</p> <p>Content: design methods and application software packages for solving problems and stages of three-dimensional surface and sheet modeling. Operations with a three-dimensional model. Formation of a model of releases, extension of elements. Creating cutouts, bends, and unfoldings of sheet parts. Creating plates, blinds, closing corners. Creating an open and closed stamping model.</p>	5				v	v					
19		PD	EC	Modern Technological Processes in Mechanical Engineering	<p>Purpose: to acquire knowledge and skills of using modern technological processes of mechanical processing, welding and assembly production.</p> <p>Content: Problems of modern mechanical engineering. Modern technologies of metal</p>					v		v	v			

					processing by pressure. Different welding classes. Automatic laser cutting for metal cutting. Technology of metal processing by cutting. Machines used in flexible production systems. Principles of machine tool aggregation. Automated control of machines. Multi-purpose machines and machining centers. Methods for controlling the accuracy of machining at machining centers. Production of products made of non-metallic materials.													
	Machine Design Methods	PD	EC	Nanotechnology in mechanical engineering	<p>Purpose: formation of knowledge about new materials used in mechanical engineering, about the physical essence of nanotechnology, the scope of their application.</p> <p>Content. Physical foundations of nanotechnology. Classification of nanomaterials. Nanomaterials for mechanical engineering. Nanopowders (features of structure and properties, basic methods of production, application). Mixtures and complex oxides. Nanostructured materials on a solid basis. Spraying. Structuring. Coverage. Hardening of stainless, structural tool steels. Hardening of hard alloys. Methods and methods of application of nanotechnology in mechanical engineering.</p> <p>Prospects for the development of nanotechnology in mechanical engineering.</p>	5										v		v
		PD	EC	Nanotechnologies and nanomaterials	<p>Purpose: formation of knowledge in the field of nanomaterials and nanotechnologies, in the design and development of nanotechnologies of materials and devices of a new generation.</p> <p>Content. Basic concepts, terms and</p>						v		v					

				<p>definitions. Physical, chemical and technological features of various types of nanostructured materials. Carbon nanoclusters, nanostructures, and nanomaterials (nanotubes, fullerenes, fullerenes, graphene). The shape and structure of nanotubes, methods of production. Properties of nanotubes. Definition of technology and nanotechnology. Classification of nanotechnologies. The basic concepts of modern technologies of synthesis of nanomaterials and the main methods of diagnostics of nanomaterials. Prospects of nanomaterials, nanostructures and nanotechnologies.</p>												
		PD	EC	<p>3D modeling of parts and assembly units in CAD/CAM systems</p>	<p>Purpose: acquisition of skills in 3D modeling of parts and assembly units in CAD/CAM systems Content: Application software packages for 3-dimensional modeling of parts and assembly units. Creation of a solid-state model according to the design parameters of the design documentation. Using methods of solid-state surface and sheet modeling. Getting associative views on drawings from three-dimensional models. Creating two-dimensional drawings based on a three-dimensional model. Automatic acquisition of associative dimensions from three-dimensional models.</p>	6				v	v	v				
		PD	EC	<p>Modeling of technical systems</p>	<p>Purpose: to master the methods of designing the production technology of machines. Contents: basic concepts of the technology of production of parts, assemblies and assembly of machines. Determination of the type of production. Requirements for technological processes.</p>						v		v			

					Methodology of technological process development. Automation of technological process design. Dimensional analysis of technological processes. Design of standard and group technological processes. Modular technology for manufacturing parts. Classification of technology elements. Automated systems of classification, grouping and design of technological processes. Feasibility study of the effectiveness of the selected technological process.												
		PD	EC	Design and Strength Calculations in CAD/CAE Systems	<p>Purpose: To master the methods of calculations for the strength and durability of machine parts in the conditions of friction pairs and machine parts operating under repeatedly variable loads.</p> <p>Content: design, construction and engineering calculations of products in CAD/CAM/CAE systems. Purpose, functions and classification of CAD/CAM/CAE systems. Performing analysis of strength calculations. Using the possibilities of optimization of structures based on iterative modeling and construction of parametric models, the possibilities of the finite element method as a modern tool for engineering analysis of structures. Expanding the scope of CAD/CAM/CAE technologies in mechanical engineering.</p>	5					v		v	v			
		PD	EC	Design Methods in CAD/CAE Systems	<p>Purpose: to master the methods of designing machines based on the application of modern design methods and software.</p> <p>Content: Design of mechanical engineering products and development of technological processes for their manufacture.</p>					v	v		v				

				Search for optimal solutions in the design of products and the development of technological processes. Solving the problem of designing automated technological processes and control programs using CAD/CAM/CAE systems. Prospects and possibilities of automation of design and technological preparation of production in modern conditions of mechanical engineering. Software and hardware required to work in CAD/CAM/CAE systems.												
		PD	EC	Modeling in CAD /CAM System SOLIDWORKS	<p>Purpose: to study the methods of designing parts and modeling parts and assemblies, developing the technology of the assembly process in serial and mass production.</p> <p>Content: Modeling of physical and technological processes based on computer modeling of parts and assembly units. The main features and tools of the SOLIDWORKS application programs for modeling parts and assemblies. Performing cuts and sections of the model. Design of welded frame parts and assembly of the welded product. Modeling the simplest parts and creating common assemblies.</p>	6				v	v					
		PD	EC	Design preparation of production	<p>Purpose: to study the methods of designing machines and to acquire the skills of design preparation for the development of new products.</p> <p>Content: The main tasks and stages of design preparation of production. The main ways to improve productivity. Economic efficiency and progressiveness of new technology. Measures to improve labor productivity and production efficiency. Technical preparation of automated production. The effectiveness of</p>			v		v						

				accelerating technical training and mastering the production of new equipment. Methods of accelerating design training. The main directions of acceleration of technological preparation of production.													
		PD	EC	Fracture Mechanics	<p>Purpose: Formation of knowledge about the phenomena of the destruction process, mathematical modeling of this process, concepts and methods of mechanics of destruction of materials.</p> <p>Contents: Types and stages of destruction of machine parts. Linear mechanics of destruction. Types of cracks. Mechanisms of crack generation. Stress intensity factor. Mechanics of elastic-plastic fracture. Crack resistance. Viscous and brittle destruction. Mechanics of destruction in creep conditions. Damage parameter. Mechanics of fatigue failure. Multi-cycle and low-cycle fatigue. Fatigue cracks and the effect of creep on their growth.</p>	5				v	v	v					
		PD	EC	Modernization and development of new products.	<p>Purpose: to master the methods of organizing the production of new products at enterprises, to learn how to develop plans for technological preparation of production during the reconstruction and commissioning of new workshops.</p> <p>Contents: System engineering of pre-production in mechanical engineering. Non-factory systems of technological preparation of production (TPP). Functional modeling of RDW and design preparation of production. The procedure for conducting development work. Services, departments and bureaus of technological preparation of production. Systems of technological preparation of production capacities of enterprises.</p>			v		v							

				Technological analysis of production. Organizational preparation of production. Management requirements for organizational preparation of production. Restructuring of production.												
	Module of research work and Final Certification		Research Work of a Master Student	<p>Purpose: To acquire the skills of conducting scientific research and obtaining results for a master's thesis.</p> <p>Contents: Analytical review of well-known design and technological solutions, selection and justification of the technological scheme of production in accordance with the topic of the dissertation. The use of information technologies and computer programs in the design and development of technological processes for the manufacture of mechanical engineering products. Determination of the economic efficiency of design and technological solutions. Drawing conclusions, modeling, processing and interpretation of the results obtained.</p>	24		v			v	v	v				
			Execution and Defense of Master's Thesis	<p>Purpose: To present and defend a dissertation in accordance with the topic of the dissertation and the requirements for them.</p> <p>Content: During the execution, design and defense of the master's thesis, the undergraduate demonstrates knowledge about the current state, problems and prospects of the development of mechanical engineering, the development of methods of theoretical and experimental research, processing, analysis and generalization of results, the use of computer programs for modeling static and dynamic processes, the design and competent provision of scientific and</p>	8	v		v	v	v		v	v			

					project products. Defense of the master's thesis.												
						120											

5. SUMMARY TABLE REFLECTING THE VOLUME OF CREDITS MADE IN THE SECTION OF EDUCATIONAL PROGRAM MODULES

Course of Study	Semester	Number of master modules	Number of disciplines studied		Number of KZ credits					Total hours	Total KZ loans	number	
			HsC	EC	Theoretical teaching	Teaching practice	Research practice	Research work of a master student	final examination			exam	diff. test
1	1	3	5	2	29	-	-	1	-	900	30	6	2
	2	4	-	4	22	4	-	4	-	900	30	4	2
2	3	3	-	2	11	-	6	3	-	600	20	2	2
	4	2	-	3	16	-	-	4	-	600	20	3	1
Total		6	5	11	73	4	7	24	12	3600	120	15	6

6. LEARNING STRATEGIES AND METHODS, MONITORING AND EVALUATION

Learning strategies	<p>Student-centered learning: the student is a center of teaching/learning and an active participant in the learning and decision-making process.</p> <p>Practice-oriented training: focusing on the development of practical skills.</p>
Teaching methods	<ul style="list-style-type: none"> • Conducting lectures, seminars, various types of practices with: • using innovative technologies: <ul style="list-style-type: none"> • problem-based learning; • case study; • work in a group and creative groups; • discussions and dialogues, intellectual games, olympiads, quizzes; • reflection methods, projects, benchmarking; • Bloom's taxonomies; • presentations; • rational and creative use of information sources: <ul style="list-style-type: none"> • multimedia training programs; • electronic textbooks; • digital resources. <p>Organization of independent work of students, individual consultations.</p>
Monitoring and the evaluation of the achievability of learning outcomes	<p>Current control on each topic of the discipline, control of knowledge in classroom and extracurricular classes (according to syllabus). Assessment forms:</p> <ul style="list-style-type: none"> • survey in the classroom; • testing on the topics of the academic discipline; • control works;

	<ul style="list-style-type: none">• protectionofindependentcreativeworks;• discussions;• trainings;• colloquiums;• essays, etc. <p>Boundary control at least twice during one academic period within the framework of one academic discipline.</p> <p>Intermediate certification is carried out in accordance with the working curriculum, academic calendar.</p> <p>Formsofholding:</p> <ul style="list-style-type: none">• exam in the form of testing;• oral examination;• written exam;• combined exam;• protect of practice reports.. <p>Finalstatecertification.</p>
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7. EDUCATIONAL AND RESOURCE SUPPORT OF THE EP

<p>InformationResourceCenter</p>	<p>The university has a unified system of library and information services. The total area of the scientific library is 2917.18 m², including the area of the book depository – 101.1 m². The library fund is replenished by 200-300 copies .new publications, for which 400-600 thousand tenge is allocated. The unified information and library fund is 2440639 copies, including 1523820 copies in the state language. all types and types of publications. Electronic access to library resources is provided via the university's website page http://www.asu.ukgu/, which presents:</p> <ul style="list-style-type: none"> - electronic library catalog; - electronic library; - personal indexes of the works of scientists; - bibliographic indexes and lists; - acquired information resources; - new arrivals; - list of periodicals issued by the library, etc. <p>The library page on the website is regularly updated. Access is organized from the university's website and Educational Portal.</p>
<p>Materialandtechnicalbase</p>	<p>The material and technical base of the university currently consists of: three academic buildings, which house a library, reading and subscription halls, laboratories, specialized classrooms and classrooms, which are equipped with modern technical training facilities. All computer classes are equipped with new generation computers and LCD monitors, connected to a local network and connected to the Internet, the services of which all employees and undergraduates use for free and without time limit. University departments are equipped with computers, printers, audio-video equipment. Interactive whiteboards, multimedia projectors, panoramic screens are available for classes. The University has a sufficient sports base, which consists of a combination of various indoor and outdoor sports facilities.</p> <p>University resources are available to teachers and undergraduates, including a scientific library with electronic resource halls, a publishing house, dormitories, a student household complex, a sanatorium-dispensary, 2 medical offices.</p> <p>A printing house equipped with the necessary equipment for the publication of teaching aids, books, visual aids; an editorial and publishing department with a production site on which printing equipment is installed operates.</p> <p>Offices for administration, teaching staff, staff, affordable modern equipment contribute to maintaining the goals of educational programs, the expected learning outcomes of undergraduates and provide an atmosphere conducive to learning.</p> <p>The classroom fund consists of lecture halls, seminar rooms, laboratory facilities, workplaces for undergraduates, as well as facilities, tools and equipment, modern instrumentation, meet the requirements of the OP.</p>

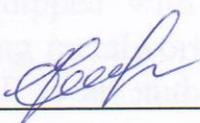
	<p>The material and technical base of the OP is represented by the following resources: the educational area of the premises is 327m², including 2 specialized laboratories in metrology with an area of 47 and 44 m² and an interdepartmental laboratory with an area of 693 m² (118 B), taking into account one undergraduate -6.4 m², where laboratory installations in several disciplines and research stands are installed. The educational process and scientific research are carried out in 5 specialized laboratories and subject classrooms, including computer classes of the department and scientific laboratories of the university. The laboratories are equipped with modern scientific equipment, interactive whiteboards for conducting all types of classes, taking into account modern requirements for the use of innovative teaching technologies. There are 17 computers for use by undergraduates, undergraduates, teaching staff of the Department of electronic regulatory framework (ST RK, GOST, international standards, etc.),</p>
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AGREEMENT SHEET

according to the Educational program

«7M07123-3D-modeling in mechanical engineering»

Director of AID  A.S. Naukenova

Director of ASD  U. B. Nazarbek

Director of DEK  T. S. Bazhirov