A. Burkitbayev Institute of Power and Mechanical Engineering

Department of «Mechanical engineering»

EDUCATIONAL PROGRAM

7M07228 - Advanced technologies of materials processing

(Code and name of educational program)

Code and classification of the field of education:
7M07-Engineering, manufacturing and contruction industries
Code and classification of training directions:
7M072- Industrial and manufacturing branches
Group of educational programs:
M113 - Technology of materials pressure processing
Level based on NQF: 7
Level based on IQF: 7
Study period: 2 years
Amount of credits: 120

Almaty 2025

Educational program **7M07228 - Advanced technologies of materials**
(code and name of educational program)

processing

was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes 10 dated « 06 » 03 2025.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes 3 dated « 20 » 12 2024.

Educational program **M07228 - Advanced technologies of materials**
(code and name of educational program)

processing

was developed by Academic committee on direction of "7M072-Industrial and manufacturing branches"

Full name	Academic degree/ academic title	Position	Workplace	Signature
Teaching staff:				
Nugman E.Z.	Doctor PhD, Associate Professor	Head of the Department of "Mechanical Engineering"	Institute of Energy and Mechanical Engineering named after A.Burkitbaev	
Kerimzhanova M.F.	Candidate of Technical Sciences, Docent	Professor	Department of Mechanical Engineering	
Uderbayeva A.E.	Doctor PhD	Assoc. Professor	Department of Mechanical Engineering	
Employers:				
Andreev V.I.		General Director	Kazecotech STE LLP	
Students				
Myrzakhan A.		1st year doctoral student	Department of "Mechanical Engineering"	

Table of contents

List of abbreviations and designate

ECTS	European Credit Transfer and Accumulation System
BD	Basic disciplines
HEI	Higher education institution
SMSE	State mandatory standard of education
KazNRTU	K. I. Satpayev Kazakh National Research Technical University
MEP	Modular educational program
NJSC	Non-profit joint stock Company
RWMS	Research work of a master's student
EP	Educational program
PD	Profile disciplines
WC	Working curriculum
IWMS	Independent work of a master's student
EMC	Educational and Methodological Council
AC	Academic council
SDGs	Sustainable development goals

1 Description of educational program

EP 7M07228 - "Advanced technologies of materials processing" are focused on learning outcomes that form professional competencies in accordance with the requirements of the labor market.

The objects of professional activity of the master in EP 7M07228 - "Advanced technologies of materials processing" are:

-digitalization of machine-building production, including information-sensor, executive and control modules, their mathematical, algorithmic and software, methods and means of their design, modeling, experimental research and design;

- theoretical and experimental studies of digitalization of machine-building production for various purposes.

The Master's degree in EP 7M07228 - " Advanced technologies of materials processing" can perform the following types of work and professional activities.
Types of professional activities for which graduates who have mastered the

Master's degree program are preparing:

- research;
- design and engineering;
- organizational and managerial;
- installation and commissioning;
- service and operational;
- scientific and pedagogical.

A master's degree in the field of training "Advanced materials processing technologies" should be prepared to solve professional tasks in accordance with the profile orientation of the master's program and types of professional activity:

research activities:

- analysis of scientific and technical information, domestic and foreign experience in the field of development and research of digitalization of machine-building production; study of new methods of control theory, artificial intelligence technologies and other scientific areas that make up the theoretical basis of digitalization of machine-building production, compilation and publication of reviews and abstracts;

- carrying out theoretical and experimental research in the field of development of new samples and improvement of existing digitalization of machine-building production, their modules and subsystems, search for new additive technologies;

- conducting patent research accompanying the development of new digitalization of machine-building production, in order to protect intellectual property objects, the results of research and development;

- development of experimental samples of digitalization of machine-building production, their modules and subsystems in order to verify and substantiate the main theoretical and technical solutions to be included in the terms of reference for the implementation of development work;

- organization and conduct of experiments on the existing digitalization of machine-building production, their subsystems and individual modules in order to determine their effectiveness and identify ways to improve, processing the results of

experimental research using modern information technologies;

- preparation of reports, scientific publications and reports at scientific conferences and seminars, participation in the implementation of research and development results into practice;

design and engineering activities:

- preparation of a feasibility study of new digitalization projects of machine-building production, their individual subsystems and modules;
- calculation and research of digitalization of machine-building production, control, information-sensor and executive subsystems using mathematical modeling methods, conducting mock-up and testing of existing systems, processing experimental data using modern information technologies;
- development of special software for solving design problems of digitalization of machine-building production, development of technical specifications and direct participation in the design of additive machines and equipment;

organizational and managerial activities:

- development of organizational and technical documentation (work schedules, instructions, plans, estimates) and established reporting on approved forms;
- organization of the work of small groups of performers involved in research, design work and experimental research;
- control over the implementation of measures for the prevention of occupational injuries, occupational diseases, prevention of environmental violations in the process of research and operation of digitalization of machine-building production;

installation and commissioning activities:

- participation in verification, adjustment, adjustment, assessment of equipment condition and setting up digitalization of machine-building production for various purposes, including both technical means and software control systems;
- participation in the coupling of software and hardware complexes with technical objects as part of the digitalization of machine-building production, in testing and commissioning of prototypes of such systems;

service and operational activities:

- participation in verification, adjustment, adjustment and assessment of the state of digitalization of machine-building production for various purposes, as well as their individual subsystems, in setting up control hardware and software complexes;
- preventive control of the technical condition and functional diagnostics of digitalization of machine-building production for various purposes, as well as their individual subsystems;
- preparation of operating instructions for digitalization of machine-building production and their hardware and software, development of routine testing programs;
- preparation of applications for equipment and components, preparation of technical documentation for equipment repair;

scientific and pedagogical activity:

- participation in the development of programs of academic disciplines and courses based on the study of pedagogical, scientific, technical and scientific-

methodical literature, as well as the results of their own professional activities;

- participation in the formulation and modernization of individual laboratory work and workshops in professional disciplines;
- conducting training sessions with students, participating in the organization and management of their practical and research work;
- application and development of new educational technologies, including computer and distance learning systems.

2 Purpose and objectives of the educational program

Purpose of EP:

Training of highly qualified and competitive scientific and pedagogical personnel for design, research, production, technological and management activities in the field of digitalization of materials processing technology by pressure.

Tasks of EP:

- formation of knowledge of the basics of advanced technologies in the field of materials processing;
- acquisition of theoretical and practical knowledge on the organization, conduct of scientific and experimental research in the field of development of innovative technologies in the field of procurement production;
- formation of knowledge and skills in the analysis of scientific and technical information, new methods of management theory, scientific directions of advanced materials processing technologies;
- formation of knowledge and practical skills of performing scientific and pedagogical activities, the use of computer and distance learning.

3 Requirements for evaluating the educational program learning outcomes

Description of the mandatory standard requirements for completing a 2-year master's degree in scientific and pedagogical direction and awarding the academic degree of Master of Technical Sciences: mastering at least 120 academic credits, including theoretical training, research work of a graduate student and the defense of a master's thesis.

4 Passport of the educational program

4.1 General information

№	Field name	Comments
1	Code and classification of the field of education	7M07- Engineering, manufacturing and contruction industries
2	Code and classification of training directions	7M072 - Industrial and manufacturing branches
3	Educational program group	M113 - Technology of materials pressure processing
4	Educational program name	7M07228 - "Advanced technologies of materials

		processing".
5	Short description of educational program	The professional activity of graduates of the educational program is aimed at digitalization of procurement production, processing of materials by pressure. In the educational program, students receive professional knowledge on digital design and modeling of new materials, product designs used for the manufacture of blanks, organization, conducting research in the field of materials processing by pressure. He has the skills of designing and developing innovative processes, methods of processing nanomaterials, powder materials, advanced technologies, machinery and equipment.
6	Purpose of EP	Training of highly qualified and competitive scientific and pedagogical personnel for design, research, production, technological and management activities in the field of digitalization of materials processing technology by pressure.
7	Type of EP	New
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	-
11	List of competencies of educational program	- Ability to follow ethical standards in professional activity; - The ability to plan and solve problems of their own professional and personal development. - Ability to critically analyze and evaluate modern scientific achievements, generate new ideas when solving research and practical tasks; - The ability to design and carry out comprehensive research based on a holistic systematic scientific worldview using knowledge in the field of history and philosophy of science; - Willingness to participate in the work of domestic and international research teams to solve scientific and educational problems in the field of technologies for processing new materials; - Willingness to use modern methods and technologies of scientific communication in the state and foreign languages;
12	Learning outcomes of educational program	ON1 To understand, interpret and use a foreign language in their professional, scientific and pedagogical activities. ON2 Analyze psychological phenomena and processes, develop and apply psychological methods in professional activities. ON3 Apply modern methods of computer modeling of objects and technological processes, methods of computer-aided design of the product lifecycle. ON4 Analyze, design and control innovative technological processes for pressure treatment of materials to ensure product quality, energy efficiency and sustainable production development. ON5 Demonstrate knowledge of advanced materials, methods of their production and application in digital engineering production. ON6 Analyze and apply environmentally friendly, resource-saving materials in innovative pressure treatment

		technologies. ON7 Apply sound solutions for the design and application of multipurpose equipment, the operation of machinery and equipment that ensure the environmental and industrial safety of digital production. ON8 Demonstrate knowledge of digital industrial enterprise management systems and innovative technological processes. ON9 To develop and conduct scientific research and experimental work in the field of advanced technologies for processing materials by pressure. PO10 To evaluate the impact of tribological processes and develop measures to improve the reliability of technological processes and products. PO11 To analyze and apply norms in the field of intellectual property, scientific research and sustainable development strategies.
13	Education form	full-time
14	Period of training	2 years
15	Amount of credits	120
16	Languages of instruction	russian
17	Academic degree awarded	Master of technical sciences
18	Developer(s) and authors	The educational program was developed by the academic committee on direction «7M072 - Industrial and manufacturing branches»

4.2 Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)										
				ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9	ON10	ON11
Cycle of basic disciplines University component														
1	Foreign language (professional)	The course is designed for undergraduates of technical specialties to improve and develop foreign language communication skills in professional and academic fields. The course introduces students to the general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies. The course ends with a final exam. Undergraduates also need to study independently (MIS).	5	v										
2	Psychology of management	The discipline studies the modern role and content of psychological aspects in managerial activity. The improvement of the psychological literacy of the student in the process of implementing professional activities is considered. Self-improvement in the field of psychology and studying the composition and structure of management activities, both at the local level and abroad. The psychological feature of modern managers is considered.	3		v									
3	History and philosophy of science	The subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	3									v		v
4	Higher school pedagogy	The course is intended for undergraduates of the scientific and pedagogical magistracy of all specialties. Undergraduates will master the methodological and theoretical foundations of higher school pedagogy, plan and organize the processes of teaching and upbringing, master the communicative technologies of subject-subject interaction between a teacher and a master in the educational process of a university.	3	v										v
Cycle of basic disciplines Elective component														
5	Equipment and technology of rolling production	The purpose of the discipline is the development of technological processes, the production of all the main types of rolled products – semi-	5				v					v		

		finished products, rails, beams, long and sheet metal, wheel bands. The methods of rolling all types of product, the equipment used and the calibration of rolls necessary to understand the essence of the process are studied. The flow of the material during rolling of the most important types of product is described, for calculating the elements of the technological process													
6	Technologies of pressing and drawing of materials	The purpose of the discipline is to form knowledge and principles in the field of physical foundations and mathematical theory of plastic deformation. The theoretical foundations and practical method of calculating processes in the technology for metal processing by pressure are studied, the methods of experimental determination of the parameters of the stress-strain state using the methods of coordinate dividing grid and current lines under conditions of plane and axisymmetric deformation during pressing and drawing are determined	5				v						v		
7	Technological processes of additive manufacturing	The purpose of the discipline is the formation of knowledge of the basics of digital production in mechanical engineering, the methodology of designing additive technological processes. The discipline studies the history of the development of additive technologies, trends in the development of innovative technologies; the basics of additive manufacturing, the basic principles of additive technologies. The theoretical and technological foundations of the production of products made of polymer and metal materials using additive technologies are considered; the stages of development of technological processes of additive manufacturing are shown and examples of modern equipment for manufacturing products using additive technologies are given.	5			v	v								
8	Fundamentals of research activity	The purpose of the discipline is the formation of knowledge on the technical foundations of the creative process, conducting scientific research in the field of machine-building complex. The general methods and means of research of technological processes of machine-building production, parameters and their characteristics are studied. The methods of creating new patentable technical solutions, modern methods of conducting scientific research and processing their results are being studied. As a result, the skills of applying advanced research methods, identifying new properties and patterns in technological processes, identifying new technical solutions, formulating the novelty of inventions or utility models and their legal protection are acquired.	5				v								v
9	Advanced technologies in mechanical engineering	The purpose of the discipline is to acquire knowledge of modern innovative technologies aimed at developing innovative infrastructure and sustainable industrial processes in accordance with SDG 9. New processing methods in mechanical engineering, technologies of robotization and automation of production are considered. Industrial	5			v		v							

		ecosystems, sustainable approaches to the production and use of materials, reducing the impact of production on the environment, energy conservation, the use of renewable energy sources in mechanical engineering. Engineering design and life cycle management of high-tech production of machine-building products.													
10	Intellectual property and research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.	5								v				v
Cycle of profile disciplines University component															
11	Production Planning and Control	The purpose of the discipline is the formation of knowledge and the acquisition of practical skills in planning and control of machine-building production. The discipline studies the methodology of planning, its features at a machine-building enterprise; conducting marketing research, principles and approaches of operational and calendar planning, material and technical support of production; providing operational activities with the production capacity of the enterprise. The production infrastructure of modern machine-building production, financial planning and control, organizational and technical development and business planning are considered.	5				v				v				
12	Design of Industrial Experiments	The purpose of the discipline is to develop students' skills in designing industrial experiments using statistical methods and mathematical modeling to optimize technological processes, improve product quality and reduce costs. An introduction to experiment design. Comparison of traditional and modern approaches to experimentation. Study of planning methods: full factor experiments, fractional factor plans, central composition and other response plans. Mathematical and statistical methods of data analysis, application of software tools, practical application in industry. The skills of processing and interpreting experimental data using mathematical and statistical methods are acquired.	5									v			v
13	Advanced Digital Manufacturing Monitoring	The purpose of the discipline is to acquire knowledge of the basics of technical diagnostics, production control systems at all stages of the product life cycle. The discipline examines the monitoring system of production equipment, systems of the MDC/MDA class (Machine Data Collection/ Machine Data Acquisition). Systems for monitoring the operation of CNC machines: development of programs that provide information about the condition of the machine and production personnel. The issues of optimization of technological processes, control of the	5				v				v				

		efficiency of the use of equipment, tooling and tools are considered.													
14	Reliability and diagnostics of technological systems	The purpose of the discipline is to develop undergraduates' knowledge, skills and competencies in the field of analysis, evaluation and reliability of technological systems, as well as methods for diagnosing and predicting their condition. The fundamentals of reliability of technological systems, statistical and mathematical methods of reliability analysis, methods of diagnostics of technical systems are studied. The methods of estimating the remaining resource, time series and trends of failures are considered. Diagnostic and monitoring tools for technological systems, automated diagnostic systems. Risk and reliability management in production systems.	5								v			v	
		Cycle of profile disciplines **Component of choice**													
15	Integrated CAD / CAM systems	The purpose of the discipline is to develop undergraduates' competencies in the field of integration of CAD/CAM systems for computer-aided design, modeling, preparation and management of production processes. The role of CAD/CAM in modern manufacturing, architecture and functionality of integrated systems, main platforms (Siemens NX, SolidWorks, CATIA, AutoCAD, Fusion 360, etc.). 3D modeling and parametric design, structural analysis using CAE tools. CAD/CAM integration with PDM/PLM and digital manufacturing, product lifecycle management (PLM). Process optimization using modern CAD/CAM tools.	5									v			
16	CAD/CAM/CAE/PLM of Additive Manufacturing	The purpose of the discipline is to acquire knowledge and skills in designing automated and automated production facilities based on information technology. The discipline examines the principles and methodology of building integrated CAD/CAM/CAE/PLM systems of additive manufacturing, the possibilities and prospects of automation of design and technological preparation of production in modern conditions of mechanical engineering. Integrated systems of design and technological preparation of production, engineering calculations in CAE systems, functions and capabilities of basic systems providing implementation of PLM solutions are studied, practical tasks are solved in the SolidWorks program.	5			v						v			
17	Multipurpose equipment in digital manufacturing	The purpose of the discipline is to acquire knowledge and practical skills in the use of multipurpose equipment in automated production. The design and technological features of CNC machining machines are considered; principles of development of control programs and analysis of machine software; means of technological equipment. The development and implementation of 3D printers are considered; features of their maintenance, diagnostics and operation. The study of the software of CNC equipment, programming features, issues of debugging and editing programs, the advantages of multipurpose equipment in digital production.	5								v				
18	PLM / PDM processes	The purpose of the discipline is the formation of theoretical knowledge and practical skills in designing machine–building products based on modern software	5			v								v	

		products. The discipline examines PDM (Product Data Management) and PLM (Product Lifecycle Management) systems that provide product lifecycle management: marketing research, design of the production facility, planning and development of the production process, technical support and maintenance, disposal and recycling. Practical application of the programs SOLIDWORKS, Compass 3D, Inventor for the formation of the composition of the product using 3D models.													
19	Technological fundamentals of powder metalurgy	The purpose of the discipline is to form knowledge of the mechanism and laws of creating composite and powder materials, mastering engineering skills in building technological processes for obtaining powder materials. The discipline studies the essence of powder metallurgy, prospects and main directions of development. The physical and technological properties of powders, methods of their determination, mechanical and physico-chemical methods of obtaining powders, methods of choosing a method for obtaining powder are considered. Theoretical foundations of powder forming, theory and technology of sintering.	5					v	v						
20	Nanomaterials for processes of processing	The purpose of the discipline is to form knowledge of the problems of creation, research and application of metallic nanomaterials, properties of nanomaterials and methods of their production. The discipline examines the physical foundations of nanotechnology, methods for studying nanostructures and properties; the use of nanomaterials in mechanical engineering. The principles and methods of obtaining functional nanomaterials are studied: carbon, semiconductor, photonic crystals, films of surfactants. Types and methods of obtaining structural nanomaterials (metals, ceramics, composite materials), properties of structural nanomaterials.	5					v	v						
21	Design and operation of machines and equipment for gas and plasma atomization	As a result of the formulated study of this discipline, the cutting process (cutting) should be able to carry out on plasma cutting installations automatically in compliance with all necessary allowances, rationally insert parts on sheets, provide a high utilization rate of metal.	5				v			v					
22	Blanks processing technology on the automatic machines and lines	The purpose of the discipline is to acquire knowledge and practical skills in designing technological processes for manufacturing machine parts on automatic lines. The discipline considers the types, composition, principles of construction of automatic lines (AL); types of machine tools, transport and storage system of automatic lines; fixation devices on AL operations; calculation of productivity and operating modes of AL; feasibility study of automated assembly of machines or processing of machine parts. Quality management of machine production at AL.	5			v	v								

23	Pipe production technologies	The purpose of the discipline is to master the technology of production of different types of pipes. The production of pipes is being studied, starting from seamless pipes on aggregates with automatic, continuous, pilgrim, three-roll rolling mill, on an aggregate with a rack-and-pinion mill for continuous non-stop rolling of pipes to the production of seamless and cold-formed pipes on batch mills. The main technologies of quality and finishing of pipes are described at the modern scientific level	4						v	v				
24	Tribology in pressure treatment	The purpose of the discipline is to acquire theoretical foundations for determining the forces of external friction in various processes of metal processing by pressure. Methods for determining the coefficient of friction in plastic deformation processes are studied. The issues of the theory of lubricating action, the range of effective technological lubricants, methods of their production, as well as lubrication systems and their operating conditions are considered. Described methods of testing lubricants and their technical and economic indicators	4							v			v	
25	Advanced Additive Manufacturing Ergonomics	The purpose of the discipline is the formation of knowledge of ergonomics of machine–building production in the conditions of its automation and digitalization. The discipline examines the historical development of ergonomics, the directions and methods of ergonomics, system engineering design. The ergonomic system, physical and organizational ergonomics in the introduction of additive technologies are studied; problems of system reliability. The classification of human-operator errors, psychological mechanisms of reliability are considered. Research and forecasts of the development of ergonomics of additive equipment and machines.	5				v		v					
26	Design and operation of machines and equipment for filament production systems	The formulated results of the study of this discipline are perfectly mastered the skills of working on machines and machines for the production of filaments, design of equipment for them	5					v		v			v	

5 Curriculum of the educational program

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year: 2025-2026 (Autumn, Spring)
Group of educational programs: M113 - "Technology for materials pressure processing"
Educational program: 7M07228 - "Advanced technologies of materials processing"
The awarded academic degree: Master of Technical Sciences
Form and duration of study: full time (scientific and pedagogical track) - 2 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters				Prerequisites
									1 course		2 course		
									1 sem	2 sem	3 sem	4 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)													
CYCLE OF BASIC DISCIPLINES (BD)													
M1 Engineering training module													
LNG213	Foreign language (professional)		BD, UC	3	90	0/0/30	60	E	3				
HUM214	Psychology of management		BD, UC	3	90	15/0/15	60	E	3				
MSM227	Equipment and technology of rolling production	1	BD, CCH	5	150	30/0/15	105	E	5				
MSM228	Technologies of pressing and drawing of materials	1	BD, CCH	5	150	30/0/15	105	E	5				
MSM220	Technological processes of additive manufacturing	2	BD, CCH	5	150	30/0/15	105	E	5				
MNG782	Sustainable development strategies	2	BD, CCH	5	150	30/0/15	105	E	5				
HUM212	History and philosophy of science		BD, UC	3	90	15/0/15	60	E		3			
HUM213	Higher school pedagogy		BD, UC	3	90	15/0/15	60	E		3			
ISO241	Advanced technologies in mechanical engineering	1	BD, CCH	5	150	30/0/15	105	E			5		
MNG781	Intellectual property and research	1	BD, CCH	5	150	30/0/15	105	E			5		
M3 Practice-oriented module													
AAP273	Pedagogical practice		BD, UC	8				R			8		
CYCLE OF PROFILE DISCIPLINES (PD)													
M2 The module of digitalization of materials processing by pressure													
MSM202	Advanced Digital Manufacturing Monitoring		PD, UC	5	150	30/0/15	105	E	5				
IND229	Production Planning and Control		PD, UC	5	150	30/0/15	105	E	5				
IND228	Design of Industrial Experiments		PD, UC	5	150	30/0/15	105	E		5			
MCH208	Reliability and diagnostics of technological systems		PD, UC	5	150	30/0/15	105	E		5			
MCH255	Integrated CAD / CAM systems	1	PD, CCH	5	150	30/0/15	105	E		5			
IND209	Multipurpose equipment in digital manufacturing	1	PD, CCH	5	150	30/0/15	105	E		5			
MCH284	Technological fundamentals of powder metalurgy	2	PD, CCH	5	150	30/0/15	105	E		5			
MCH279	Nanomaterials for processes of processing	2	PD, CCH	5	150	30/0/15	105	E		5			
MSM217	CAD/CAM/CAE/PLM of Additive Manufacturing	1	PD, CCH	5	150	30/0/15	105	E			5		

MCH244	PLM / PDM processes	1	PD, CCH	5	150	30/0/15	105	E			5		
MCH215	Design and operation of machines and equipment for gas and plasma atomization	2	PD, CCH	5	150	30/15/0	105	E			5		
MSM208	Advanced Additive Manufacturing Ergonomics	2	PD, CCH	5	150	30/0/15	105	E			5		
MCH217	Design and operation of machines and equipment for filament production systems	3	PD, CCH	5	150	30/0/15	105	E			5		
MCH252	Blanks processing technology on the automatic machines and lines	3	PD, CCH	5	150	30/0/15	105	E			5		
MSM229	Pipe production technologies	1	PD, CCH	4	120	30/0/15	75	E				4	
MSM230	Tribology in pressure treatment	1	PD, CCH	4	120	30/0/15	75	E				4	
M3 Practice-oriented module													
AAP256	Research practice		PD, UC	4				R				4	
M4 Experimental research module													
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R	4				
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R		4			
AAP251	Research work of a master's student, including internship and completion of a master's thesis		RWMS	2				R			2		
AAP255	Research work of a master's student, including internship and completion of a master's thesis		RWMS	14				R				14	
M5 Module of final attestation													
ECA212	Registration and protection of the master thesis		FA	8								8	
Total based on UNIVERSITY:									30	30	30	30	
									60		**60**		

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	0	0	0	0
BD	Cycle of basic disciplines	0	20	15	35
PD	Cycle of profile disciplines	0	24	29	53
Total for theoretical training:		**0**	**44**	**44**	**88**
RWMS	Research Work of Master's Student				24
ERWMS	Experimental Research Work of Master's Student				0
FA	Final attestation				8
TOTAL:					120

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 19.12.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs — Uskenbayeva R. K.

Approved:

Vice Provost on academic development — Kalpeyeva Z. E.

Head of Department - Department of Educational Program Management and Academic-Methodological Work — Zhunagaliyeva A. S.

Director of the Institute - A.Burkitbaev Institute of Energy and Mechanical Engineering — Yelemesov K. .

Department Chair - Mechanical Engineering — Nugman E. .

Representative of the Academic Committee from Employers ___Acknowledged___ — Andreev V. I.