A. Burkitbayev Institute of Power and Mechanical Engineering

Department of «Mechanical engineering»

EDUCATIONAL PROGRAM

7M07112 - Digitalization of engineering manufacturing

(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:
7M071-Engineering and engineering affairs
Group of educational programs:
M103-Mechanics and metal working
Level based on NQF: 7
Level based on IQF: 7
Study period: 2 years
Amount of credits: 120

Almaty 2025

Educational program **7M07112- Digitalization of engineering**
(code and name of educational program)
manufacturing

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 **7M07112- Digitalization of engineering**
(code and name of educational program)
manufacturing

was developed by Academic committee on direction of "7M071- Engineering and Technology "

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 designations

1. Description of educational program

2. Purpose and objectives of educational program

3. Requirements for the evaluation of educational program learning outcomes

4. Passport of educational program

4.1. General information

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

5. Curriculum of educational program

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
НАО	Некоммерческое акционерное общество
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

The professional activity of graduates of the educational program is aimed at digitalization of machine-building production, the use of innovative technologies in the field of mechanical engineering.

The direction of the educational program covers engineering and engineering.
The objects of professional activity of the master in EP 7M07112 - " Digitalization of engineering manufacturing" 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.

A master's degree in the field of training " Digitalization of engineering manufacturing" should be prepared to solve professional problems 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;

- 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;

2 Purpose and objectives of the educational program

Purpose of EP:

High-quality training of highly qualified and competitive specialists with creative thinking, ready for production, technological, scientific and pedagogical activities in the conditions of innovative digital engineering.

Tasks of EP:

- formation of knowledge of the basics of digital technologies in the field of mechanical engineering;
- acquisition of theoretical and practical knowledge on the organization, conduct of scientific and experimental research in the field of development of technological processes of machine-building products;
- formation of knowledge and skills in the analysis of scientific and technical information, new methods of control theory, scientific directions of digital engineering;
- formation of knowledge and practical skills of performing scientific and pedagogical activities, the use of computer and distance learning.

3 Requirements for evaluating 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 construction industries
2	Code and classification of training directions	7M071- Engineering and engineering affairs
3	Educational program group	M103- Mechanics and metal working
4	Educational program name	7M07112 - "Digitalization of engineering manufacturing".
5	Short description of educational program	The professional activity of graduates of the educational program is directed to the field of digitalization of machine-building production. In the educational program, students will receive professional knowledge of digital design and modeling of product structures, advanced materials and additive technologies; current problems of scientific research, the basics of research activities, lean digital production, scientific and pedagogical activities. They will acquire the skills of designing and developing business processes, technological processes of additive manufacturing, analysis of automated production technologies.

6	Purpose of EP	The purpose of EP 7M07112 - Digitalization of engineering manufacturing high-quality training of highly qualified and competitive specialists with creative thinking, ready for production, technological, scientific and pedagogical activities in the conditions of innovative digital engineering.
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; - 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; - 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 scientific-educational tasks; - 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 and apply norms in the field of intellectual property, scientific research, and sustainable development strategies. ON3 Master the principles of innovation management, quality management and risk management in digital engineering. ON4 Possess a set of personal qualities, scientific, pedagogical and professional competencies for industrial, pedagogical and research activities. ON5 Analyze and effectively apply modern innovative technologies, methods of designing and modeling digital production processes to solve professional problems. ON6 Analyze and effectively apply modern innovative technologies, methods of designing and modeling digital production processes to solve professional problems/ ON7 Apply advanced materials for additive manufacturing, automated product lifecycle management systems, and advanced manufacturing automation technologies. ON8 Apply sound design solutions to ensure the

		safety of life, environmental and industrial safety of digital engineering production. ON9 To use computer and information technologies to solve practical and scientific problems in the field of digitalization of mechanical engineering.
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 academic committee on direction "7M071-Engineering and Technology "

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
Cycle of basic disciplines University component												
1	English 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			v					
2	Psychology of management	The purpose of the discipline is to familiarize students with modern ideas about the role and multidimensional content of the psychological component of managerial activity; to increase the psychological culture of the future master for the successful implementation of professional activities and self-improvement. Studies the main stages, trends and trends in the development of Kazakh and foreign management psychology, the composition and structure of management activities. Special attention is paid to the psychological component of the managerial function, the individual characteristics of the manager, the ethical and cultural components of the manager, the basics of interaction.	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					
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	Lean Manufacturing Methodology	The purpose of the discipline is to form a systematic representation of the concept of lean production, knowledge of theoretical provisions and regulatory documents in the field of quality management. The discipline studies the basic concepts, the history of	5		v	v			v			

		the Lean management system, lean production as a model for improving the efficiency of the enterprise; principles and essence of quality management systems - Kaizen and 6 sigma. The tools of quality management systems are considered; criteria for economic indicators characterizing changes in the activities of engineering enterprises.											
6	Advanced Materials for Additive Manufacturing	The discipline studies the place and role of additive technologies in the digital economy. Additive technologies using polymer and composite materials.The physical nature and technological possibilities of application in additive technologies of various materials. Methods of obtaining metal powders, nanomaterials and nanopowders for creating machine parts.	5	v						v		
7	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		
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	Digitalization tools for machine-building production	The purpose of the discipline is to master knowledge on the tools of digitalization of machine–building production - digital design and the tools used in it, new materials that are based on the concept of digital materials with specified properties, additive technologies, reverse engineering technologies, the Internet of things. A system of knowledge and skills is being formed on the creation of digital production technology, modern approaches and ways of implementing digital transformation in the field of high technologies, skills and abilities in using modern digital production tools to create and scale innovative projects and products	5					v	v			
10	Sustainable development strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable development strategies are included.	5		v						v	
Cycle of profile disciplines University component													

11	Virtual Factory and Augmented Reality	The goal is to form a knowledge system in the field of new business models, business processes and technologies in high–tech industries. The course covers industrial revolutions, Industry development programs 4.0; modern information technologies and marketing; the creation of factories of the future, their architecture. Digital transformation, principles and management of a digital company. The concept of a virtual factory and the construction of logistics networks for a digital factory. "Digital double", technical and operational data.	5			v					v	
12	Digital design and modeling	The purpose of the discipline is to acquire knowledge of the basics of computer modeling and computer technologies used in mechanical engineering. The technologies of computer-aided design, rapid prototyping, a complex information model and an integrated information environment used in computer systems supporting the life cycle of mechanical engineering products are considered. Perspective directions of development of computer technologies and industrial systems, virtual engineering are considered. Practical application of computer modeling and design methods in the production of products.	5					v		v		
13	3D scanning methods and technologies	The purpose of the discipline is to form theoretical and practical knowledge in the field of digital 3D scanning of objects, methods for restoring 3D objects, 3D scanning technologies. The principles of operation of a 3D scanner, types of scanners according to the principle of use, scanning technologies and methods, advantages and disadvantages of three-dimensional scanners, and applications are studied. Practical skills are acquired in applying various methods of restoring machine-building products, working with manual 3D scanners, choosing scanning methods and technologies.	5							v	v	
14	Innovative Processes of Digitization for Industrial Manufacturing	The purpose of the discipline is the formation of knowledge in the field of innovation, innovation management, production of digital engineering. The course examines the role of science in innovative development, innovative business; classification and planning of innovations; methods of engineering creativity; theory of solving technical problems; technological approaches and their characteristics. The prospects for the development of high-tech industrial technologies; automation and robotization of machine-building production; digitalization of production are considered	5			v		v				
Cycle of profile disciplines Component of choice													
15	CAE/PLM for Industrial Manufacturing	The purpose of the discipline is to acquire knowledge and skills of working with CAE/PLM design and engineering analysis systems. The discipline studies the modern concept of CAD construction, the place of CAD in integrated systems of design, production and operation of engineering products. The features of CAE systems for solving problems of design, production and engineering calculations of machine-building products are considered; the effectiveness of CAD application in the development of new machine designs; software, information, linguistic and technical support of CAD. Computer-aided design of machine parts and assemblies; engineering equipment design.	5						v			v

16	PLM technologies	The purpose of the discipline is to provide knowledge about PLM systems and their application in the development, development and improvement of technology, systems and means of machine-building production. Acquire knowledge, skills and abilities in the field of industrial CAD and product lifecycle management systems. The ability to participate in the preliminary technical and economic analysis of design calculations, the development of design, working and operational technical documentation of machine-building industries; in measures to control the compliance of the developed projects and technical documentation with the current regulatory documents. Acquire practical design skills	5									v
17	Computer-integrated production	The purpose of the discipline is to form knowledge of the basics of technical training of an automated machine-building complex using modern technological equipment and production management systems. The discipline studies the main characteristics of automated production: modern methods of production organization based on the widespread use of software-controlled technological equipment, microprocessor computing tools, robotic systems, automation tools for design, technological and planned production work. Design and organization of machine-building production based on multi-purpose machine tools with software control.	5								v	v
18	Organizational and technical bases of flexible automated production	The purpose of teaching the discipline is to master the theoretical foundations of creating flexible automated production systems for the manufacture of parts and assembly of machines in modern machine-building production. The subject of the study is progressive technological systems created on the basis of the development of such fields of science and technology as mechanical engineering technology, electronics, computer science, economics, production organization, etc. The systems designed taking into account technical and economic factors are able to solve the tasks of increasing labor productivity, improving product quality, and reducing resource consumption.	5							v	v	
19	Actual problems of advanced scientific research	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				v	
20	Risk Management in Digital Manufacturing	The purpose of the discipline is to form knowledge of the basics of digital production management, diagnostics and risk modeling. The discipline examines the essence of risks as an economic category, criteria for risk classification. Development of risk management in practice: stages of the risk management process, methods of risk identification and analysis. The methodology of construction and application of economic and mathematical models of risk analysis and assessment, the basics of risk management in the evaluation activity of a machine-building enterprise using software are studied.	5		v	v						

21	Digital Systems of Industrial Manufacturing	The purpose of the discipline is to acquire knowledge of the design of digital machine-building industries, methods and means of construction based on information and production technologies. The discipline examines the concept of information support for the life cycle of products, the principles of building automated production, the methodology of end-to-end automated design of mechanical engineering products. As a result, students will be able to develop highly efficient technological processes and equipment using modern computer-aided design systems, create new technical solutions in the field of mechanical engineering technology, equipment and tools.	5					v	v			
22	Additive manufacturing technologies and equipment	The purpose of the discipline is to master professional knowledge on additive manufacturing technologies and their application in mechanical engineering; to form an idea of the procedure for preparing products for reproduction using additive technologies; to study software tools used to prepare product models. The study of basic additive technologies; materials used in additive manufacturing; post-processing technologies of products. Skills of 3D printing of products, assessment of their quality, selection of equipment for various methods of additive manufacturing are acquired.	5							v	v	
23	Corrosion in mechanical engineering	The purpose of the discipline is to acquire knowledge in the field of corrosion of engineering products and methods of protection. Various methods of protecting mechanical engineering products from corrosion, ensuring the durability of products in various climatic regions, technical requirements, quality control of surface protection are studied. Requirements for the quality of products, their functional parameters, reliability, ease of maintenance, duration of operation. The choice of structural material and protection options that meet the requirements of moral and economic durability of the product, reducing labor costs.	4		v					v		
24	Operating systems of Additive manufacturing	As a result of the study of this discipline formulated a curriculum aimed at leveling the basic knowledge in the field of materials additive manufacturing. The course teaches undergraduates not only the basic concepts of characteristics and applications, but also to use these tools to solve problems of applied and scientific nature.	4					v		v		
25	Occupational Health and Safety for Additive Manufacturing	The purpose of the discipline is to acquire knowledge on ensuring the safety of life in additive manufacturing. The discipline is based on the study of normative and technical documents on labor protection, work safety in areas equipped with additive equipment. The main categories of work in additive manufacturing are considered: material extrusion, powder layer melting, photopolymerization in a bath, material jet processing, binder jet processing, sheet lamination. Classification of hazards arising during the operation of additive machines and equipment. Safety and security measures for work on additive equipment.	5							v	v	v
26	Ergonomics of production	The purpose of studying the discipline is to form theoretical and practical knowledge in the field of industrial ergonomics, design of ergatic systems, types and basic functions of systems. The tasks of ergonomics, the essence of human labor activity, engineering psychology, the severity of work and its integral assessment are studied. The content and features of ergonomic design, methods of research of sensorimotor	5							v	v	

		activity in work. Skills of designing and evaluating workplaces, ergodesign of professional equipment and personal protective equipment are acquired											

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: M103 - "Mechanics and metal working"
Educational program: 7M07112 - "Digitalization of engineering manufacturing"
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				
MSM231	Lean Manufacturing Methodology	1	BD, CCH	5	150	30/0/15	105	E	5				
MSM222	Advanced Materials for Additive Manufacturing	1	BD, CCH	5	150	30/0/15	105	E	5				
IND251	Fundamentals of research activity	2	BD, CCH	5	150	30/0/15	105	E	5				
MNG781	Intellectual property and research	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			
MSM232	Digitalization tools for machine-building production for Industrial Manufacturing	1	BD, CCH	5	150	30/0/15	105	E			5		
MNG782	Sustainable development strategies	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 Production digitalization module													
ISO225	Corrosion and Protection Methods in mechanical engineering		PD, UC	5	150	30/0/15	105	E	5				
MSM218	Digital design and modeling		PD, UC	5	150	30/0/15	105	E	5				
MSM238	3D scanning methods and technologies		PD, UC	5	150	30/0/15	105	E		5			
MSM206	Innovative Processes of Digitization for Industrial Manufacturing		PD, UC	5	150	30/0/15	105	E		5			
MSM219	Computer-integrated production	1	PD, CCH	5	150	30/0/15	105	E		5			
MSM234	Organizational and technical bases of flexible automated production	1	PD, CCH	5	150	30/0/15	105	E		5			
IND249	Actual problems of advanced scientific research	2	PD, CCH	5	150	30/0/15	105	E		5			
IND210	Risk Management in Digital Manufacturing	2	PD, CCH	5	150	30/0/15	105	E		5			
MSM210	CAE/PLM for Industrial Manufacturing	1	PD, CCH	5	150	30/0/15	105	E			5		

MSM237	PLM technologies	1	PD, CCH	5	150	30/0/15	105	E			5		
MSM211	Digital Systems of Industrial Manufacturing	2	PD, CCH	5	150	30/0/15	105	E			5		
MSM236	Additive manufacturing technologies and equipment	2	PD, CCH	5	150	30/0/15	105	E			5		
MSM235	Ergonomics of production	3	PD, CCH	5	150	30/0/15	105	E			5		
IND225	Occupational Safety and Security of Digital Industrial Manufacturing	3	PD, CCH	5	150	30/0/15	105	E			5		
MSM224	Wearproof and strengthening coverings	1	PD, CCH	4	120	30/0/15	75	E				4	
IND206	Operating systems of Additive manufacturing	1	PD, CCH	4	120	15/0/15	90	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. B.

Head of Department - Department of Educational Program Management and Academic-Methodological Work — Zhumagaliyeva 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.