Ministry of Science and Higher Education of the Republic of Kazakhstan
Karaganda University of the name of academician E.A. Buketov

«APPROVED BY»
The decision of the Administration of
NLC «Karaganda University of the name
of academician E.A. Buketov»

Protocol № 4 24.05.2024

prof. N.O. Dulatbekov

«APPROVED BY»
The decision of the Directory Board of
NLC «Karaganda University of the name
of academician E.A. Buketov»

Protocol № 5 21.06.2024

EDUCATIONAL PROGRAM

7M07104 - Heat power engineering

Level: Master

Karaganda
2024

APPROVAL SHEET
EDUCATIONAL PROGRAM «7M07104- HEAT POWER ENGINEERING»

«AGREED»

Director of RSE "Chemical and Metallurgical Institute named after Zh. Abishev"

_____ S.O. Baysanov
«__17__» _____07_____ 2024y.

«AGREED»

Director of LLP «Energoservice-LTD»

_____ Ye. Mugaraazh
«__18__» _____04_____ 2024y.

«AGREED»

Executive Director of Karaganda Energy Center LLP

_____ A.A. Beimbetov
«__18__» _____04_____ 2024y.

The educational program «7M07104- Heat power engineering» was developed on the basis of:

– Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education" (with amendments and additions as of 04.01.2023);

– Rules for the organization of the educational process on credit technology (Order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152) (with amendments and additions dated 23.09.2022 No.79);

– National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.

– Classifier of areas of training with higher and postgraduate education (Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 13, 2018 No.569 (with amendments and additions dated 06.05.2020. No.234);

– The State mandatory standard of postgraduate education of the Republic of Kazakhstan approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 2 dated 20.07.2022.

– The standard "Teacher, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan No.500 dated 15.12.2022.

– For all scientific and pedagogical master's and doctoral programs, it is necessary to add a Professional standard for teachers (teaching staff) of higher and (or) postgraduate education organizations, approved by Order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 591 dated November 20, 2023.

- Professional standard of the OP: Commissioning of heat supply systems, Operation of heat supply systems, Wastewater treatment, Design and operation of water supply and drainage networks.

– Atlas of new professions: Aerohydrodynamics of wind and hydro turbines, A mechanic of a generating device, a developer-designer of autonomous power systems, a recovery engineer, a meteorological power engineer, an engineer for regeneration and utilization, Numerical methods in energy.

Content:

Passport of the educational program

1. Code and name of the educational program: "7M07104-Heat power engineering"

2. Code and classification of the field of education, training areas: 7M07 Engineering, manufacturing and construction industries, 7M071 Engineering and Engineering work

3. Group of educational programs: M098-Heat power engineering

4. Volume of credits: 120 ECTS.

5. Form of study: full-time

6. Language of instruction: Kazakh, Russian

7. Degree awarded Master of Technical Sciences in the educational program 7M07104- Heat power engineering

8. Type of EP: the current EP is an educational program, according to which training is carried out at the university.

9. ISCE level (International Standard Classification of Education) – level 7.

10. The level of the NQF (National Qualifications Framework) - level 7.

11. IQF level (Industry Qualifications Framework) – level 7.

12. Distinctive features of EP: - no

13. Number of the appendix to the license for the direction of personnel training: No. 016 KZ 83LAA00018495 dated 07/28/2020.

14. The name of the accreditation body and the validity period of the accreditation of the EP: Certificate of international accreditation of educational programs of NAOKO SA-A No. 0174/2 dated December 23, 2019-December 20, 2024.

15. The purpose of the EP: Preparation of masters with in-depth knowledge in the field of modern thermal power engineering, who possess methods of conducting fundamental and applied scientific research, who have professional knowledge in the design, installation, operation and repair of equipment for thermal and nuclear power plants, power supply sources of industrial enterprises and housing and communal services, who have ideas about classical and new directions of modern energy and environmental technologies, and capable of applying the acquired knowledge in scientific, practical and industrial activities.

a) Qualification characteristics of the graduate: the graduate of the master's degree is awarded the degree of Master of Technical Sciences in the educational program "7M07104-Heat Power Engineering".

b) List of graduate positions: a graduate can hold the following positions: junior researcher, engineer-laboratory assistant, power engineer, heat engineer, master, leading specialist, senior engineer, leading engineer, head of a structural unit, deputy shop supervisor, assistant.

c) The scope and objects of professional activity of graduates in this "7M07104-Heat Power Engineering" are: the field of professional activity is heat power engineering as an integral part of technology, which includes a set of means, methods and methods of human activity created for generating and applying heat, controlling its flows and converting various types of energy into heat.

The objects of professional activity of masters 7M07104- Heat Power Engineering are:

- energy systems and complexes;
- power supply systems for engineering facilities and industries;
- power supply systems of industrial enterprises;
- power supply systems for autonomous facilities;
- power plants;

- power plants and complexes based on unconventional and renewable energy sources, etc

. d) Types of professional activities for which graduates who have mastered the educational program in the direction of training "8D05303-Thermophysics and theoretical heat engineering" are preparing

- formulate and solve problems arising in the course of production, design and engineering activities, installation and operation of energy and energy technology equipment, power supply systems of buildings and enterprises; - ready and able to take part in the work on the implementation of research, the development of projects and programs, in carrying out the necessary measures related to the use of equipment and its introduction into operation, as well as carrying out work on standardization and certification of power plants and systems, in reviewing various technical documentation and preparing the necessary technical reviews, reviews, conclusions; - study and analyze the necessary scientific and technical information, technical data, indicators and results of work, generalize and systematize them, conduct the necessary research and calculations using modern computer technology, participate in scientific and technical conferences and meetings.

16. Functions of the graduate's professional activity

Under the guidance of a leading (senior) engineer, a responsible executor or the head of the topic (task), a master's student performs: participates

in learning activities:

- under the guidance of a mentor, determines the content and selects the forms, methods and means of training sessions (seminars, practical, laboratory) in accordance with the objectives of the course;
- plans and organizes independent work of students under the guidance of a mentor;
- under the guidance of a mentor, develops the EMC of the disciplines to be read;
- author's courses under the guidance of a mentor in accordance with the mission and goals of the organization of education.

17. Formulation of learning outcomes based on competencies

Type of competencies	Learning result code	Learning result (according to Bloom's taxonomy)
1. Behavioral skills and personal qualities: ((Soft skills)	LR 1	Able to use knowledge of traditional and modern problems of history and philosophy of science in research activities in the professional direction. He has the basic concepts and categories of the philosophy of science for setting and solving urgent problems in his own field of scientific research. Substantiates the modern paradigm of higher education, its content. Defines the driving forces and principles of the learning process in higher education. Reveals the features of modern pedagogical concepts in higher education. Demonstrates knowledge in the field of modern educational technologies. Selects the optimal and most effective forms of organization of the educational process in a high school. Has the skills to use the knowledge gained in the process of mastering the psychology of management in professional activity. He is able to use the basic provisions and methods of the psychological science of management in his professional activity. To know the basic psychological methods and methods of conflict management in the organization.
	LR 2	Fluent in foreign languages at a level that allows effective interaction in a professional and scientific environment; has the skills to carry out with a high degree of activity and self-regulation further training and development of a linguistic personality. To know foreign terminology in thermal power engineering. Able to show foreign language competence when working in an interdisciplinary team. Applies knowledge of foreign terminology in thermal power engineering at a professional level when reading foreign literature. Collects information when conducting a literary review on the topic of the study. It is able to transmit the result of the conducted research in the form of specific recommendations in terms of thermal power engineering. Clearly formulates ideas, conclusions, problems on the subject of scientific research. He is able to use the acquired knowledge when writing articles in a foreign language using professional terminology on the subject of scientific research. Is able to correctly translate foreign literature in the field of thermal power engineering.
	LR 3	Able to use basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations in cognitive and professional activities. Has basic theoretical knowledge about the organization of innovation activities, basic theoretical knowledge about the use of information technology in innovation risk management. Understand the essence of innovations and features of innovation processes; readiness to develop and implement methodological models, techniques, technologies and teaching methods, to analyze the results of the process of their use in organizations engaged in educational activities.
2. Digital competencies: (Digital skills):	LR 4	Know the main traditional and non-traditional renewable energy sources; the energy potential of renewable energy sources; principles and methods of practical use of renewable energy sources. Provision of technical solutions aimed at the rational use of unconventional and renewable energy sources; implementation of technical and economic calculations related to the assessment of the efficiency of the use of unconventional energy sources; analysis of information on the technical parameters of power plants using renewable energy sources. To form an understanding of the main trends and directions in the improvement of energy systems based on renewable energy resources in domestic and foreign practice, the development of the ability to objectively assess the advantages and disadvantages of such systems and their elements, both domestic and foreign.
	LR 5	Knows the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activity; understands the methods of planning and organizing scientific research; has the methodology of scientific design, creativity, the general scheme of organizing scientific research, the practice of using methods of scientific knowledge in the field of innovation in natural sciences. Scientific, technical and technological research. To prepare a specialist to solve the problems of design, research and operation of thermal power and thermal technology installations and systems, capable of analyzing the efficiency of energy conversion schemes, assessing the prospects of new methods of energy production, and putting innovative developments into practice. To master the methods and techniques of analog, physical and mathematical modeling; development of skills and abilities: mathematical modeling of processes, devices and systems of heat power engineering and heat technology; conducting a computational experiment; the use

		of computer technology and computer technology for the study and selection of optimal options for installations and systems of heat power and heat technology.
3. Professional competencies: (Hard-skills)	LR 6	To set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. To know different types of heat exchange and methods of their calculation; to be able to calculate different types of heat exchange and the thermal state of various components and parts; to include the acquired knowledge in thermal and gas-dynamic physical and mathematical models of various processes associated with gorenje fuels and the flow of combustion products in propulsion systems.
	LR 7	To know the basic principles of heat and mass transfer and methods of mathematical modeling of heat and mass transfer processes and installations, the main sources of scientific and technical information about new developments in the field of heat and mass transfer; to be able to independently analyze the processes of heat and mass transfer and make optimal decisions in the design and operation of heat and mass exchange equipment; independently set and solve problems of thermal hydraulic processes and perform numerical calculations; develop computer models of thermal hydraulic processes.
	LR 8	Know the procedures for setting and solving scientific problems; applies standards and regulations for the registration of research results, for the preparation of scientific reports, publications for seminars and conferences; applies procedures for searching global networks for information on scientific developments, opportunities for scientific contacts, applications for scientific grants of various levels.
	LR 9	Demonstrates the procedures for testing the results of scientific research, preparation of publications based on the results of scientific research; possess a way of presenting scientific materials and forming a manuscript of scientific work, registration of a master's thesis.

18. Determination of modules of disciplines in accordance with the results of training

Learning result code	Name of the module	Name of disciplines	Volume (ECTS)
LR 1	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
		Higher school pedagogy	4
		Management Psychology	4
		Pedagogical practice	4
LR 2	Professional languages	Foreign language (professional)	4
		Professional foreign terminology in engineering Foreign terminology in alternative energy	5
LR 3	Innovative process of scientific research organization	Commercialization of the results of scientific and scientific-technical activities Theory and technique of scientific experiment	5
		Innovation in thermal power engineering Technology and methodology of scientific organization of labor in the heat power industry	5
LR 4	Fundamental principles of modern thermophysics and thermal power engineering	Modern metering and control devices of thermal energy Integrated use of renewable energy sources	4
		Methods of teaching special disciplines Aerodynamics and heat transfer of bodies in a turbulent flow	4
LR 5	Fundamental principles of modern thermophysics and thermal power engineering (continuation of the module)	Organization and planning of scientific research in thermal power engineering	4
		Scientific and technical problems of heat power engineering and heat technologies	4
		Information systems in heat power engineering and heat technology	4
LR 6	Modern problems of technical physics	Basic principles and problems of modern wind energy Physics of Pulse Phenomena	5
		Physical methods of non-destructive testing Methods of measuring the thermal resistance of thin-layer coatings	6
LR 7	Selected Chapters of experimental thermal power engineering and modeling of thermophysical processes	Methods of recovery of heat exchangers Dynamics and heat exchange of bodies in a turbulent flow	5
		Automated thermal energy distribution systems Modeling of non-stationary heat and mass transfer processes based on MathCAD (in English)	5
LR 8	Research work	Research practice	12
		Research work of a master's student, including internship and completion of a master's thesis (RWMS)	24
LR 9	Final certification	Preparation and defense of a master's thesis	8

19. Matrix of achievability of learning outcomes

NN	Name of disciplines	Brief description of the discipline	Number of credits	Generated learning results (codes)								
				LR 1	LR 2	LR 3	LR 4	LR 5	LR 6	LR 7	LR 8	LR 9
Cycle of basic disciplines University component												
D 1	History and philosophy of science	It is studied with the aim of forming knowledge about the significance of scientific knowledge in its tendency to development and sociocultural profile. Questions about the philosophy, methodology of science, science as a cognitive activity and tradition are considered.	4	+								
D 2	Pedagogy of higher education	Studied to form ideas about the modern paradigm of higher education and the theory of scientific activity in higher education. The issues of pedagogy, education of professionals-specialists, professional skills of teaching in educational organizations, pedagogical control and evaluation of knowledge in higher education are considered.	4	+								
D 3	Psychology of management	It is studied with the aim of forming knowledge about the psychological laws of managerial activity, skills in analysis of socio-psychological principles, the characteristics of the psychology of management, the personal characteristics of the leader.	4	+								
D 4	Pedagogical practice	The purpose of pedagogical practice is a component of professional preparation for scientific and pedagogical activity in a higher educational institution (university) and is a type of practical activity of doctoral students in the implementation of the educational process in higher education, including the teaching of special disciplines, the organization of educational activities of students, scientific and methodological work on the subject, obtaining skills and practical teaching skills.	4	+								
D 5	Foreign language (professional)	The course is taken for developing the skills and abilities of foreign language speech activity in the subject area for effective communication in situations of professional interaction. The course is designed to teach how to work with specialized literature, to practice of oral and written bilingual translation. There are considered the issues of a foreign language for specific purposes and norms of professional speech.	5		+							
D 6	Organization and planning of scientific research in heat power engineering	Summary of the course: the stages of research, the basics of scientific knowledge and creativity, the accumulation and processing of scientific and technical information, the organization of work in scientific libraries and libraries of research institutes; processing of data using modern methods, modern experimental research methods, design of the results of scientific work, writing a scientific article or a brief information message.	4					+				

D 7	Scientific and technical problems of heat power engineering and heat technologies	Course summary: the course discusses the introduction to the problems of modern experimental studies of thermal power and thermal processes; methods of planning and conducting scientific experiments; the use of modern methods and instruments for measuring the parameters of thermal processes; methods of processing the results of scientific experiments using computer technology.	4					+				
D 8	Information systems in heat power engineering and heat engineering	The purpose of the discipline "Information systems in heat power engineering and heat technologies" includes the following main sections: Information, its characteristics. The emergence of information technology. Information processes in thermal power engineering. Technical means of information technologies in thermal power engineering. Software tools of information technologies. Technologies for processing textual and numerical information. Technologies for storing and searching information. Network technologies of information processing.	4					+				
Cycle of basic disciplines Component of choice													
D 9	Professional foreign terminology in engineering	The purpose of the discipline is to know foreign terminology in thermal power engineering. Able to show foreign language competence when working in an interdisciplinary team. Applies knowledge of foreign terminology in thermal power engineering at a professional level when reading foreign literature. Collects information when conducting a literary review on the research topic. It is possible to transmit the result of the conducted research in the form of specific recommendations in terms of thermal power engineering.	5		+							
	Foreign terminology in alternative energy	Alternative energy is a set of promising methods of obtaining, transmitting and using energy (often from renewable sources), which are not as widespread as traditional ones, but are of interest because of the profitability of their use with, as a rule, a low risk of harm to the environment.			+							
D 10	Commercialization of the results of scientific and scientific and technical activities	It is studied in order to form skills to use the results of scientific and scientific and technical activities, including the results of intellectual activity in order to withdraw new or improved goods aimed at extracting income to the market.	5			+						
	Theory and technique of scientific experiment	The purpose of studying the discipline is to gain in-depth knowledge of the fundamentals of the theory of experimental studies of electrical devices and practical knowledge of the specifics of experimental techniques for testing devices for various purposes.				+						
D 11	Innovations in heat power engineering	Course summary: understanding of the essence of innovation and features of innovative processes; willingness to develop and implement methodological models, methods, technologies and methods of training, to analyze the results of the process of their use in organizations engaged in educational activities.	5			+						
	Technology and methodology of scientific organization of labor in the heat power industry	The purpose of studying the discipline is to train highly qualified specialists who possess the skills and abilities necessary for the organization and conduct of scientific and applied research in the field of thermal power engineering and heat technologies; able to develop proposals to ensure the reliability and energy efficiency of heating installations, conduct computer modeling of technological processes.	5			+						

D 12	Modern metering and control devices of thermal energy	The purpose of studying the discipline is the basics of energy conservation. The development of market relations necessitates the efficient use of energy and all types of resources, improving the scientific, technical and organizational level of production in all sectors of the economy, as well as training highly qualified personnel.	4				+					
	Integrated use of renewable energy sources	Course summary: training of specialists capable of setting and solving tasks involving the use of renewable energy sources in the energy balance of the country and the region, the result of which should be all-round energy conservation in industry and at housing and communal facilities and improvement of environmental conditions.					+					
D 13	Methods of teaching special disciplines	The purpose of studying the discipline is the study of basic knowledge and skills, the intensive development of conditions in society puts forward increased requirements for the quality of training and professional development of specialists in higher educational institutions.	4				+					
	Aerodynamics and heat transfer of bodies in a turbulent flow	The purpose of the discipline is the study by undergraduates of the physical processes of aerodynamics and heat transfer of aircraft, as well as the demonstration of the main methods and approaches in solving problems and the formation of undergraduates"" understanding of the current state of science in these areas.					+					
D 14	Basic principles and problems of modern wind energy	Students should master the discipline at a level that allows them to freely navigate the technologies of processing and using renewable energy sources; choose energy equipment according to technical catalogs; develop autonomous power supply systems based on local types of renewable fuels.	5						+			
	Physics of impulse phenomena	The purpose of the discipline is to master the hydrodynamic laws of a vapor liquid for measuring electrical quantities in a liquid, the laws of destruction of wollastonite ores for studying microstructure and crushing.							+			
D 15	Physical methods of nondestructive testing	Course summary: to set and solve innovative tasks on application of modern methods of nondestructive control using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints.	6						+			
	Methods of measuring the thermal resistance of thin-layer coatings	The objectives of the discipline are to provide graduates with knowledge on measuring instruments, basic metrological concepts, elements of error theory, general concepts of reliability for measurement and control systems of modern power plants.							+			
D 16	Methods of recovery of heat exchangers	Summary of the course: analysis of ways to clean heat exchangers from various types of pollution. Methods of recovery of characteristics of heat exchangers. Electro-hydraulic method of cleaning the heat exchangers.	5							+		
	Dynamics and heat exchange of bodies in a turbulent flow	The purpose of teaching the discipline is to study the unsteady movements of liquids with gas and steam bubbles. Systematic presentation of mechanics and engineering thermophysics of various multiphase media, including bubble liquids, gas- and vapor-liquid flows of mixtures of mutually insoluble liquids in porous bodies.								+		
D 17	Automated thermal energy distribution systems	The purpose of the discipline is to study the general principles of automated and automatic control of technological processes in thermal energy.	5							+		
	Simulation of unsteady heat and mass transfer processes based on	Course summary: theoretical bases of numerical methods, modeling of physical processes, methods of the solutions of differential equations systems,								+		

	MathCAD (in English)	symbolic methods for the solutions of equations systems by the program MathCAD.											
D 18	Research practice	Research practices are organized in accordance with the profile of the master's program and include the formation of the required competencies of undergraduates. When checking, there is an individual educational trajectory, the topic of the master's dissertation, as well as the type of professional activity chosen by the magician. The practice includes the implementation of a list of tasks by a master student on the profile of his future activity. It requires the study, collection, processing and systematization of materials for writing magic.	12									+	
D 19	Research work of a master's student, including internship and completion of a master's thesis (RWMS)	The main purpose of the research work (RWMS) is the study by undergraduates of the current state of the scientific and practical problem on the topic of the master's thesis. Research work for the preparation of a master's thesis was carried out simultaneously with the educational process during the duration of the master's degree and in the form of a scientific seminar.	24									+	
D 20	Preparation and defense of a master's thesis	The purpose of the problem investigated in the work should be in demand and relevant. The ways to solve it and the methods used are innovative and previously unexplored. A master's student should rely on new inventions in her work and have suggestions for solving the problem.	8										+

20. Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning results	Planned learning results for the module	Teaching methods	Assessment methods
LR 1	Able to use knowledge of traditional and modern problems of the history and philosophy of science in research activities in the professional direction. Has the basic concepts and categories of the philosophy of science for setting and solving urgent problems in his own field of scientific research. Substantiates the modern paradigm of higher education, its content.	Interactive lecture, case-methods, round table, analysis of publications, demonstration of speech	Colloquium, testing
LR 2	Fluent in foreign languages at a level that allows effective interaction in a professional and scientific environment; he has skills that allow him to carry out further training and development of a linguistic personality with a high degree of self-activity and self-regulation. To know foreign terminology in thermal power engineering. Applies knowledge of foreign terminology in thermal power engineering at a professional level when reading foreign literature.	Interactive lecture, experimental works intended for scientific research	Project preparation
LR 3	Able to use basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations in cognitive and professional activities. Has basic theoretical knowledge about the organization of innovation activities, basic theoretical knowledge about the use of information technology in innovation risk management.	Interactive lecture, experimental works intended for scientific research	Written work
LR 4	Know the main traditional and non-traditional renewable energy sources; the energy potential of renewable energy sources; principles and methods of practical use of renewable energy sources. Provision of technical solutions aimed at the rational use of unconventional and renewable energy sources;	Round table	Portfolio
LR 5	Knows the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activity; understands the methods of planning and organizing scientific research; has the methodology of scientific design, creativity, the general scheme of organizing scientific research, the practice of using methods of scientific knowledge in the field of innovation in natural sciences. Scientific, technical and technological research.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Written work
LR 6	To set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. Know different types of heat exchange and methods of their calculation; be able to calculate different types of heat exchange and the thermal state of various components and parts;	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Testing
LR 7	Know the basic principles of heat and mass transfer and methods of mathematical modeling of heat and mass transfer processes and installations, the main sources of scientific and technical information about new developments in the field of heat and mass transfer; be able to independently analyze the processes of heat and mass transfer and make optimal decisions in the design and operation of heat and mass exchange equipment;	Analysis of conducted experiments, analysis of scientific literature, presentation of reports	Report, presentation
LR 8	Know the procedures for setting and solving scientific problems; applies standards and regulations for the registration of research results, for the preparation of scientific reports, publications for seminars and conferences; applies procedures for searching global networks for information on scientific developments, opportunities for scientific contacts, applications for scientific grants of various levels.	Monitoring of the implementation by doctoral students of an individual research plan (publication of scientific results, preparation of a dissertation).	Report, presentation
LR 9	Demonstrates the procedures for testing the results of scientific research, preparation of publications on the results of scientific research; possess a way of presenting scientific materials and forming a manuscript of scientific work, registration of a master's thesis.	Analysis of the results of the intermediate and final certification of the research work of PhD students. Organization and monitoring of the defense of doctoral dissertations.	Protection

21. The graduate model of the educational program

Attributes:

- deep professional knowledge in their field of study;
- interest in mastering trends in education and science;
- ability to collaborate in the professional community;
- independence in the search for opportunities for professional and personal development;
- sociability;
- tolerance and good manners;
- academic integrity;
- willingness to participate in solving state tasks and strategies of Kazakhstan.

Types of competencies	Description of competencies
1. Behavioral skills and personal qualities (Soft skills)	Able to use knowledge of traditional and modern problems of the history and philosophy of science in research activities in the professional direction. Has the basic concepts and categories of the philosophy of science for setting and solving urgent problems in his own field of scientific research. Fluent in foreign languages at a level that allows effective interaction in a professional and scientific environment; has the skills to carry out with a high degree of independence and self-regulation further training and development of a linguistic personality. He is able to use basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations in cognitive and professional activities.
2. Digital competencies (Digital skills):	Know the main traditional and non-traditional renewable energy sources; the energy potential of renewable energy sources; principles and methods of practical use of renewable energy sources. Providing technical solutions aimed at the rational use of unconventional and renewable energy sources; know the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activity; understands the methods of planning and organizing scientific research; possesses the methodology of scientific conception, creativity, the general scheme of the organization of scientific research, the practice of using methods of scientific cognition in the field of innovation in natural science, technical and technological research. To master the methods and techniques of analog, physical and mathematical modeling; development of skills and abilities: mathematical modeling of processes.
3. Professional competencies (Hard skills)	To set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. To know different types of heat exchange and methods of their calculation; to know the basic principles of heat and mass transfer and methods of mathematical modeling of heat and mass transfer processes and installations, the main sources of scientific and technical information about new developments in the field of heat and mass transfer; independently set and solve problems of thermohydraulic processes and perform numerical calculations; develop computer models of thermohydraulic processes. Know the procedures for setting and solving scientific problems; applies standards and regulations for the design of research results, for the preparation of scientific reports, publications for seminars and conferences; demonstrates procedures for testing the results of scientific research, preparation of publications based on the results of scientific research; possess the method of presentation of scientific materials and the formation of the manuscript of scientific work, the design of a master's thesis.

4.2	Purchase of equipment	Number	3	4	1	2
4.3	Other (interactive board)	Number	1	1		1
5.	**Updating the content of the EP**					
5.1	Updating the learning outcomes and the list of disciplines taking into account the requirements of the labor market, scientific achievements, professional standards	Year		+		
5.2	Introduction to the EP of academic disciplines in foreign languages*	Year				+
5.3	Introduction of new teaching methods	Year	+			
5.4	Opening of joint/two-degree program on the basis of the EP	Year				

Head of the professor Zh.S. Akylbaev Department of engineering Thermophysics **K.M. Shaimerdenova**

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
7M07104 - Heat power engineering

The purpose of the Plan is to contribute to improving the quality of the conditions for the implementation of the educational program, taking into account the current requirements of the labor market and the achievements of modern science.

Target indicators

№	Indicators	Unit of measurement	2024-2025 (in fact)	2025-2026 (plan)	2026-2027 (plan)	2027-2028 (plan)
1	**Human resources development**					
1.1	Increase in the number of teachers with academic degrees	Number of people	1	2	2	2
1.2	Advanced training in the teaching profile	Number of people	2	3		2
1.3	Involvement of practitioners in teaching	Number of people	1	1		1
2	**Promotion of the EP in the ratings**					
2.1	IQAA	Position	2	1	2	3
2.2	IAAR	Position	3	2	3	4
2.3	Atameken	Position	-	-	-	-
3.	**Development of educational and scientific-methodical literature, electronic resources**					
3.1	Textbooks	Number				
3.2	Training manuals	Number	1			1
3.3	Methodological recommendations/instructions	Number				
3.4	Electronic textbook	Number				
3.5	Video/audio lectures	Number			1	1
3.6	Other (monograph)	Number	1		1	
4.	**Development of educational and laboratory facilities**	Number				
4.1	Purchase of software products	Number	1			1

Developers:
Members of the working group:

Head of the professor Zh.S. Akylbaev Department of engineering Thermophysics — K.M Shaimerdenova

Associate Professor of the professor Zh.S. Akylbaev Department of engineering Thermophysics — A.N. Dyusembaeva

Master's student of 2 year of study — A.B. Kurmanaliev

The educational program was reviewed by the Faculty Council from 25.04.24 Protocol No. 8
The educational program was reviewed at the meeting of the Academic Council from 28.04.24 Protocol No. 5
The educational program was reviewed and approved at the meeting of the University Board from 24.05.24 Protocol No. 8

Member of the Board-Vice-Rector for Academic Work — **M.M. Umurkulova**

Director of the Department for Academic Work — **T.M. Khasenova**

Dean of the faculty of physics and technology — **A.K. Zeinidenov**