

APPROVAL SHEET

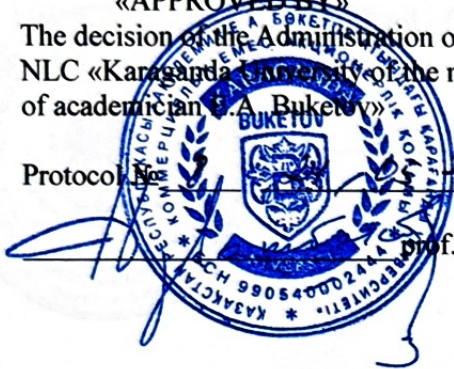
Ministry of Science and Higher Education of the Republic of Kazakhstan  
Karaganda University of the name of academician E.A. Buketov

«APPROVED BY»

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

Protocol No. 5 / 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 No. 5 / 21.06.2024



**EDUCATIONAL PROGRAM**

**7M01501 – Physics**

**Level: Master's Degree**

Karaganda,  
2024

APPROVAL SHEET

EDUCATIONAL PROGRAM «7M01501 – Physics»

«AGREED»

Head of Intellectual School of Chemistry  
and Biology Karaganda



R.M. Yakupov

2024

«AGREED»

Director of TSI «Darya» Specialized boarding  
school-lyceum



A. Temerkhanova

« 11 »

2024

**The educational program 7M01501-«Physics» is developed on the basis of:**

- Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III «On Education».
- State Compulsory Standard for Postgraduate Education dated August 31, 2018 No. 604.
- National Qualifications Framework dated March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.
- Order of the Ministry of Education and Science of the Republic of Kazakhstan «On approval of the Rules for organizing the educational process in credit technology» dated April 20, 2011 No. 152 (with amendments and additions dated August 11, 2023).
- Classifier of areas of training for personnel with higher and postgraduate education dated October 13, 2018. No. 569 (with amendments and additions as of 08/12/2023).
- Professional standard «Teacher» (Appendix to the order of the Acting Minister of Education of the Republic of Kazakhstan dated December 15, 2022 No. 500.
- Professional standard for teachers (faculty) of organizations of higher and (or) postgraduate education, approved by order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 591 dated November 20, 2023.

**Content:**

<b>Nº</b>	<b>Passport of the educational program</b>	<b>Pages</b>
1	Code and name of the educational program	5
2	Code and classification of the field of education, areas of training	5
3	Group of educational programs	5
4	Volume of credits	5
5	Form of education	5
6	Language of education	5
7	Degree awarded	5
8	Type of EP	5
9	Level according to the ISCE	5
10	Level according to the NCF	5
11	Level according to the IQF	5
12	Distinctive features of the EP	5
	Partner University (JEP)	5
	Partner University (TDEP)	5
13	The number of the appendix to the license for the direction of training	5
14	The name of the accreditation body and the validity period of the accreditation EP	5
15	The purpose of the EP	5
16	Qualification characteristics of the graduate	5
a)	List of graduate positions	5
b)	Scope and objects of professional activity of the graduate	5
b)	Types of professional activity of the graduate	6
r)	Functions of the graduate's professional activity	6
17	Formulation of learning outcomes based on competencies	21

## **Passport of the educational program**

**Code and name of the educational program:** 7M01501-«Physics»

**Code and classification of the field of education, areas of training:** 7M01 Pedagogical sciences; 7M015 Training of teachers in natural science subjects

**Group of educational programs:** M011 Training of physics teachers

**Volume of credits:** 120 academic credits.

**Form of study:** full-time

**Language of instruction:** Kazakh, Russian, foreign languages.

**Degree awarded:** Master's degree in the educational program 7M01501-«Physics».

**Type of EP:** current EP.

**Level according to the ISCE:** Level 7.

**Level according to the NCF:** Level 7.

**Level according to the IQF:** Level 7.

**Distinctive features of EP:** none

**Appendix number to the license for the direction of personnel training:** State license of the Ministry of Education and Science of the Republic of Kazakhstan KZ83LAA00018495, date of issue: July 28, 2020.

**The name of the accreditation body and the validity period of the OP accreditation:** IQAA, SA-A No. 0242/3, date of issue: May 28, 2022 y., validity period: May 27, 2027 y.

**The purpose of the educational program is** Training of qualified physics teachers with basic scientific and professional training, with knowledge of modern educational, information, analytical, communication technologies, methods of scientific research and analysis, capable of innovative professional activity, constant self-education and improvement.

### **Qualification characteristics of the graduate**

**List of graduate positions:** The graduate of the master's degree is awarded the degree of «Master of Pedagogical Sciences in the educational program «7M01501-Physics». A graduate can hold the following positions: teacher-researcher, teacher-assistant, curator, head of an organization, head of a structural unit, deputy head of a structural unit.

**Scope and objects of professional activity of the graduate:** a master's degree in the educational program carries out his professional activities in the field of education and science.

The objects of professional activity of masters are:

- Educational institutions of state and non-state funding;
- Secondary schools, colleges;
- Higher educational institutions.

**Types of professional activity of the graduate:** educational (pedagogical); experimental research; organizational and managerial; teaching; educating; methodical; social and communicative.

**Functions of the graduate's professional activity:**

- training;
- research;
- formulation of the task and plan of scientific research in the field of physics on the basis of bibliographic work with the use of modern information technologies;
- implementation of adjustment, adjustment and experimental verification of physical devices, systems and complexes;
- design and construction of various types of systems, blocks and nodes of justifications;
- educating;
- methodical;
- social and communicative.

## 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)	RC 1	Forms own scientific ideas and hypotheses, argues for them, and chooses the best methodology for theoretical and applied research.
	RC 2	Establishes interpersonal contacts, convinces the colleagues of the expediency of the initiatives, organizes and unites the team, creates a favorable psychological climate.
	RC 3	Demonstrates the required amount of knowledge of a foreign language for communication on a general and professional level, skills to express thoughts in interpersonal, business and professional way.
	RC 4	Competently translates physical texts and professionally presents the material in oral, written form in the state, Russian and English languages Plans and conducts classes taking into account the requirements of trilingualism.
	RC 5	Focuses on a wide range of new technologies, ideas, and directions and uses them in its teaching activities.
2. Digital competencies: (Digital skills):	RC 6	Selects mathematical and computer methods of data analysis, modeling and visualization for solving scientific and applied problems, taking into account the requirements of information security.
	RC 7	Selects the principles and methods of developing educational resources, including digital educational resources using information and communication technologies and taking into account the basic requirements of information security.
3. Professional competencies: (Hard skills).	RC 8	Finds and applies solutions based on knowledge of natural sciences, technology and mathematics. Selects methods for measuring physical quantities and uses devices for training and research.
	RC 9	Develops educational and methodological materials, selects adequate methods of training and education for different pedagogical situations. Projects the results of scientific research into educational materials.
	RC 10	Compares and predicts the role of science and education in the life of society; summarizes the knowledge gained within the framework of special disciplines in the field of physics and methods of teaching physics in order to conduct research, write scientific articles and commercialize the results of scientific activity.
	RC 11	Structures the methods of planning and organizing scientific research. It presents 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, physical research.
	RC 12	Analyzes the fundamental concepts and problems of modern physics, its role in the development of culture, the classical provisions of higher school didactics in integration with the theoretical concepts of a special field, higher school didactics in the aspect of training multilingual personnel, innovative and distance educational technologies in school and university.
	RC 13	Offers effective methods for solving a physical problem, interprets the results obtained, develops recommendations based on them, applies mathematical methods to the study of professional problems.
	RC 14	Has the ability to formulate and effectively solve subject and psychological-pedagogical problems, process, test and implement research results independently and as a team member, establish cooperation in the educational process with employers, professional associations and scientific organizations in order to translate best practices and commercialize the results.
	RC 15	Analyzes and synthesizes current knowledge of modern history and philosophy of science, applied natural science disciplines that contribute to the implementation of the main directions of modernization of public consciousness.

### Determination of modules of disciplines in accordance with the results of training

Learning result code	Module name	Discipline name	Volume (ECTS)
RC 1, 15	Philosophical and historical aspects of social and humanitarian knowledge	History and philosophy of science	4
RC 9, 12		Pedagogy of higher education	4
RC 2, 14		Psychology of management	4
RC 3	Professional languages	Foreign language (professional)	4
RC 3, 4		Professional foreign terminology in physics (in English)	5
RC 4, 12		Physics teaching in foreign languages	
RC 10, 14	Innovative process of scientific research organization	Commercialization of the results of scientific and scientific and technical activities	5
RC 7, 10		Fundamentals of inventive activity and patent science	
RC 8, 10, 14		Innovation in applied physics	5
RC 6, 8, 13	Applied mathematics and physics		
RC 5, 9, 12	Learning technology	Innovation technologies for physics teaching in the high school	5
RC 1, 11, 12		Actual problems of modern physics	5
RC 5, 7, 8, 9		Modern pedagogical technologies in training natural sciences	5
RC 8, 13	Selected Chapters of Modern Physics	Practice-oriented problems in physics	4
RC 1, 10, 11		Organization of research activities of students	
RC 1, 12, 15		Selected chapters of theoretical physics	
RC 6, 13		Computer methods in theoretical physics	5
RC 6, 10, 15		Selected chapters of optics	
RC 12, 15		Applied optics	5
RC 12, 13		Selected chapters of nuclear physics	
RC 1, 15		Modern astronomical world view	
RC 6, 13		Computer methods in nanotechnology (in English)	5
RC 6, 8		Methods and means of technical measurements	



### Matrix of achievability of learning outcomes

№	Name of disciplines	Brief description of the discipline (30-40 words)	Q-ty credits	Generated learning outcomes (codes)													
				RC 1	RC 2	RC 3	RC 4	RC 5	RC 6	RC 7	RC 8	RC 9	RC 10	RC 11	RC 12	RC 13	RC 14
Cycle of basic disciplines University component																	
D1	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	+													+
D2	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									+			+		
D3	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		+												+
D4	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	4			+											

		and norms of professional speech.																
Cycle of basic disciplines Component of choice																		
D5	Professional foreign terminology in physics (in English)	Purpose: formation of language competencies for academic and professional interaction. The course studies professional scientific and technical terminology in physics; the main grammatical phenomena of scientific, professional and business style, taking into account their oral and written forms; aspects and features of the translation of technical literature in physics; general scientific and business vocabulary. Tasks: mastering English-language terms and describing processes in the field of natural sciences, technology, engineering and mathematics; correct translation of foreign literature; collecting information during a literary review of the research topic.	5			+	+											
	Physics teaching in foreign languages	Purpose: to study the methods of teaching physics in higher and secondary schools in English. Teaching methods, modern pedagogical technologies and interactive teaching tools are considered. features of the formation of physical terms, basic laws and phenomena of the sections "Mechanics", "Molecular Physics", "Electricity and Magnetism", "Optics" and "Atomic Physics" in English. The course is aimed at developing the skills of conducting physics classes using innovative teaching technologies, selecting the most rational forms and didactic methods, interactive tools.					+								+			
D6	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 technical activities, including the results of intellectual activity in order to withdraw new or improved goods aimed at extracting income to the market.	5											+				+
	Fundamentals of inventive activity and patent science	Purpose: formation of ideas about human creative activity, legal protection of the results of creative work, which become								+				+				

		intellectual property. Both the laws of the Republic of Kazakhstan on all objects of intellectual industrial property and international systems of intellectual property protection, including regional patent corporations, are considered. Upon completion of the course, undergraduates should be able to: determine the legal basis and mechanisms for the protection of intellectual property; to carry out information-analytical and patent verification using modern means of information.															
D7	Innovation in applied physics	Purpose: formation of a holistic approach to professional activity for the creation of innovations. The course examines the general characteristics of the technical blocks of the innovation process; the basics of scientific knowledge and creativity, collection and processing of scientific and technical information, the basic concepts of innovation management; the basic rules of innovation management and a systematic approach to the goal of innovation; the role and responsibilities of a specialist innovator. Upon completion of the discipline, undergraduates should be able to: describe the principles of applied research; choose an approach to the creation of innovations.	5							+		+					+
	Applied mathematics and physics	Purpose : formation of in-depth knowledge and skills of conducting scientific research, methods of modeling physical processes. Contents: Study of physical phenomena in the context of interdisciplinary problems; application of mathematical methods, algorithms in other fields of science and technology; classification of mathematical models; basic forms of mathematical models used in solving applied problems. Upon completion of the course, undergraduates are able to: analyze, select and apply methods of mathematical description of physical phenomena and processes that determine the principles of							+		+						+

		operation of various technical devices.															
Cycle of profile disciplines University component																	
D8	Innovation technologies for physics teaching in the high school	The discipline is the basis of methodological and practical training of a high school teacher. The course is presented in the following sections: methods and means of interactive and information and communication technologies of training; development of educational and methodological documentation based on the regulatory framework for the organization of the educational process of higher education; modern physics equipment, software, electronic educational environment of the university; models of interaction between electronic and distance learning. The study of the course is focused on the formation of skills for conducting classes in physics using innovative teaching technologies, the selection of the most rational forms and didactic methods, interactive tools.	5						+					+			+
D9	Actual problems of modern physics	Purpose: to form an understanding of the physical picture of the world that determines the evolution of our knowledge, as well as to develop new scientific, applied technologies that most accurately correspond to the main tasks of teaching physics. Content: The study of the basic concepts, the laws of physics, which allow us to get modern ideas about the physical nature of the phenomenon. Emerging competencies: demonstrates a holistic view of the history of the development of modern physics, its basic laws and principles, the limits of applicability of fundamental physical theories and their practical use.	5	+											+	+	
D10	Modern pedagogical technologies in training natural sciences	The discipline is studied in order to form the skills of applying modern pedagogical technologies in the educational process within the content of secondary education. The issues of formation of functional	5						+		+	+	+				

		literacy in the field of natural sciences, digital technologies in education, SMART education, STEM education are considered. Formed competencies: analyzes and synthesizes knowledge on the methodology of teaching natural science disciplines at school; develops didactic materials, selects and systematizes assignments.															
Cycle of profile disciplines Component of choice																	
D11	Practice-oriented problems in physics	The discipline is studied in order to form skills for solving problems in physics. The course presents practical experience in comparing, evaluating phenomena, processes, identifying cause-and-effect relationships, setting tasks, selecting tasks, determining criteria for evaluating tasks, methods for solving applied problems in physics. The study of the course is focused on mastering the methods and technologies of practice-oriented teaching of physics.	4														
	Organization of research activities of students	Purpose: to study the method of projects and the main problems in the organization of research activities of students. The course covers: the use of elements of project activities in physics lessons; organization and conduct of research activities of students in physics; involvement of students in modeling and designing physical devices and models; evaluation of the effectiveness of educational projects. Upon completion of the course, undergraduates should be able: to assess the risks associated with the organization of project and experimental research activities of students; to organize research activities of schoolchildren on the chosen topic.		+													
D12	Selected chapters of theoretical physics	Purpose: to form a general idea of the most important ideas and directions of modern theoretical physics, to instill skills of working with the mathematical apparatus used in calculations. Upon completion of	5	+													

		the discipline, undergraduates should be able to: analyze the basic processes and mathematical apparatus of quantum mechanics; determine the scope of applicability of the mathematical method; choose and apply methods for studying the functional characteristics of environments.															
	Computer methods in theoretical physics	The discipline studies computer methods of statistical processing of observation results; practical techniques to improve the efficiency of data processing; computational methods and computer modeling of physical processes. Emerging competencies: is able to apply the acquired knowledge for computer plotting of the obtained experimental dependencies, is able to use a computer to formalize the results of the study; knows the basics of working with computer programs; is able to apply numerical methods and computer programs to build and calculate models of mechanical, hydrodynamic, electromagnetic and thermal processes.						+							+		
D13	Selected chapters of optics	Purpose: formation of in-depth knowledge and understanding of optics issues. The course studies the regularities of modern methods of excitation of fluorescence of atoms and the basics of the quantum theory of diatomic molecules. Upon completion of the course, undergraduates should be able to: capable of describing methods of excitation and registration of fluorescence of atoms; they are able to explain the use of modern technologies for analytical purposes, to discuss the possibility of using optics for further development of practical applications.	5					+			+						+
	Applied optics	The discipline is devoted to the study of basic physical processes in optoelectronics, the practical application of the mathematical foundations of field theory. Emerging competencies: classifies optoelectronic emitters and photodetectors; analyzes the physical principles of optoelectronic emitters and photodetectors;											+				+

		investigates the main characteristics of optoelectronic emitters and photodetectors.																			
D14	Selected chapters of nuclear physics	Purpose: formation of in-depth knowledge and understanding of nuclear physics issues. The course is aimed at mastering the concepts of the structure of the nucleus, its basic physical properties. The issues of radioactive decay, synthesis, model ideas about the forces of internuclear interaction and general field theory are considered. Upon completion of the course, undergraduates should be able to: they are able to describe and calculate the energy characteristics of nuclear fusion and decay reactions; they are able to determine the composition of the atomic nucleus; describe the types of interaction between the elements of the nucleus; compare the types and characteristics of elementary particles.	5														+	+			
	Modern astronomical world view	Purpose: formation of a system of knowledge, skills, and skills in the field of modern cosmology. The methodology of modern cosmology is considered. Friedman cosmological model; analyze the main epochs of the universe development; demonstrate deep subject knowledge and awareness of the variety of ideas that can be used; effectively interact in a group, exchange information and, if necessary, modify responses.		+																+	
D15	Computer methods in nanotechnology (in English)	The discipline is devoted to the study and practical application of information technologies in the field of nanoelectronics. The features of solving systems of differential equations describing the operation of micro- and nanoelectronics devices are considered. Diffusion-drift and hydrodynamic models are proposed. The features of the numerical solution of one-dimensional problems based on the MathCAD package (MatLAB) are investigated; the features of solving two-dimensional problems are investigated based on FlexPDE and Synopsys packages.	5						+											+	

	Methods and means of technical measurements	Purpose: formation of practical skills of working with technical measuring instruments. The course is aimed at mastering the methods of using analog and digital measuring instruments. Methods of measuring mechanical, electrical, magnetic and other quantities are considered. Upon completion of the course, undergraduates should be able to: they are able to explain the principles of operation of analog and digital measuring instruments; describes the classification, main characteristics and scope of the main types of measuring transducers; suggest methods for developing programs for measurements.							+		+								
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## Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module

Learning outcomes	Planned learning outcomes by module	Teaching methods	Assessment methods
RC 1	Forms own scientific ideas and hypotheses, argues for them, and chooses the best methodology for theoretical and applied research.	Interactive lecture, case-methods, round table, analysis of publications, demonstration of speech	Writing an essay
RC 2	Establishes interpersonal contacts, convinces the colleagues of the expediency of the initiatives, organizes and unites the team, creates a favorable psychological climate.	Interactive lecture, experimental works intended for scientific research	Colloquium, test
RC 3	Demonstrates the required amount of knowledge of a foreign language for communication on a general and professional level, skills to express thoughts in interpersonal, business and professional way.	Project training, analysis of conducted experiments, interpretation of results	Colloquium, test
RC 4	Competently translates physical texts and professionally presents the material in oral, written form in the state, Russian and English languages Plans and conducts classes taking into account the requirements of trilingualism.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Presentation
RC 5	Focuses on a wide range of new technologies, ideas, and directions and uses them in its teaching activities.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Colloquium, test
RC 6	Selects mathematical and computer methods of data analysis, modeling and visualization for solving scientific and applied problems, taking into account the requirements of information security.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Colloquium, test
RC 7	Selects the principles and methods of developing educational resources, including digital educational resources using information and communication technologies and taking into account the basic requirements of information security.	Analysis of scientific literature, presentation of reports	Written work
RC 8	Finds and applies solutions based on knowledge of natural sciences, technology and mathematics. Selects methods for measuring physical quantities and uses devices for training and research.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Project preparation
RC 9	Develops educational and methodological materials, selects adequate methods of training and education for different pedagogical situations. Projects the results of scientific research into educational materials.	Analysis of conducted experiments, analysis of scientific literature, presentation of reports	Written work
RC 10	Compares and predicts the role of science and education in the life of society; summarizes the knowledge gained within the framework of special disciplines in the field of physics and methods of teaching physics in order to conduct research, write scientific articles and commercialize the results of scientific activity.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Colloquium, test
RC 11	Structures the methods of planning and organizing scientific research. It presents 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, physical research.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Colloquium, test
RC 12	Analyzes the fundamental concepts and problems of modern physics, its role in the development of culture, the classical provisions of higher school didactics in integration with the theoretical concepts of a special field, higher school didactics in the aspect of training multilingual personnel, innovative and distance educational technologies in school and university.	Analysis of scientific literature, presentation of reports	Written work

RC 13	Offers effective methods for solving a physical problem, interprets the results obtained, develops recommendations based on them, applies mathematical methods to the study of professional problems.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Project preparation
RC 14	Has the ability to formulate and effectively solve subject and psychological-pedagogical problems, process, test and implement research results independently and as a team member, establish cooperation in the educational process with employers, professional associations and scientific organizations in order to translate best practices and commercialize the results.	Analysis of conducted experiments, analysis of scientific literature, presentation of reports	Written work
RC 15	Analyzes and synthesizes current knowledge of modern history and philosophy of science, applied natural science disciplines that contribute to the implementation of the main directions of modernization of public consciousness.	Interactive lecture, discussion, analysis of scientific literature, presentation of reports	Colloquium, test

## Criteria for assessing the achievability of learning outcomes

Codes of LO	Criteria
LO 1	<b>Knows:</b> the basics of historical development of institutional forms of scientific activity, methods of teaching special disciplines, forms and methods of organizing students' learning activities, scientific and methodological work, ways of improving the skills and abilities of practical teaching activity.
	<b>Can:</b> to solve problems of higher education in physics and physical education, justify the requirements to the modern educational process and identify its regularities
	<b>Owens:</b> the skills allowing to carry out with a high degree of independence and self-regulation the further training and development of linguistic
LO 2	<b>Knows:</b> the general laws of scientific knowledge in its historical development and changing socio-cultural context, the basics of philosophy and methodology of science, the characteristics of scientific knowledge, the functions of science in the life of society.
	<b>Can:</b> apply the knowledge of traditional and modern problems of history and philosophy of science in research activities on professional direction.
	<b>Owens:</b> the skills of scientific cognition and scientific methodology
LO 3	<b>Knows:</b> the basic provisions of normative documents in the field of education and science, psychological foundations of managerial activity, basic concepts, theoretical provisions and actual problems of management psychology
	<b>Can:</b> solve psychological and pedagogical problems in the educational process of higher school, plan, predict, analyze the main components of the process of training and education in higher school.
	<b>Owens:</b> the skills of managerial activity, methods of assessment of managerial activity efficiency
LO 4	<b>Knows:</b> fundamental laws and modern trends of physics
	<b>Can:</b> to apply the experience gained in the process of learning practical activity in the field of the studied profession, to adapt to the specific conditions of activity of organizations of various organizational-legal forms.
	<b>Owens:</b> the skills of self-education, formation, consolidation and development of professional competencies of a teacher in higher education institutions.
LO 5	<b>Knows:</b> the basic psychological methods and techniques of conflict management in the organization.
	<b>Can:</b> to use the main provisions and methods of the psychological science of management in professional activity.
	<b>Owens:</b> to use the knowledge obtained in the process of mastering the psychology of management in professional activity.
LO 6	<b>Knows:</b> the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activities, procedures for setting up and solving scientific problems.
	<b>Can:</b> to apply methods of planning and organization of scientific research, methods of scientific cognition in the field of innovation in natural science, physical research, to apply standards and regulations on the registration of the results of scientific research, on the preparation of scientific reports, publications for seminars and conferences.
	<b>Owens:</b> methodology of scientific conception, creativity, general scheme of organization of scientific research, practice of use, mechanism of scientific search, analysis, conducting experiments, organization of surveys, drawing up questionnaires, etc.; skills of selection of scientific research topic and selection of necessary bibliographic publications and information materials on research topic.
LO 7	<b>Knows:</b> the basics of the process of commercialization of the results of scientific and intellectual activity, investment attraction, implementation of developments in production and their further support, the legal framework of the Republic of Kazakhstan and foreign countries in the field of intellectual property protection (inventions, utility models, industrial designs, trademarks, etc.)
	<b>Can:</b> to apply basic knowledge in cognitive and professional activities in the areas of commercialization of innovations and assessment of commercial potential of innovations.
	<b>Owens:</b> basic theoretical knowledge about the organization of innovation activities, basic theoretical knowledge about the use of information technology in innovation risk management.
LO 8	<b>Knows:</b> professional physical terminology, basic vocabulary and grammar of foreign language
	<b>Can:</b> basic translation techniques when working with a foreign language text of both general language and special topics of oral and written speech in English sufficiently for communication on general and professional topics, can correctly express physical ideas in a foreign language.
	<b>Owens:</b> a foreign language as a means of intercultural and professional communication.

LO 9	<b>Knows:</b> the latest methods and achievements of physics and is able to apply them in his/her research activities; independently set specific research problems in physics and solve them using modern methods of theoretical physics and modern information technologies
	<b>Owens:</b> to compose and format scientific and technical documentation, scientific reports, reviews, reports and articles.
LO 10	<b>Knows:</b> the methodological and functional approaches used in theoretical and classical physics, types, forms and ways of organizing quality control of learning.
	<b>Can:</b> to design and carry out complex research, including interdisciplinary, on the basis of a holistic systematic scientific worldview.
	<b>Owens:</b> modern methods and technologies of organization and implementation of educational process of teaching physics at different educational levels in different educational institutions.
LO 11	<b>Knows:</b> methods, methodological techniques, forms of the organization of educational activities based on the theory of learning and providing the planned results.
	<b>Can:</b> apply problem-based learning, multilevel learning, research methods in learning, game technology and in teaching science disciplines.
	<b>Owens:</b> to create problematic situations in learning activities and to organize active independent activity of students to solve them.
LO 12	<b>Knows:</b> new problems, terminology and methodology of physics.
	<b>Can:</b> analyze scientific problems and physical processes and use in practice the fundamental knowledge obtained in the field of natural sciences.
	<b>Owens:</b> the skills of self-study, applying theory and methods of mathematics, physics, and computer science to construct qualitative and quantitative models.
LO 13	<b>Knows:</b> methods of analysis and calculation of physical systems and is able to apply them in professional activity.
	<b>Owens:</b> the methods of analysis of scientific problems and physical processes.
LO 14	<b>Knows:</b> the methods of analysis and calculation of nuclear systems and is able to apply them in practice.
	<b>Owens:</b> the skills of critical reflection of the received knowledge.
LO 15	<b>Knows:</b> the tasks of his/her professional activity, their characteristics (models), characteristics of methods, means, technologies, algorithms of solving these tasks.
	<b>Can:</b> to monitor the quality of education, to identify and assess productive and non-productive costs.
	<b>Owens:</b> to assess progress in quality improvement.

**Graduate model of an educational program:**

**Attributes of a graduate of a Master's degree**

- 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 professional and personal development opportunities
- Communication skills
- Tolerance and good manners
- Academic integrity
- Willingness to participate in solving state tasks and strategies of Kazakhstan

Types of competencies	Description of competencies
1. Softskills	<p>Demonstrates the possession of skills that allow for further training and development of a linguistic personality with a high degree of independence and self-regulation.</p> <p>The ability to use knowledge of traditional and modern problems of the history and philosophy of science in research activities in a professional direction.</p> <p>Demonstrates the level of training for solving psychological and pedagogical tasks in the educational process of higher education. Professionally has the skills guide the main provisions of regulatory documents in planning, forecasting, analysis of the main components of the process of education and upbringing in high education.</p> <p>Knows the current trends in physics for the successful application of knowledge in solving practical problems. He is able to consolidate and improve the practical experience acquired in the course of training in the field of the profession being studied. Adapts to the specific conditions of the activities of organization of various organizational and legal forms. Forms, strengthens and develops teaching skills in higher education institutions.</p> <p>Has the skills to use the knowledge gained in the process of mastering the psychology of management in professional activities. He is able to use the basic principles and methods of the psychological science of management in his professional activity. Knows the basic psychological methods and techniques conflict management in the organization.</p>
2. Digital skills	<p>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 the organization of scientific research, the practice of using methods of scientific cognition in the field of innovation in natural science, physical research; owns the mechanism of scientific research, analysis, conducting experiments, organizing surveys, compiling questionnaires, etc.; has the skills of choosing a scientific research topic and selecting the necessary bibliographic publications and information materials on the research topic; knows 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.</p> <p>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. Has basic theoretical knowledge about the organization of innovation activities, basic theoretical knowledge about the use of information technology in innovation risk management.</p>
3. Hardskills	<p>Ability to correctly express physical ideas in a foreign language</p> <p>Ability to use the latest methods and achievements of physics in their research activities; independently set specific tasks of scientific research in the field of physics and solve them with the help of modern methods of theoretical physics and modern information technologies ability and willingness to put into practice the skills of compiling and processing scientific and technical documentation, scientific reports, reviews, reports and articles.</p> <p>The ability to design and carry out complex research, including interdisciplinary, based on a holistic systematic scientific worldview; apply modern methods</p>

and technologies for organizing and implementing the educational process of teaching physics at various educational levels in various educational institutions.

The ability to use such pedagogical technologies as problem-based learning, multi-level learning, research methods in teaching, the technology of using game methods in teaching, etc. in teaching natural sciences.

The ability to analyze scientific problems and physical processes, to use in practice the fundamental knowledge gained in the field of natural sciences, to master new problems, terminology, methodology and to master scientific knowledge, self-study skills, to apply the theory and methods of mathematics, physics and computer science to build qualitative and quantitative models.

The ability to use methods of analysis and calculation of physical systems, to analyze scientific problems and physical processes, to use in practice the fundamental knowledge gained in the field of natural sciences, to master new problems, terminology, methodology and to master scientific knowledge, possession of self-study skills.

Critically comprehends the acquired knowledge. Demonstrates knowledge in the use of modern methods of analysis and calculation of nuclear systems.

Ability to monitor and master methods of assessing progress in the field of quality improvement, identify and evaluate productive and unproductive costs; apply knowledge of the tasks of their professional activity, their characteristics (models), characteristics of methods, tools, technologies, algorithms for solving these tasks.

**Developers:**

Members of the working group:

Head of the Department of physics and Nanotechnology



G.S. Omarova

Associate Professor of the Department of Physics and Nanotechnology



E.K. Mussenova

Master's student



A. Kazbek

The educational program was reviewed by the Faculty Council from 25.04.2024 Protocol No. 9

The educational program was reviewed at the meeting of the Academic Council from 29.04.2024 Protocol No. 5

The educational program was reviewed and approved at the meeting of the University Board from 24.05.2024 Protocol No. 8

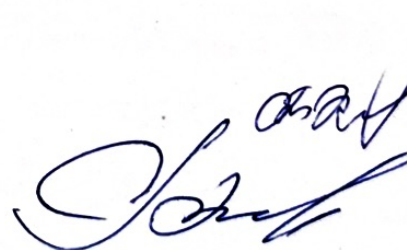
**Member of the Board – Vice-rector for academic affairs**

**M.M. Umurkulova**

**Director of the Department for Academic Work**

**T.M. Khasenova**

**Dean of the faculty of physics and technology**



**A.K. Zeinidenov**