

**MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KARAGANDA UNIVERSITY
NAMED AFTER ACADEMICIAN E. A. BUKETOV**

«AGREED»

Acting Director of the State Enterprise "Institute of Applied Mathematics"

Ministry of Digital Development, Innovation and aerospace industry of the Republic of Kazakhstan, Karaganda

Afanasyev D.A.



«15» 12 2021 y.



«APPROVED»

Chairman of the Board-Rector

Karaganda University

named after academician E.A. Buketov

Dulatbekov N.O.

«19» 01 2022 y.

EDUCATIONAL PROGRAM

«8D05302 -PHYSICS»

Level: Doctorate

Degree: doctor of philosophy PhD in educational program «8D05302 – Physics»

Karaganda, 2022

The educational program in the direction of preparation "8D05302 Physics" was developed on the basis of:

- - The Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education" (with amendments and additions as of March 31, 2021)
- - State compulsory standard of higher education of August 31, 2018, № 604 (with amendments and additions as of 05.05.2020, № 182).
- - State compulsory standard of postgraduate education dated August 31, 2018, № 604
- - National qualifications framework of 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 on credit technology" dated October 2, 2018, № 152 (with amendments and additions dated October 12, 2018, № 563)
- - Classifier of areas of training with higher and postgraduate education from 03.09.2020, № 1.

Educational program "8D05302 Physics"

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1. Field of Education: 8D05 Natural Sciences, Mathematics and Statistics
2. Direction of training: 8D053 Physical sciences
3. Training period: 3 years
4. Language of instruction: Kazakh, Russian
5. Appendix to the state license for engaging in educational activities: State license of the Ministry of Education and Science of the Republic of Kazakhstan No. 12015198, date of issue "15.10.2012".
6. Accreditation of the educational program: IQAA, SA No. 0113/4, date of issue "May 29, 2017", validity period May 27, 2022.
7. Requirements for applicants: Master of Pedagogical Sciences in the specialty 7M01501 - Physics, Master of Natural Sciences in the specialty 7M05302 - Physics.
8. Type of educational program:
 - current
9. Settable prerequisites for mastering the program:
 - if the profile of the educational program of doctoral studies coincides with the program of postgraduate education - it is not required
 - if the profile of the educational program of doctoral studies does not coincide with the program of postgraduate education: - Mathematics (10 ESTC), Physics (10 ESTC).
10. Information about foreign partners in the implementation of the program: (Mitko Stoev - Doctor of Engineering, Associate Professor of South-West University "Neofit Rilski", Blagoevgrad, Bulgaria, Shragher Ernst Rafailovich - Doctor of Physics and Mathematics, Professor of Tomsk State University (Russia, Tomsk).
12. The main bases of practices for the educational program:
 - pedagogical (Department of Physics and Nanotechnology, Department of Pedagogy and Methods of Primary Education, Psychology)
 - research (Institute of Molecular Nanophotonics, Institute of Technical Physics and Environmental Problems, Research Center of ion-plasma technologies and modern instrument making, IP "Serikov", LLP Energoservice - LTD).
13. The main scientific organizations, organizations of relevant industries or fields of activity, including foreign ones, for conducting scientific internships (Memorandum of Cooperation with the National Research Tomsk Polytechnic University, Cooperation Agreement with Omsk State University of Railways, Cooperation Agreement with Siberian State University of Telecommunications and Informatics, Cooperation Agreement with Novosibirsk State Pedagogical University, Cooperation Agreement with Orenburg State University, Cooperation Agreement in the field of education and science with National Research Tomsk State University.)
14. Major scientific organizations, research institutes, centers for scientific research work Institute of Molecular Nanophotonics, Institute of Technical Physics and Environmental Problems, Research Center of ion-plasma technologies and modern instrument making, IP "Serikov", LLP "Energoservice - LTD").
15. Opportunities for further training
16. List of employers

№	Name of companies, enterprises, organizations	Contacts, phone, e-mail
1	Institute of Molecular Nanophotonics	+7(7212)77-04-46; niazibraev@mail.ru
2	Institute of Technical Physics and Environmental Problems	+7(7212)77-03-62; katkargu@mail.ru
3	Research Center for Ion-Plasma Technologies and Modern Instrumentation	+77052666427; exciton@list.ru
4	IP "Serikov"	+7(777)5724440; serikov-timur@mail.ru
5	LLP "Energoservice - LTD"	+7(7212)35-30-67, 35-30-71; energoservis-2006@mail.ru

2. Qualification characteristics of doctoral graduates

2.1 List of qualifications and positions

The graduate of doctoral studies is awarded the degree "Doctor of Philosophy (PhD)" in the educational program "8D05302 Physics". A graduate can hold the following positions: researcher, assistant teacher, curator, head of an organization, head of a structural unit, deputy head of a structural unit.

2.2 Sphere of professional activity

The sphere of professional activity of graduates for this educational program "8D05302 Physics" are:

- fields of science and technology, including research, development, creation and operation of new materials, technologies, devices and devices.

2.3 Objects of professional activity

The objects of professional activity of masters in the educational program "8D05302 Physics" are:

- for scientific and pedagogical training - research institutes, research centers, research laboratories, design and design bureaus, firms and companies, higher educational institutions, state educational institutions and educational enterprises, as well as non-state educational organizations, ministries, state bodies management of the relevant profile, organization of the system of higher and secondary specialized education.

2.4 Subject of professional activity

The subject of professional activity of graduates in the educational program "8D05302 Physics" are:

- construction of mathematical models of research objects and the choice of a numerical method for their modeling, the development of a new or the choice of a ready-made algorithm for solving the problem;
- development of functional and structural diagrams of complexes and systems, taking into account the physical principles of their operation, and the establishment of technical requirements;
- development and implementation of technological processes.

2.5 Types of professional activity:

- experimental research; organizational and managerial; educational (pedagogical); educational; educating; methodical; social and communicative

2.6 Functions of professional activity:

- formulation of the problem and plan of scientific research in the field of physics based on bibliographic work using modern information technologies;
- performing mathematical modeling and optimization of object parameters using the developed and available research and design tools, including standard and specialized packages of applied programs;
- implementation of adjustment, tuning and pilot testing of physical devices, systems and complexes;
- design and construction of various types of systems, blocks and justification units;
- educational;
- educating;
- methodical;
- research;
- social and communicative.

2.7 Typical tasks of professional activity:

- solution of theoretical and experimental problems arising from the consideration of various physical processes;

- analysis of physical phenomena based on modern theoretical concepts and their application in applied research;
- development and improvement of formal models and methods used in the creation of objects of professional activity;
- development and research of methods of analysis, synthesis, optimization of forecasting the quality of processes of functioning of objects of professional activity;
- development, improvement and application of means of specification of methods for the development of standards and technologies for the production of objects of professional activity;
- knowledge of the content of the curriculum of the taught course (discipline);
- knowledge of general pedagogy and general psychology, developmental physiology and psychology.

2.8 Content of professional activity:

- research activities;
- scientific and pedagogical activity;
- design and engineering activities;
- supervising the research work of undergraduate students; the use of innovative pedagogical technologies within the credit education system aimed at increasing the level of self-education and creative mastering of students' knowledge;
- organizational and management activities.

3. The purpose of the educational program

The purpose of education is to increase the efficiency of the work of higher educational institutions and research organizations that train doctoral students; stimulation of independent educational, research and teaching activities of doctoral students; ensuring the recognition of documents of the Republic of Kazakhstan on awarding the academic degree "Doctor of Philosophy" in the international educational space and in the international labor market.

3.1 The general goal of the educational program:

Training of qualified specialists for the development of the economy, industry and culture of the Republic of Kazakhstan, providing conditions for obtaining a full-fledged education, professional competence in Physics.

3.2 Purpose of the cycle of basic disciplines

- obtaining a full-fledged and high-quality professional education, professional competence in the field of pedagogy;
- mastering a humanitarian culture, ethical and legal norms governing attitudes towards a person, society, and the environment;
- development of cognitive, information and communication, constructive, design, organizational skills that are significant for pedagogical activity;
- the formation of professional competence in the field of pedagogy, mastering the basics of pedagogical skills as the basis for readiness to carry out activities in educational institutions;
- development of a culture of thinking, skills of self-education and scientific organization of labor;
- implementation of teaching activities in educational institutions of various types;
- the ability and skills to independently conduct lectures, seminars, practical, laboratory classes, taking into account the requirements of the developed and approved methodological guidelines;
- the ability and skills under the guidance of a mentor to determine the content and choose the form, methods and means of training sessions (seminar, practical and laboratory) in accordance with the objectives of the course; under the guidance of a mentor, planning and organizing students' independent work;
- knowledge of the didactics of higher education in the aspect of training multilingual personnel;
- knowledge of the content of the curriculum of the taught course (discipline);

- knowledge of the methodology for the development of scientific and methodological products, educational and methodological complexes, author's courses in the framework of training multilingual personnel;
- knowledge of methods for introducing research results into practical pedagogical activity;
- independently conducts lectures approved by the department; plans and organizes independent work of students;
- under the direct supervision of a mentor, determines the content of the lecture material (for approval at the department), taking into account modern concepts of vocational education.

3.3 Purpose of the majors cycle

The purpose of studying a cycle of major disciplines is to provide deep theoretical knowledge and practical skills in the development, creation and operation of instruments and methods of analysis, forecasting and control of the properties of materials and technological materials.

- independent use of theoretical and practical knowledge for the formulation and solution of research problems, the introduction of research results into practical pedagogical activity;
- in cooperation with colleagues, the implementation of approbation of the obtained research results, planning and implementation in a special area, including for the purpose of commercializing the results obtained.

3.4 Purpose of research / experimental research work

- preparation of a doctoral student, both for independent research work, the main result of which is the writing and successful defense of a master's thesis, and for conducting scientific research as part of a creative team.

3.5 Purpose of the final assessment

The final certification of a graduate of a higher educational institution is mandatory and is carried out after mastering the educational program in full. The final state certification includes passing the state exam and defending a master's thesis. Assessment of learning outcomes and key competencies achieved upon completion of the study of the doctoral study program.

4. Key competencies of the graduate

Competency code	Description of competencies
Personal competencies	
PC1	The methodological status of philosophy in understanding the development and functioning of social and humanitarian knowledge is explained. The object and the subject in social and humanitarian knowledge, their organic relationship are highlighted. By virtue of which social and humanitarian knowledge becomes an integral system. The specificity of the cognizing subject in social and humanitarian cognition is emphasized. Particular attention is paid to the methodological role of the philosophical concept of values and value orientations in the analysis of the nature and essence of social and humanitarian knowledge, as well as in revealing the internal motives of human activity in human history.
PC2	The readiness to solve real communication problems in certain situations of communication and professional activity through the studied language and the readiness to develop physical qualities for the purpose of intellectual development of human abilities.
PC3	The ability to independently master and use new research methods, to master new areas of professional activity, the willingness to use knowledge of modern problems of science and education in solving professional problems, the ability to apply modern methods and technologies of organizing educational activities, diagnosing and assessing the quality of the educational process in various educational programs, the ability to form an educational environment and use

	professional knowledge and skills in the implementation of the tasks of innovative educational policy, the ability to analyze the results of scientific research, apply them in solving specific research problems in the field of science and education, independently carry out scientific research.
Profile competencies	
PC1	The ability to independently acquire and use new knowledge and skills in practice, including in new areas of knowledge that are not directly related to the field of activity, to expand and deepen their scientific outlook, including with the help of information technologies; the ability to use an understanding of the methodological foundations of scientific knowledge and creativity, the role of scientific information in the development of science; readiness to conduct bibliographic work using modern information technologies, the ability to analyze, synthesize and critically summarize information; the ability and willingness to use in-depth knowledge in the field of natural sciences and humanities in professional activities.
PC2	The ability to use the fundamental laws of natural sciences in professional activities, as well as to apply the physical and mathematical apparatus and methods of mathematical analysis in practice. Ability to organize research and production work and manage team, readiness to assess the quality of performance results. The ability to critically analyze modern problems of technical physics, set tasks and develop a research program, choose adequate methods and methods for solving experimental and theoretical problems, interpret, present and apply the results obtained.
PC3	The ability to plan and set research tasks, choose experimental work methods, interpret and present the results of scientific research, give practical recommendations for their implementation in production; - willingness to present research results in the form of reports, abstracts, scientific publications and in public discussions.
PC4	Participation in research work, development of projects and programs, development of creative initiative, rationalization, invention, implementation of the achievements of domestic and foreign science, technology, use of advanced experience, participation in research work contributing to the development of sectors of the national economy of the Republic of Kazakhstan.
PC5	Evaluate each competence in terms of manifestation in the form of labor functions (modular approach to building content, final certification for a set of competencies); Assess clusters of competencies (final certification); Assess fragments - individual signs of competencies (intermediate certification for each discipline).

5. Key learning outcomes

Learning result code	Result
LO1	Ability to use knowledge of traditional and modern problems of history and philosophy of science in research activities in a professional direction.
LO2	Demonstrates the level of preparation for solving psychological and pedagogical problems in the educational process of higher education. Professionally possesses the skills of managing the main provisions of regulatory documents in planning, forecasting, analysis of the main components of the process of teaching and upbringing in higher education
LO3	Has the skills to use the knowledge gained in the process of mastering the psychology of management in professional activities. Knows how to use the basic provisions and methods of the psychological science of management in professional activities. Knows the basic psychological methods and techniques of conflict management in the organization.
LO4	Knows modern trends in physics for the successful application of knowledge in solving practical problems. Knows how to consolidate and improve the experience of practical activity acquired in the learning process in the field of the studied profession. It adapts to the specific conditions of the activities of organizations of various organizational and legal forms. Forms, consolidates and develops teaching skills in higher education institutions.
LO5	Demonstrates possession of skills that allow for further learning and development of a linguistic personality with a high degree of independence and self-regulation.
LO6	Ability to correctly express physical ideas in a foreign language.
LO7	Able to use in cognitive and professional activities basic knowledge in the areas of commercialization of innovations and assessment of the commercial potential of innovations. Possesses basic theoretical knowledge of the organization of innovation, basic theoretical knowledge of the use of information technology in innovation risk management.
LO8	Knows the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations for the implementation of scientific activities; understands methods of planning and organizing scientific research; possesses the methodology of scientific intent, creativity, the general scheme of the organization of scientific research, the practice of using methods of scientific knowledge in the field of innovation in natural science, physical research; owns the mechanism of scientific research, analysis, conducting experiments, organizing surveys, drawing up questionnaires, etc.; has the skills to select a scientific research topic and select 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 the results of scientific research, for the preparation of scientific reports, publications for seminars and conferences; applies procedures for searching in global networks for information on scientific developments, opportunities for scientific contacts, applications for scientific grants of various levels; demonstrates the procedures for approbation of the results of scientific research, preparation of publications based on the results of scientific research; own the way of presentation of scientific materials and the formation of a manuscript of a scientific work, registration of a master's thesis.
LO9	He is proficient in basic measuring techniques in the use of probe, electro-optical and X-ray methods for studying nanoobjects. Analyzes the physical essence of phenomena and processes in nature and technology, fundamental physical laws and theories, conducting scientific observations of physical processes, analyzes images obtained from a probe microscope.
LO10	Knows the theoretical foundations of laser technology; applies knowledge in practice; analyzes the ways to solve the problem, finding the most effective one. Knows the design of lasers, independently measures the main parameters of laser radiation; develops new devices for solving specific problems of analysis and control of technological chains; serves laser technology used in industry. Possesses the skills of working with laser devices and the use of laser technology for solving scientific and applied problems. Applies laser technologies in various tasks of science and technology. Has experience with lasers and simplest laser devices.

6. Matrix for correlating learning outcomes for the educational program as a whole with the form of competence

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14	LO15	LO16	LO17	LO18	
PC1	+	+	+	+															
PC2					+	+													
PC3							+	+											
PC1										+	+							+	
PC2									+			+	+						+
PC3														+					
PC4															+				
PC5																+			

7. Card of competencies

Module code	Module name	Module discipline codes	Discipline name	Learning result code	Competency code
1	2	3	4	5	6
SRM 01	Scientific research methodology	AW1201	Academic writing	LO1	PC1
		RM1202	Research Methods	LO2	PC2
RM 02	Research methods	OMMNNR1203	Optical and microscopic methods of nanostructures and nanomaterials research	LO3	PC3
		PN1203	Photonics of nanostructures	LO4	PC1
RM 03	Research methods	PP1204	Pedagogical practice	LO5	PC2
Nm 04	Nanomaterials	FNPPA1305	Functional nanomaterials: preparation, properties, application	LO6	PC3
Np 05	Nanophysics	Nan1306	Nanoplasmonics	LO7	PC4
		CN1306	Carbon nanostructures	LO9	PC1
Np 06	Nanophysics	RP2207	Research practice	LO10	PC4
SRW 07	Scientific research work	NIRD1208	PhD student research work including the completion of a doctoral dissertation	LO8	PC5
FA 08	Final attestation	NZDD3209	Completion and defense of doctor dissertation	LO8	PC5

8. Content of the educational program

8.1 Map of the educational program

Module code	Loop and component	The code disciplines	Form of control	Semester	ESTC	Module learning outcomes
1 course						
SRM 01	BD/UC	AW1201	Exam	1	5	<p><i>Knowledge:</i> about the basic epistemological models, the nature of transformations of the concept of rationality; forms and methods of pre-scientific, scientific and non-scientific knowledge, modern approaches to socio-humanitarian and natural science knowledge and their commensurability.</p> <p><i>Skills:</i> to formulate and solve problems arising in the course of research activities and requiring in-depth professional knowledge; choose the necessary research methods, modify existing and develop new methods based on the tasks of a particular research; analyze and comprehend the realities of modern theory and practice based on the methodology of socio-humanitarian and natural science knowledge.</p> <p><i>Skills:</i> conducting independent research and scientific-pedagogical activities, requiring a wide multidisciplinary education; the ability to apply methodological and methodological knowledge in scientific research, pedagogical and educational work; writing scientific articles, abstracts, speeches at conferences, symposia, round tables, discussions and disputes.</p> <p><i>Competence:</i> LC1</p> <p><i>Evaluation criteria:</i> Possession of the basic concepts and categories of the philosophy of science for the formulation and solution of urgent problems in their own field of scientific research.</p> <p>Ability to navigate in theories of the historical development of scientific knowledge to develop relevant research areas in the field of one's own scientific interests.</p>
SRM 01	BD/UC	RM1202	Exam	1	5	<p><i>Knowledge:</i> the main provisions of the content of higher education, modern didactic concepts in higher education; features of the design and organization of the pedagogical process at the university, modern educational technologies; fundamentals of pedagogical skills and pedagogical techniques, management in education, management of the process of formation and development of the personality of students.</p> <p><i>Skills:</i> to formulate and solve problems arising in the pedagogical process and requiring in-depth pedagogical knowledge; analyze and comprehend the realities of modern theory and practice of teaching in higher education; diagnose and advise students, taking into account the profile of future professional activities.</p> <p><i>Skills:</i> conducting independent research and scientific-pedagogical activities, requiring a wide multidisciplinary education; the ability to apply methodological and methodological knowledge in scientific research, educational and educational work.</p>

						<p><i>Competence:</i> LC1</p> <p><i>Evaluation criteria:</i> defines the modern paradigm of higher education, its content; names the driving forces and principles of the learning process in higher education; indicates the features of modern didactic concepts in higher education; uses traditional and active teaching methods in higher education; makes the optimal choice of forms of organization of the educational process in higher education; applies modern educational technologies.</p>
RM 02	BD/EC	OMMNNR 1203	Exam	1	5	<p><i>Knowledge:</i> the main provisions and features of the activity of a practical psychologist in the field of management activities; ways and techniques to improve the efficiency of the organization.</p> <p><i>Skills:</i> ability for abstract thinking, analysis, synthesis; the ability to use in management activities, knowledge in the field of theory and practice of organizing potential opportunities in the organizational sphere.</p> <p>on the possibilities of using the studied materials in the practical activities of a psychologist in the managerial sphere and in the field of resolving conflict situations between the subjects of interaction; about acceptable boundaries and ways of influencing employees; on the procedure and patterns of mediation conflict resolution.</p> <p><i>Skills:</i> Skills of working with the parties to the conflicting parties, the organizational system, providing them with psychological assistance in the managerial sphere; readiness for communication to solve problems in the field of management psychology; the ability to take into account the interests, positions and motives of employees; resolution of professional conflicts in the organization.</p> <p><i>Competences:</i> LC3</p> <p><i>Evaluation criteria:</i> The "satisfactory" grade is given for poor knowledge of theoretical material, difficulties in using special terms, and annoying mistakes in defining scientific provisions. The mark "good" is given for complete knowledge of the theoretical material, possession of the necessary subject knowledge, admission of minor inaccuracies in the answers. The mark "excellent" is given for the conceptual vision of the theoretical material, fluency in the necessary subject knowledge, confirmation of theoretical provisions by empirical data.</p>
RM 03	BD/PR	PP1204	Diff. credit	1	10	<p><i>Knowledge:</i> the structure, functions of pedagogical activity and the main directions of its development in the context of the transformation of modern society; features of pedagogical communication and interaction between teacher and students; requirements for the teaching profession.</p> <p><i>Skills:</i> design and implementation of the organization of the pedagogical process at school / university, the use of modern information technologies in teaching information disciplines, take into account the age and individual characteristics of students; own methods, techniques and means of conducting lessons and extracurricular activities.</p> <p><i>Skills:</i> definition and formulation of educational and educational goals and</p>

						<p>learning objectives; selection of adequate types, forms and methods of activity in the pedagogical process in accordance with the requirements of the state education system.</p> <p><i>Competence:</i> LC1</p> <p><i>Evaluation criteria:</i> defines the modern paradigm of higher education, its content; names the driving forces and principles of the learning process in higher education; indicates the features of modern didactic concepts in higher education; uses traditional and active teaching methods in higher education; makes the optimal choice of forms of organization of the educational process in higher education; applies modern educational technologies.</p>
Np 05	CD/EC	Nan1306	Exam	1	5	<p><i>Knowledge:</i> in each of the sections of the most important concepts, theoretical positions; general representation of objects, tasks, methods and results of knowledge of this science.</p> <p><i>Skills:</i> in the field of physicochemistry of nanodisperse systems for interpretation, modeling and forecasting of physicochemical properties of nanomaterials.</p> <p><i>Skills:</i> staging research tasks, choosing methods of experimental work, interpreting and presenting the results of scientific research</p> <p><i>Competences:</i> PC1</p> <p><i>Criteria of assessment:</i> Assessment is "satisfactory" for a reproductive statement of the answer with a hint (knowledge, reproduction). The grade is "good" for the reproductive statement of the answer without hints (memory and application for solving typical tasks). The assessment is "excellent" for the free possession of necessary subject knowledge, confirmation of theoretical positions by empirical data.</p>
Nm 04	BD/ CC	FNPPA130 5	Exam	1	5	<p><i>Knowledge:</i> principles of operation and basic types of lasers.</p> <p><i>Skills:</i> use different types of lasers in spectroscopy.</p> <p><i>Skills:</i> work on modern laser technology and use of the most common methods of laser processing of materials to evaluate the order of physical magnitude, a clear representation of the limits of the application of physical models and hypotheses.</p> <p><i>Competences:</i> PC1</p> <p><i>Evaluation criteria:</i> Assessment is "satisfactory" for poor knowledge of theoretical material, difficulty in applying special terms, admission of annoying errors in the definition of scientific positions. The assessment of "good" is based on the full knowledge of the theoretical material, the possession of the necessary subject knowledge, the admission of insignificant inaccuracies in the answers. Evaluation is "excellent" for a conceptual vision of theoretical material, free possession of necessary subject knowledge, confirmation of theoretical positions with empirical data.</p>
						2-3 course
Np 06		RP2207	Diff.	2	10	<i>Knowledge:</i> modern physics trends for the successful application of

			credit			<p>knowledge in solving practical problems.</p> <p><i>Skills:</i> to consolidate and improve the experience of practical activities acquired in the learning process in the field of the studied profession; develop models, algorithms for solving a specific problem, task; find a solution, get results and interpret them; systematize the necessary materials for the master's thesis.</p> <p><i>Skills:</i> adaptation to specific conditions of activity of organizations of various organizational and legal forms; search and selection of relevant literary sources; using the basic techniques of research activities, conducting an experiment.</p> <p><i>Competence:</i> PC3</p> <p><i>Evaluation criteria:</i> "Satisfactory" is given to a master student who has not completed the internship program in full. Needed help in completing practice assignments and preparing a report. The reporting documentation was not provided in full on time, there are serious comments on its design and content that required revision. Review of the head with remarks "Good" is given to the master student who completed the internship program in full with a slight violation of the deadlines, was less independent, initiative in activities. The reporting documentation is presented with a slight violation of the deadlines in full, comments on its design and content are small. The head's review is positive. "Excellent" is given to the master's student, who completed the internship program on time, in full and at a high level, showing independence, initiative, and a creative approach. The reporting documentation was submitted on time in full, there are no comments on its design and content. The manager's feedback is positive.</p>
SRW 07		NIRD1208	Diff. credit	1,2,3	123	<p><i>Knowledge:</i> the main stages of scientific research, the logic of their development; basic forms and methods of quality control in education; various types of control and measuring materials; modern diagnostics of the quality of the educational process for various educational programs; rules for the registration of research results.</p> <p><i>Skills:</i> correctly determine the goal and objectives of one's own scientific research and concretize it in a number of tasks; present the results of the work done in the form of a report drawn up in accordance with the existing requirements, using modern means of editing and printing; choose such methods and research techniques that are with the greatest efficiency lead to a successful solution to the stated problem; process the results obtained, analyze and interpret them taking into account the available data; skillfully develop the apparatus of scientific research and its program, present the structure of scientific research, be able to describe the main elements in the context of one's own scientific research.</p> <p><i>Skills:</i> independent research and teaching activities; methods of design, organization, implementation and evaluation of the results of scientific research in the field of primary education methods using modern methods of</p>

					<p>science; application of methods of scientific knowledge, research techniques and principles in their own research activities; correct presentation of research results.</p> <p><i>Competence:</i> PC4</p> <p><i>Evaluation criteria:</i> "Satisfactory" is given to a master student who did not complete the research work in full. Needed help in completing assignments and preparing a report. The reporting documentation was not provided in full on time, there are serious comments on its design and content that required revision. Review of the head with remarks "Good" is given to the master student who completed the research work in full with a slight violation of the deadlines, was less independent, initiative in activities. The reporting documentation is presented with a slight violation of the deadlines in full, comments on its design and content are small. The head's review is positive. "Excellent" is given to the master student who completed the research work on time, in full and at a high level, showing independence, initiative, and a creative approach. The reporting documentation was submitted on time in full, there are no comments on its design and content. The manager's feedback is positive.</p>	
FA 08		NZDD320 9		3	12	<p><i>Knowledge:</i> basic principles and laws of physics and their mathematical expression; basic physical phenomena, methods of their observation and experimental research.</p> <p><i>Skills:</i> to use modern information technologies, methods of processing scientific information; develop an algorithm for solving a specific physical problem, write a program for its solution, debug the program on a test example, substantiate its correctness, obtain numerical results and interpret them.</p> <p><i>Skills:</i> evaluate orders of magnitude of physical quantities, a clear understanding of the limits of the application of physical models and hypotheses.</p> <p><i>Competence:</i> PC5</p> <p><i>Evaluation criteria:</i> A "satisfactory" rating is given for insufficient knowledge in the field of physics. Poor application of the knowledge gained in solving physics problems. The mark "good" is given to good possession of fundamental knowledge in the field of physics, good ability to apply innovative teaching methods. The mark "excellent" is given for fluency in fundamental knowledge in the field of physics. Perfectly uses innovative teaching methods.</p>

8.2 Summary table by the volume of the educational program

Course of study	Semester	Amount of mastered modules	Amount of disciplines studied		Amount of credits						Total in hours	ECTS	Amount		
			UC	CC	Theoretical teaching	Ped. practice	Industrial (ped.) Practice	Research practice	NIRD	Final examination			Total	Exam	Diff. credit
1	1	5	3	2	25				5		30	900	30	5	1
	2					10			20		30	900	30		2
2	3						10		20		30	900	30		2
	4							30		30	900	30		1	
3	5								30		30	900	30		1
	6							18	12	30	900	30		1	
Total					25	10		10	123	12	180	5400	180	5	8

Compilers:

Head of the Department physics and nanotechnology

Agreed:

Chairman of the Quality Assurance Commission of the faculty of physics and technology

Notes:

The educational program was reviewed and recommended by the Faculty Council from 22.11.2021 Protocol No.5

The educational program was reviewed at the meeting of the Academic Council of the University and recommended for approval from 15.12.2021 Protocol No.2

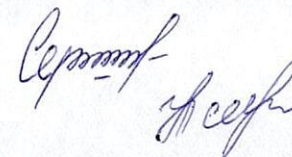
The educational program was reviewed and approved at the meeting of the University Board from 19.01.2021 Protocol No.2

Member of the Board, Vice-Rector for Scientific Work

Board Member, Vice-Rector for Academic Affairs

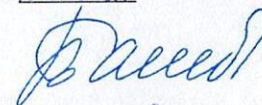
Director of the Department for Academic Work

Dean of the faculty of physics and technology



T.M. Serikov

A.S. Utegenova



E.M. Tashbaev

T.Z. Zhusipbek

G.S. Akybaeva

A.K. Zeinidenov

