Ф.7.02-10

MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY



«APPROVED»
Chairman of the Board-Rector
D.Zh.Ahmed-Zaki
«23» 03 2026y.

EDUCATIONAL PROGRAM

7M05310-Physics

Registration number	7M05300004
Code and classification of the field of education	7M05 Natural sciences, mathematics and statistics
Code and classification of areas of study	7M053 - Physical chemical sciences
Group of educational programs	M090 Physics
OP type	Acting
ISCED level	7
NQF level	7
IQF level	7
Language of instruction	Kazakh Russian
The complexity of EP	120 credits
Distinctive features of EP	-
Partner University (JEP) -	-
University partner (DDEP) -	-

Shymkent, 2026

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Drafters:

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The educational program has been updated taking into account the new approaches of inclusive education and agreed with the City department of employment and social protection.

Deputy Head of the Department of Employment and Social Protection of Shymkent _____ K.Kaldykarayev

The EP was considered at a meeting of the Academic Quality Committee of the Higher School «Natural Sciences and Pedagogy», Minutes 6 «23» 02 2026 y.

Chairman of the Committee _____ A.Z.Tursynbaev

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU , Minutes 4 «23» 02 2026 y.

Chairman of the EMM _____ E.I. Imangaliyev

The EP was approved by the decision of the Academic Council of the University

Minutes 4 «26» 03 2026 y.

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1. Concept of the Educational program

University mission	Generation of new competencies, preparation of a leader who translates research and entrepreneurial thinking and culture
University values	• Openness - open to change, innovation and cooperation. • Creativity – generates ideas, develops them and turns them into values. • Academic freedom - **free in choice, development and action.** • Partnership - creates trust and support in relationships where everyone wins. • Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.
Model ofgraduate	• Deep subject knowledge, its application and constant expansion in professional activities. • Information and digital literacy and mobility in a rapidly changing environment. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for self-activity and well-being. • Global and national citizenship, tolerance for cultures and languages.
Uniquenessof EP	• Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders. • Practice orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow you to be functionally literate and competitive in any life situation and be in demand in the labor market.
Academic Integrity and Ethics Policy	The university has taken measures to maintain academic integrity and academic freedom, protection from any type of intolerance and discrimination: • Rules of academic integrity (order No. 212 of October 10, 2022); • Anti-corruption standard (order No. 221 n/a dated 12/07/2021). • Code of Ethics (Order No. 212 of October 10, 2022).
Legal framework for the development of EP	1. Law Republic Kazakhstan "Education"; 2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021 No. 614 3. Standard rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 with amendments and additions dated 06/02/2023. No. 252 4. State mandatory standards for higher and postgraduate education, approved by order of the Ministry of Education and Science of July 20, 2022 No. 2; 5. Rules for organizing the educational process in credit technology of

	education, approved by order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152; with changes and additions from 09/23/2022. No. 79 6. Qualification reference book for positions of managers, specialists and other employees, approved by order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated December 30, 2020 No. 553. 7. Methodological recommendations for introducing ECTS principles into the educational process and expanding academic freedom. Appendix to the order of the Minister of Science and Higher Education. of the Republic of Kazakhstan dated February 12, 2024 No. 57 8. Guidelines for the development of educational programs for higher and postgraduate education, Appendix 1 to the order of the Director of the National Center for the Development of Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan dated May 4, 2023 No. 601 n/k
About the organization of educationalprocess	• Implementation principles Bologna process • With a student center ededucation • Availability • Inclusiveness
Ensuring the quality of the EP	• In the interior systemensure quality • Attraction of stakeholders to the development of the EP and its evaluation • Systematic monitoring • Content update (update)
Requirements for applicants	They are established in accordance with the Standard Rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education by order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated October 31, 2018, with changes and additions dated June 2, 2023. No. 252
Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs(SSN)	For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS). For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website http://lib.ukgu.kz/ is open 24/7. An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

2. Passport of the Educational program

Purpose of EP	Training of highly qualified specialists in the field of physics who are able to conduct scientific research, solve fundamental and applied problems using modern methods and digital technologies, carry out scientific and pedagogical activities and develop innovative solutions.
EP Tasks	– meeting the needs of the individual in intellectual, cultural and moral development by obtaining higher postgraduate education; - training of masters, teachers of physics, capable of successfully mastering related areas of professional activity, as well as advanced training, training in additional education programs and continuing education in doctoral studies; – meeting the needs of society in qualified specialists in the field of education and teaching physics in universities that are able to integrate academic values with entrepreneurial ideas; - development of a favorable educational environment for the implementation of professional, cultural and linguistic needs of students ; – formation of a deep professional understanding of fundamental problems and practical methods for their solution in the field of physics and methods of teaching physics and its applications in scientific and pedagogical activities; - the formation of professional ability to plan and independently conduct effective scientific and pedagogical work, as well as to critically evaluate its results; - the formation of the ability to adapt and apply general methods of solution to the solution of non-standard problems; - preparation for professional activities at a university, research institute, in production or doctoral studies. - Establishing conditions for the development of in-demand knowledge and skills, as well as a conscious attitude towards enhancing the welfare of society and conserving the planet within the framework of the SDGs.
Harmonization of EP	• **7** th level of the National Qualifications Framework of the Republic of Kazakhstan; • Dublin descriptors of the 7th level of qualification; • 2 cycle of a Framework for Qualification of the European Higher Education Area); • • 7th Level of European Qualification Framework for Life long Learning).
Connection of EPwith the professional sphere	Professional standard "Teacher", approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated June 8 , 2017 Professional standard: “Support of an innovative project” approved by order Appendix No. 11 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan “Atameken” dated December 24, 2019. No. 259 GOSO ViPVO" Order of the Ministry of Science and Higher Education of Kazakhstan dated July 20, 2022 No. 2, as amended by the order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated March 4, 2025 No. 90
Name of the degree awarded	After successful completion of this educational program, the graduate is awarded the degree: Master of Natural Sciences of the EP «7M05310-Physics» code and name of the educational program
List of qualifications and positions	Masters in OP «7M05310-Physics» can hold positions of a physics teacher in universities, colleges and a researcher in research institutions.

Sphere of professional activity	– -the field of experimental and applied physics and education, scientific activity in the field of science and innovation.
Objects of professional activity	– higher, secondary and secondary specialized educational institutions (universities, colleges, educational institutions of technical and vocational education), – management organizations: state educational authorities, departments of education.
Subjects of professional activity	- physical systems of various scales and levels of organization, processes of their functioning; physical, engineering-physical, biophysical, chemical-physical, medical-physical, environmental technologies; physical expertise and monitoring. - - scientific process, theoretical and experimental methods of scientific research; - the educational process in the unity of its value-target orientations, content, methods, forms and results; - innovative, informational and analytical activities in the field of physics, pedagogy and teaching methods.
Types of professional activity	*pedagogical and educational:* – organization of the educational process at different levels of the education system (organization of the process of education and upbringing, design and management of the pedagogical process, diagnostics, correction, prediction of the results of pedagogical activity); – preparation and conduct of classes in physics and informatics; – management of scientific work of students; – conducting optional classes in physics and informatics; – organization of cultural and leisure work with young students in the field of education, development of programs, methods and technologies for educational work in the field of physics and computer science, as well as its scientific and technical achievements. *research* : – conducting scientific research on the problems posed in the field of education; - selection of the necessary research methods; – formulation of new tasks arising in the course of scientific research; – work with scientific literature using new information technologies, tracking scientific periodicals; – analysis of the received scientific information using modern computer technology. *scientific and innovative* : – application of the results of scientific research in innovative activities; – development of new methods of scientific and pedagogical activity; – participation in the formulation of new tasks and the development of new methodological approaches in scientific and innovative research; – processing and analysis of the received data with the help of modern information technologies. *organizational and managerial* : – participation in the organization of research and scientific and innovative work; – participation in the organization of seminars, conferences; – preparation of abstracts, writing and design of scientific articles; – participation in the preparation of applications for grant competitions and the preparation of scientific and pedagogical projects, reports and patents.

Learning Outcomes	**LO 1** Design and conduct fundamental, applied, and interdisciplinary research in physics by applying contemporary scientific research methodologies, knowledge of the history and philosophy of science, scientific analysis methods, and the principles of academic integrity and research ethics. **LO 2** Use the state, Russian, and foreign languages for effective professional, scientific, and academic communication; engage in international scientific collaboration; work effectively in multidisciplinary teams; and contribute to creating a supportive educational and research environment. **LO 3** Organize and manage educational, scientific, and research activities by applying the principles of educational leadership, management psychology, academic integrity, and quality assurance in education. **LO 4** Design and deliver the educational process in Physics based on a student-centered approach, utilizing innovative pedagogical strategies, digital learning resources, artificial intelligence, machine learning, and distance learning technologies, while integrating national and international best practices in education. **LO 5** Develop instructional and methodological support for Physics courses; apply contemporary teaching, criterion-referenced assessment, monitoring, and learning outcome evaluation methods to ensure the quality of the educational process and foster master students' research competencies. **LO 6** Independently formulate research problems; plan and conduct experimental and theoretical research in Physics by applying advanced physical methods, digital technologies, data analysis techniques, and international best practices in scientific research. **LO 7 Analyze** the physical principles of energy conversion from alternative energy sources, **evaluate** the results of calculations and computer modeling of energy system parameters, and **develop** proposals for their optimization using modern software tools and digital technologies. **LO 8 Analyze and evaluate** the results of research and non-destructive testing of materials using artificial intelligence, machine learning, computer vision, and data analytics technologies, **develop** approaches to automating the processing, interpretation, and classification of research results. **LO 9** Apply advanced methods of structural and physicochemical characterization of materials to determine their composition, structure, properties, and characteristics; justify the selection of appropriate research methods and interpret the results obtained. **LO 10 Analyze** current global trends in the development of physics and materials science, **evaluate** the results of independent scientific research, and **develop** scientific materials to present research findings in the form of publications, presentations, projects, and recommendations for practical application. **LO 11** Design and implement innovative, research, and educational projects; collaborate effectively with employers, research institutions, and other stakeholders; facilitate technology transfer; and evaluate the effectiveness of innovation activities throughout the entire lifecycle of products and research outcomes.

3. Competencies of an EP graduate

GENERAL COMPETENCIES (SOFTSKILLS). Behavioral skills and personal qualities

SS 1. Competence in managing one's own literacy	SS1.1. Strive for professional and personal growth throughout life.
	SS 1.2. Constantly update own knowledge within the chosen trajectory and in an interdisciplinary environment, carry out further learning with a high degree of independence and self-regulation.
	SS 1.3. To be capable of reflection, an objective assessment of one's achievements, an awareness of the need to form new competencies and continue education in doctoral studies.
SS 2. Language competence	SS2.1. The ability of possessing a sufficient level of communication in the professional field in the state, Russian and foreign languages for negotiating and business correspondence.
	SS 2.2. The ability of mastering the skills of mediation and intercultural understanding.
SS 3. Mathematical Competence and Competence in the field of Science	SS3.1. The ability to interpret the methods of mathematical analysis and modeling for solving applied problems in the field of study.
	SS3.2. The ability to plan the setting of scientific experiments, integrate and implement the results of scientific research in the professional field.
	SS 3.3. The ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity.
SS 4. Digital competence, technological literacy	SS 4.1. The ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communications.
	SS 4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices.
	SS 4.3. Ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities.
SS 5. Personal, social and academic competencies	SS 5.1. Possession of the norms of business ethics, social and ethical values and focus on them in professional activities.
	SS 5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement.

	SS 5.3. Ability to work in a team, correctly, clearly and reasonably defend one's position during discussions and make decisions of a professional nature. SS 5.4. Ability to adequately navigate in various social spheres of activity and in conditions of uncertainty. SS 5.5. Ability to find compromises, correlate own opinion with the opinion of the team.
SS 6. Entrepreneurial competence	SS 6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team. SS 6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team. SS 6.3. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, respond to changing working conditions, allocate resources and manage your time. SS 6.4. Ability to work with consumer needs.
SS 7. Cultural awareness and ability to express yourself	SS7.1. The ability to show worldview, civil and moral positions. SS7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to have high spiritual qualities.

PROFESSIONAL COMPETENCIES (HARDSKILLS).

Theoretical knowledge, practical skills and abilities specific to this area	PC1 ability to independently set specific tasks of scientific research in the field of methods of teaching physics and solve them with the help of information technology and the use of the latest domestic and foreign experience. PC2 the ability to apply knowledge of physics and methods of teaching physics to solve scientific and innovative problems, and apply the results of scientific research in innovative scientific and pedagogical activities. PC3 ability to participate in the development of new methods and methodological approaches in scientific and innovative research and teaching activities PC4 the ability to plan, organize and conduct research, scientific seminars and conferences in the field of education and physics. PC5 ability to prepare and execute scientific and pedagogical documentation, scientific reports, reviews, reports and articles. PC6 ability to lead research activities of students in the field of physics and methods of teaching physics. PC7 the ability to methodically competently build lesson plans for the sections of academic disciplines in physics and publicly present the theoretical and practical sections of these disciplines in accordance with the approved teaching AIDS.

3.1 Matrix for correlating learning outcomes in the EP as a whole with the competencies being developed

	LO1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11
SS1	+	+		+		+				+	+
SS2		+		+		+	+				
SS3			+		+	+	+			+	+
SS4		+		+		+					+

SS5	+		+	+	+					+	
SS6		+	+							+	+
SS7	+	+									
PC1	+	+	+	+	+	+	+	+	+		+
PC2	+	+	+	+			+		+		+
PC3			+	+	+	+		+	+	+	
PC4	+	+		+	+			+	+		
PC5	+	+		+	+			+			+

4. Matrix of the influence of modules and disciplines on the formation of learning outcomes and information on labor intensity

№	Module name	Cycle	component	Name of the discipline	Brief description of the discipline	Credits	Formed educational outcomes (codes)										
							EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8	EO9	EO10	EO11
1	**Module of Scientific and pedagogical training**	BD	UC	**History and Philosophy of Science**	**Course Objectives:** to form an objective view of the history and philosophy of science based on a deep understanding and scientific analysis of the main stages, patterns of modern methods of scientific cognition. **Contents:** The main laws of the development and functioning of science, philosophical and methodological foundations of modern methods of scientific cognition. Methodological apparatus of modern history and philosophy of science. Formation of a scientific and methodological worldview based on knowledge of the features of modern science. Actual problems of the history and philosophy of science, the ability to actively use the acquired knowledge of history and methodology in scientific research.	**4**	**v**										

2		BD	UC	**Foreign Language (professional)**	**Course Objectives:** formation of intercultural and communicative competence of undergraduates in the process of foreign language education at a sufficient level. presentation of scientific information in various fields of communication, methods of annotation, abstracting and translation of literature in the specialty. **Contents:** General scientific, special terminology, grammatical material sufficient for the implementation of oral and written communication in business and professional communication, methods of oral, written and electronic communication in English. Stylistic features of oral and written scientific discourse, rational methods of working with texts. Rules for the presentation of scientific information in various fields of communication	**4**		**v**	**V**								
3		BD	UC	**Psychology of Management**	**Course Objectives:** formation of knowledge of modern trends, current problems and methods of psychology development, skills of system analysis of psychological phenomena. explanation of modern trends in scientific management **Contents:** Psychological theories and management methods, modern trends in scientific management. Methodological analysis of the problem of personality psychology, psychological characteristics of personality, management methods taking into account psychological patterns. Management processes, psychological knowledge and skills in the context of their application in the practice of self-knowledge, communication, professional and personal growth.	**3**			**V**								

4	**Methodological bases of teaching**	BD	UC	**Pedagogy and Psychology of Higher School**	**Course Objectives:** to develop undergraduates' skills and abilities to effectively organize professional and pedagogical activities at a university based on modern psychological and pedagogical knowledge. **Contents:** Modern paradigms of higher education. History, trends and strategies of higher education development in Kazakhstan. The subject, tasks, and categories of higher school pedagogy and psychology. Methodological foundations of higher school pedagogy and psychology. Professional competence of a university teacher. The communicative competencies of a university teacher. Higher school didactics. Psychological features of student age.The university learning process and its patterns. The content of education at the university. Forms of organization of the educational process at the university. Technologies of organization and implementation of the educational process at the university. Features of the credit training system. Methods and methods of teaching. The relevance and objectives of inclusive education. Psychological and pedagogical aspects of teaching students with special educational needs. Creating a psychologically supportive educational environment for inclusive education at universities.	**5**		**v**		**V**							
5		PD	UC	**Teaching Methods of Special Disciplines**	**Course Objectives:** to get acquainted with the methodological foundations of working with the material of natural science orientation, the formation of an integrated approach to teaching sections of applied and experimental physics. **Contents:** Planning and conducting training sessions taking into account the specifics of applied and experimental physics, the use of scientifically based methods and means of teaching physics, scientific and methodological analysis of sections of applied and experimental physics. Ways of implementing modern technologies in teaching, their selection and design depending on the age capabilities of students and the content of the material being studied.	**5**		**v**		**V**							

6		BD	UC	**Pedagogical Practice**	**Purpose:** development of general cultural and improvement of professional competencies; familiarization with the specifics of teaching at the professional level, **Contents:** During the internship, undergraduates get acquainted with the specifics of teaching activities at a professional level, carry out pedagogical activities based on the knowledge gained in teaching disciplines of the specialty of physics; apply innovative and digital technologies, interactive teaching methods, monitor student progress, learn to make syllabuses and develop the UMK of physics disciplines, makes a report on practice.	**4**		v		V							
7	**Solid state physics**	PD	EC	**Alloys with Special Physical Properties**	**Course Objectives:** formation of knowledge about alloys with special physical properties; modern directions of rational choice of alloys for the manufacture of structural parts and their applications. **Contents:** Classification of alloys by types of physical properties, applications and production technology. Basic approaches to the study and formation of the physical properties of alloys. Features of the formation of physical properties of alloys and their change under the influence of various factors. Research and formation of physical properties of alloys, rational choice of alloys for the manufacture of structural parts.	**5**	v				v	v					
8		PD	EC	**Physics of Metals and Alloys**	**Course Objectives:** familiarization with the laws describing the equilibrium states of metals and alloys, the applications of various metals and alloys in technology; the development of scientific thinking. **Contents:** On the basis of theoretical concepts, the dependence of the physical properties of metals and alloys on the microstructure is analyzed and predicted. Composition, density of crystal lattice defects, positions in the periodic table of elements, phase state and temperature. Methods of physical analysis for solving problems of physics of metals and alloys. Principles of formation of physical properties in metals and alloys.		v				v	v				v	

9		BD	EC	**Physics of the Surface of Solids**	**Course Objectives:** to familiarize with the scientific foundations of the physics of surfaces and thin films, changes in the atomic structure on the surface of solids. **Contents:** Theory and features of physico-chemical properties of the surface of solids. Changing the atomic structure on the surface – relaxation, reconstruction, faceting. Mechanisms responsible for structural restructuring, transformation of the electronic structure, which is the cause of surface states. Methods of research and solving problems in the field of surface physics and thin films.	**6**	**v**				**v**	**v**				**v**	
10		BD	EC	**Methods for Studying Surface of Solids**	**Course Objectives:** To develop knowledge and practical skills in applying modern methods for investigating solid surfaces to address research problems in condensed matter physics, materials science, and nanotechnology. **Contents:** Modern structural, morphological, chemical, electronic, and spectroscopic methods for surface characterization are studied. The course covers electron microscopy, atomic force microscopy, X-ray photoelectron spectroscopy, Auger electron spectroscopy, electron diffraction, scanning tunneling microscopy, and other advanced techniques. Students learn the operating principles of the equipment, sample preparation procedures, processing and interpretation of experimental data, uncertainty evaluation, and the integrated application of characterization methods for investigating new materials, thin films, nanostructures, and functional coatings.		**v**				**v**	**v**				**v**	
11	**Module selected chapters of the physics course**	PD	EC	**Selected Chapters in Solid State Physics**	**Course Objectives:** to study selected chapters, laws and theory of solid state physics, methods of their physical research. **Contents:** Fundamental concepts, laws and theories of solid state physics. Methods of theoretical approaches in the description and study of phenomena in solids and methods of their physical research. Methods of processing the received data. The relationship between the structure, formation conditions and properties of promising crystalline materials, as well as the results of theoretical and experimental studies.	**5**	**v**	**v**				**v**				**v**	

12		PD	EC	**Selected Chapters of Semiconductor Physics**	**Course Objectives:** introduction to the theories and methods of modern physics of semiconductors and dielectrics used in electronics and optoelectronics. **Contents:** Modern physical methods for studying the basic electrophysical and optical properties of semiconductor materials used in electronics, including optoelectronics. Prospects for the development of semiconductor physics for solving the problems of production of modern electronic and optoelectronic equipment. The possibilities of micro- and nanoelectronics technologies in controlling the properties of semiconductor materials.		**v**	**v**				**v**				**v**	
13		BD	EC	**Selected Chapters of the General Physics**	**Course Objectives:**To deepen and systematize fundamental knowledge of the key areas of general physics; to develop skills in applying modern physical theories and mathematical tools to analyze physical processes and solve scientific research problems. **Contents:** Selected topics in mechanics, molecular physics and thermodynamics, electrodynamics, oscillations and waves, optics, atomic and quantum physics are studied. Fundamental laws and modern physical models, as well as methods for the mathematical description, analysis, and interpretation of physical processes, are considered. The course includes computational, analytical, and research-oriented tasks aimed at developing independent scientific thinking and applying physical knowledge to solve scientific and practical problems.	**4**	**v**	**v**				**v**					
14		BD	EC	**Selected Chapters of Atomic and Nuclear Physics Course**	**Course Objectives:** mastering the basic methods of atomic and nuclear physics research, mastering its methods for their use in professional activities. **Contents:** Basic laws and phenomena of the microcosm, features of multielectronic atoms and molecules, interaction of radiation and matter, basic methods of atomic and nuclear physical research. Methods for solving problems in the field of atomic and nuclear physics. Evaluation and engineering calculations of the results of nuclear transformations.		**v**	**v**				**v**					

15	**Physics of modern high tech**	PD	EC	**Selected Chapters of High Technology Physics**	**Course Objectives:** familiarization with selected chapters of high-tech physics and quantum theory of radiation. **Contents:** Principles of operation of the main elements of semiconductor microelectronics. Modern technologies for the production and assembly of semiconductor chips, the use of microelectronics. Quantum theory of radiation and interaction of light with matter, quantum amplifiers and light generators. Practical application of lasers. The physical foundations of EMR and EPR, and examples of their application in practice.	**6**	**v**	**v**				**v**				**v**	
16		PD	EC	**Alternative Sources of Electrical Energy**	**Course Objectives:** familiarization with renewable energy sources and methods of obtaining and converting energy, .acquisition of knowledge on the basics and trends in the development of modern devices that convert electromagnetic energy. **Contents:** Alternative energy sources, methods of obtaining and converting energy from non-traditional and renewable sources into electrical energy. Prospects for the development of alternative energy sources, methods of theoretical and experimental research of alternative sources. Examples of calculating the parameters of installations that convert energy from alternative sources into electrical energy.		**v**	**v**				**v**	**V**				
17		PD	EC	**Basic Principles of Modern Physics**	**Course Objectives:** to familiarize with the potential of scientific discoveries and the practical consequences of achievements in the field of physics. **Contents:** Basic phenomena of physics and their practical applications; development of nuclear physics and elementary particle physics. Interrelation and mutual influence of the basic concepts, principles and theories of physics. Concepts of space and time, principles of symmetry and conservation laws. Research methods in various fields of physics. Observed natural phenomena from the perspective of the laws of physics.	**4**	**v**	**v**				**v**					

1 8		PD	EC	**Modern Problems of Astrophysics**	**Course Objectives:** to familiarize with the basic postulates underlying modern cosmology; methods of photometric, spectroscopic, astronomical observations and the main tasks of astrophysics. **Contents:** Physical processes responsible for the nature and observable features of space objects and phenomena; features of the main processes occurring at the stages of evolution of the Universe. The main postulates underlying modern cosmology. Photometric and spectroscopic methods of astronomical observations on large telescopes and processing of observation results, as well as methods for solving astrophysics problems.		**v**	**v**				**v**					
19	**Scientific and experimental research methods**	**PD**	**EC**	**Methods of Non-Destructive Testing in Production**	**Course Objectives:** Introduction to modern methods of non-destructive testing and inspection at all stages of materials processing, physical principles of operation of diagnostic equipment, as well as the basics of artificial intelligence for automation of data analysis and processing. **Contents:** Types of technological defects. Physical principles of non-destructive testing methods (ultrasonic, magnetic, eddy current, X-ray). Automation of diagnostics using artificial intelligence: machine learning, computer vision, big data analysis. AI algorithms for defect recognition, material characteristics prediction and production management optimization.	**6**						**v**		**v**		**v**	
20		**PD**	**EC**	**Physics of Strength and Plasticity**	**Course Objectives:** to study the theory of strength and plasticity of materials and methods for determining the mechanical characteristics of materials. **Contents:** Theory of strength and plasticity of materials based on the analysis of the patterns of occurrence, movement and interaction of defects of materials in the field of applied stresses. Methods for determining the mechanical characteristics of materials. Interrelation of material properties with its microstructure and dislocation structure features; solution of applied problems of metal physics, results of mechanical tests of various materials.		**v**					**v**		**v**		**v**	

21		BD	EC	**Experimental Methods of Solid State Physics**	**Course Objectives:** To develop master's students' knowledge and practical skills in applying modern experimental methods for investigating the structure and physical properties of solids, as well as in processing and interpreting experimental data. **Contents:** Modern methods for investigating the electrical, magnetic, thermal, mechanical, optical, and structural properties of solids are studied, along with methods of sample preparation and experimental procedures. Methods for investigating defects and phase transformations, processing and interpreting experimental data, assessing the reliability of results, and designing experimental studies are considered.	**5**					**v**	**v**		**v**	**V**	**v**	
22		BD	EC	**Experimental Methods of Physical Phenomena Research**	**Course Objectives:** To develop Master's students' systematic knowledge and practical skills in applying modern experimental methods to the study of physical phenomena, conducting measurements, and processing and analyzing experimental data. **Contents:** The course covers modern methods and tools for the experimental investigation of physical phenomena; measurement methods and uncertainty estimation; planning and conducting physical experiments; experimental setups and measuring instruments; methods for data acquisition, processing, and statistical analysis; computer-based and digital technologies in experimental physics; interpretation of experimental results; and formulation of scientific conclusions.						**v**	**v**		**v**	**V**	**v**	

23		PD	EC	**Diffraction Structural Analysis**	**Course Objectives:** to study the fundamentals of the theory of diffraction on a crystal and methods for determining the atomic structure of matter. **Contents:** Fundamentals of the theory of diffraction on a crystal. Methods for determining the atomic structure of a substance from diffraction data, their possibilities and limitations. An idea of the methodology and capabilities of diffraction analysis of non-crystalline materials. Features of the use of various types of radiation – X-rays, neutrons and electrons.	**6**	**v**								**V**	**v**	
24		PD	EC	**Modern Methods of Structural Analysis**	**Course Objectives:** familiarization with modern physical methods of structural analysis and characteristics, parameters of solids. **Contents:** The basic set of physical methods of structural analysis as a single system that allows you to measure or calculate most of the known properties, characteristics and parameters of solids. The physical phenomena underlying the methods; the fundamental and real possibilities of various methods. Features of the methods, requirements for the samples under study and the equipment used.		**v**								**V**	**v**	
25				**Research practice**	**Purpose:** to gain experience in independent research activities. Familiarization with the devices of measuring instruments, modern methods of scientific research. **Contents:** The research practice of a master's student is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.	**6**			**V**		**v**		**V**				

26	**Structure and properties of materials**	PD	EC	**Physical Basics of Materials Science**	**Course Objectives:** familiarization with the physical fundamentals of materials science used in various technical industries and methods for determining the physical properties of materials. **Contents:** Electronic and atomic crystal structures of solids, structural and phase transformations, physical properties (electrical, magnetic, mechanical, etc.) of conducting, semiconductor and dielectric materials. The relationship between the atomic-electronic structure, composition and various physical properties of materials used in various technical industries. Behavior of solids in a wide range of temperatures and pressures. Methods for determining the physical properties and evaluating the functional characteristics of materials.	**5**							**V**	**v**	**V**	**v**	
27		PD	EC	**Crystallophysics and Structural Analysis**	**Course Objectives:** to study the basic concepts and elements of structural crystallography and the structure of crystalline substances, as well as crystallographic calculation methods. **Contents:** A systematized view of the laws of the structure of crystalline substances, as well as crystallographic methods for calculating and modeling crystal structures. Basic concepts and elements of structural crystallography, analysis of the main structural types of crystalline materials. The use of international crystallographic tables to describe crystal structures.								**V**	**v**	**V**	**v**	

28		PD	EC	**Nanotechnology and Advanced Materials**	**Course Objectives: t**o develop master's students' systematic knowledge of the fundamentals of nanotechnology, methods for the synthesis and characterization of nanomaterials, as well as the skills to select appropriate technologies for the development of advanced materials with predetermined properties. **Contents:** Fundamentals of nanotechnology and physicochemical principles governing the formation of nanoobjects; types, structure, and properties of nanomaterials; size effects; modern methods for the synthesis and characterization of nanostructures; relationships between composition, structure, and properties; advanced functional materials and their applications; selection of characterization methods; design of technological processes for nanomaterial production, including assessment of their capabilities, limitations, and efficiency.	**5**							**V**	**v**	**V**	**v**	
29		PD	EC	**Physical Foundations of Optoelectronics and Renewable Energy Sources**	**Course Objectives:** to study the physical foundations of optoelectronics and renewable energy sources and promising areas for the development of optoelectronics. **Contents:** The main physical phenomena in solids, which are the basis for the work of the basic elements of modern optoelectronics: photoresistors, photodetector elements based on photoedcs of various nature, solid-state and semiconductor lasers, LEDs, information display devices based on liquid crystal matrices. Promising directions of development of the element base of optoelectronics, principles of construction of optoelectronic devices, as well as physical concepts of non-traditional and renewable energy sources, the possibility of their use.								**V**	**v**	**V**	**v**	

30	**Module of research work and final attestation**			**Research work of a master student, including passing an internship and completing a master's thesis**	**Objectives:** to consolidate the theoretical knowledge gained and to master the practical skill of formulating a scientific problem, its research and substantiation of solutions. **Contents:** Preparation of a dissertation plan, a list of used literature. Performing a scientific review on the topic of the study, based on the results of which the article is being prepared. Processing of scientific, secondary information on the topic of the dissertation. Development of modern research methods, research tools. Solving research problems, using modern methods of processing, verification and presentation of scientific data. Preparation of an article, dissertation and abstract.	**24**							**V**	**v**	**V**	**v**	**v**
31				**Execution and defense of the master's project**	**Objectives:** to gain the skills to perform and design research work and the ability to defend their point of view. **Contents:** Preparation of the dissertation work according to the requirements for such works. Presentation of a scientific report on the main results of the prepared dissertation, carried out on the basis of the results of research work. When defending a dissertation, a master's student must demonstrate his research and pedagogical competencies acquired during his master's studies and their compliance with the requirements of the educational program.	**8**								**v**		**v**	**v**

5. SUMMARY TABLE SHOWING THE VOLUME OF LOANS DISPLACED IN THE SECTION OF OP MODULES

Course of Study	Semester	Number of modules being mastered	Number of disciplines studied			Number of KZ credits					Total hours	Total credits KZ	Quantity	
			CC	VC	EC	Theoretical training	Ped. practice	Research practice	Scientific research work of a master student,	final examination			copy	differential standings
1	1	3		5	2	29		-	1	-	900	30	6	2
	2	4		1	3	2 3	4		3	-	900	30	4	2
2	3	2			3	21		7	2	-	900	30	3	2
	4	1			0	0		-	18	12	900	30		1
Total				6	8	66	8	12	24	12	3600	120	1 3	7

6. Strategies, teaching methods and artificial intelligence, monitoring and assessment

Strategies and learning	**Student - centered learning**: **the** learner is the center of teaching/learning **and an active** participant in the process of learning and decision-making. **Practice-oriented learning**: focus on the development of practical skills.
Teaching methods	Conducting lectures, seminars, various types of practices with: • application of innovative technologies: • problem learning; • case study; • group work and creative groups; • discussions and dialogues, intellectual games, olympiads, quizzes; • methods of reflection, projects, benchmarking; • Bloom's taxonomy; • presentations; • rational and creative use of information sources : • multimedia educational programs ; • electronic textbooks ; • digital resources • * machine learning methods. Organization of independent work of students, individual consultations.
Monitoring and assessing the achievability of learning outcomes	**Current control** on each topic of the discipline, control of knowledge in classroom and extracurricular activities (*according to the syllabus*). Evaluation forms: • surveys; • testing topics of academic discipline; • test papers; • protection of independent creative works; • discussions; • trainings; • colloquia; • essay , etc. **R intermediate control** at least two times during one academic period within the same academic discipline. **Intermediate certification** is carried out in accordance with the working curriculum, academic calendar. Conduct forms: • examination in the form of testing; • oral exam; • a written exam; • combined exam; • protection of projects; • protection of reports on practices . **Final state certification.**

7. Educational and resource support for EP

Information Resource Center	The structure of the OIC includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The network infrastructure of the JIC is based on 180 computers with Internet access, 110 workstations , 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners, the JIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system. The library fund is reflected in the electronic catalog available to users on the site http://lib.ukgu.kz on -line 24 hours 7 days a week. Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device 24/7 via external linkhttp://articles.ukgu.kz/ru/pps . Catalogs are processed electronically. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKSU in Print", "Readers" and "SKR". The JIC provides its users with 3 options for accessing its own electronic information resources: from the "Electronic Catalog" terminals in the catalog hall and divisions of the JIC; through the information network of the university for faculties and departments; remotely on the website of the library http://lib.ukgu.kz/ . Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet" , Digital library "Aknurpress", "Smart-kitar", "Kitar.кz", etc. For people with *special needs* and disabilities, the library website has been adapted to the work of visually impaired users
Material and technical base	For the training of undergraduates in this direction in this field, the educational program has an appropriate material and technical base, including classrooms, laboratories, and a computer room that meet the requirements of the State Educational Standard (SES). The Department of Physics is assigned 11 rooms (326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 337, 215) located in Building No. 7, with a total area of 576.86 m². Room 327 (80.26 m²) and room 337 (79.15 m²) serve as classrooms where various types of lessons are conducted. Room 334 (12.19 m²) is used as a staff room for instructors. Room 215, with an area of 35 m², is a utility room. Room 333 (56.35 m²) is a computer lab equipped with 12 computers, and room 335 (31.97 m²) is another computer lab with 10 computers. Room 332 (60.77 m²) is the Mechanics and Molecular Physics laboratory. Room 330 (61.88 m²) is the Electromagnetism laboratory. Room 326 (59.10 m²) is the laboratory for Methods of Teaching Physics and Astronomy. Room 329 (55.50 m²) is the Optics laboratory. Room 328 (27.00 m²) is the Atomic Physics laboratory. Rooms 320, 329, 330, and 332 are equipped with modern interactive boards. There is a specialized scientific and technical experimental base in the laboratories of the center "SAPA" and "IRLIP", where students of EP 7M05310 - "Physics" modern experimental installations while studying the discipline: Physical fundamentals of physico-chemical analysis, and also undergo industrial practice.

APPROVAL SHEET

on the Educational program "«7M05310-Physics»"

Director of the Departament of Academic
Affairs and Quality of the Educational Process _____ Naukenova A.S.

Director of DASc _____ Nazarbek U.B.