

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN

SOUTH KAZAKHSTAN UNIVERSITY \_

named after M. Auezov

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| --- |
| "APPROVE" |
| Chairman of the Board - Rector  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| of History, Academician Kozhamzharova D.P. |
| \_\_\_\_\_\_\_\_\_\_\_\_ 20\_\_\_\_ |

**EDUCATIONAL PROGRAM**

7M05310-Physics

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| --- | --- |
| 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 sciences |
| Group of educational programs | M090 Physics |
| OP type | current |
| ISCED level | 7 |
| NQF level | 7 |
| ORC level | 7 |
| Language of instruction | Kazakh Russian |
| Typical study period | 2 years |
| Direction of training | scientific and pedagogical |
| Labor intensity of EP | 120 credits |
| Distinctive features of the OP | - |
| Partner university (SOP) | - |
| Partner university (DDOP) | - |
| Social Partner(DO) | - |

Shymkent , 2022

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The educational program is reviewed by the Academic Commission on Natural Sciences, Mathematics and Statistics,

Minutes No. \_\_\_\_\_ dated "\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_ 20\_\_\_\_

Chairman of the Commission \_\_\_\_\_\_\_\_\_\_\_\_ Madiyarov N.K.

Considered and recommended for approval at a meeting of the Educational and Methodological Council of NAO SKU named after. M. Auezov,

Minutes No. \_\_\_\_\_ dated "\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_ 20\_\_\_\_

Approved by the decision of the Academic Council of the University,

Minutes No. \_\_\_\_\_ dated "\_\_\_\_\_" \_\_\_\_\_\_\_\_\_\_ 20\_\_\_\_

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1. **PROGRAM CONCEPT**

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| **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 honesty and academic freedom, protection from any kind of intolerance and discrimination:   * Rules academichonesty (protocol scientist Council No. 3 October 30, 2018 . ); * Anti-corruption standard(Order No. 373 н/к December 27, 2019). * Codeethics (protocolscientistCouncil No. 8 January 31, 2020). |
| **Legal framework for the development of EP** | 1. LawRepublicKazakhstan "Education"; 2. Typicalregulationsactivitiesorganizationseducation implementingeducationalprogramshigher and (or) afteruniversityeducation approvedby order of the Ministry of Education and Science of the Republic of Kazakhstan, October 30, 2018 No. 595; 3. Stateobligatorystandardshigher and afteruniversityeducation approvedby order of the Ministry of Education and Science of the Republic of Kazakhstan, October 31, 2018 No. 604; 4. rulesorganizationseducationalprocessoncredittechnologytraining approvedby order of the Ministry of Education and Science of the Republic of Kazakhstan, April 20, 2011 No. 152; 5. Qualifyingdirectorypostsmanagers, professionals and other employees,approvedby orderMinisterlabor and socialprotectionpopulationRepublicKazakhstan, December 30, 2020 No. 553. 6. Managementonusing ECTS. 7. Managementondevelopingeducationalprogramshigher and afteruniversityeducation , appendix 1 to the orderatdirectors TsBPiAM No. 45 o /д, June 30, 2021 |
| **About the organization of educationalprocess** | * ImplementationprinciplesBolognaprocess * With a studentcenterededucation * Availability * Inclusiveness |
| **Ensuring the quality of the EP** | * In the interiorsystemensurequality * Attraction of stakeholders to the development of the EP and its evaluation * Systematicmonitoring * Content update (update) |
| **Requirements for applicants** | U are established in accordance with the Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Higher and Postgraduate Education Order of the Ministry of Education and Science of the Republic of Kazakhstan, No. 600 October 31, 2018 |

**2.** **EP PASPORT**

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| --- | --- |
| **Purpose of EP** | To prepare highly qualified, competitive masters with conceptual knowledge in the field of experimental and applied physics and education, able to choose methods and means of solving the task, carrying out scientific, innovative and educational activities. |
| **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. |
| **Harmonization of EP** | * 7th level National offrameworkRK qualifications; * Dublin descriptors of 7 skill levels; * 2 cycleof Framework for Qualification of the European Higher Education Area; * Level 7 of theEuropeanQualificationframeworkforlifelonglearning. |
| **Connectionof 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](http://atameken.kz/uploads/content/files/%D0%9F%D1%80%D0%B8%D0%BA%D0%B0%D0%B7%20%D0%9F%D0%A1%20%D0%9F%D0%B5%D0%B4%D0%B0%D0%B3%D0%BE%D0%B3%20%E2%84%96133%20%D0%BE%D1%82%2008_06_2017.PDF) . |
| **Scrollqualifications and positions** | The graduate is awarded the degree of Master of Natural Sciences according to the educational program 7M05310-Physics  Masters in OP 7M05310-physics can hold positions of a physics teacher in universities, colleges and design institutes as a researcher, in research institutions, design and design organizations without presenting work experience requirements in accordance with the qualification requirements of the Qualification Directory of positions of managers, specialists and other employees approved by the order of the Minister of Labor and Social Protection of the population of the Republic of Kazakhstan dated December 30, 2020 No. 513. |
| **Sphere of professional activity** | – area of education,  - social sphere for the development of children and young people in general education and higher education organizations, educational institutions and centers,  – scientific activity and entrepreneurship in the field of education,  – fields of physics and computer science, physics and computer science in education and in production. |
| **Objects of professional activity** | – higher, secondary and secondary specialized educational institutions (universities, colleges, educational institutions of technical and vocational education, lyceums, school gymnasiums),  – management organizations: state educational authorities, departments of education;  – research organizations. |
| **Subjects of professional activity** | - the educational process in the unity of its value-target guidelines, content, methods, forms and results;  –scientific and pedagogical, innovative, informational and analytical activities in the field of methods of teaching physics and informatics. |
| **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. |
| **Educational Outcomes** | **EO 1** Ability to design and implement complex research, including interdisciplinary, using knowledge in the field of history and philosophy of science, as well as physics  **EO2** Ability to use modern methods and technologies communicationson the foreign language to solve the problems of professional and scientific activities, as well as to create a psychological climate conducive to the optimal work of the team  **EO 3** The ability to psychologically analyze the relationship between organizational problems and the quality of the manager's implementation of his managerial functions.  **EO 4** The ability to carry out teaching activities at a professional level, using innovative and digital technologies, interactive teaching methods and the experience of foreign scientists, as well as using the results of modern research in the field of experimental and applied physics  **EO 5** Ability to determine the structure, composition and physical properties of metals and alloys, surfaces and thin films using experimental methods of condensed matter physics  **EO6** The ability to independently set specific tasks of scientific research in the field of physics, solving them using physical research methods and digital technologies using domestic and foreign experience.  **EO 7** Ability to apply methods for obtaining and converting energy from alternative sources into electrical energy, using the experience of foreign scientists, determining the parameters of installations that convert energy from alternative sources into electrical energy  **EO 8**Ability to use modern instrumental methods for diagnosing the properties of materials and products from them  **EO9** Abilityuse methods of structural \_analysis for definitions properties, characteristics and parameters materials, taking into account the possibilities various methods  **EO10** Demonstrate the skills of performing independent scientific research in the field of condensed matter physics, working in a team and analyzing current trends in its development. |

**3.COMPETENCES OF THE GRADUATE OF EP**

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| --- | --- |
| **SOFT SKILLS** (Behavioral skills and personality 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. |
| **HARD SKILLS** | |
| 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 Mapping matrix learning outcomes for the EP as a whole with the formed competencies**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **LO1** | **LO 2** | **LO 3** | **LO 4** | **LO 5** | **LO 6** | **LO 7** | **LO 8** | **LO 9** | **LO 10** |
| SS1 | + | + |  | + |  | + |  |  |  | + |
| SS2 |  | + |  | + |  | + | + |  |  |  |
| SS3 |  |  | + |  | + | + | + |  |  | + |
| SS4 |  | + |  | + |  | + |  |  |  |  |
| SS5 | + |  | + | + | + |  |  |  |  | + |
| SS6 |  | **+** | **+** |  |  |  |  |  |  | **+** |
| SS7 | **+** | **+** |  |  |  |  |  |  |  |  |
| PC1 | + | + | + | + | + | + | + | + | + |  |
| PC2 | + | + | + | + |  |  | + |  | + |  |
| PC3 |  |  | + | + | + | + |  | + | + | + |
| PC4 | + | + |  | + | + |  |  | + | + |  |
| PC5 | + | + |  | + | + |  |  | + |  |  |

**4 . INFLUENCE MATRIX FOR DISCIPLINE FORMATION OF EDUCATIONAL 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** |
| **1** | Module ofScientific and pedagogical training | BD | UC | History and philosophy of science | The main regularities of the development and functioning of science, the philosophical and methodological foundations of modern methods of scientific knowledge are considered; describes the methodological apparatus of modern history and philosophy of science; discusses the formation of a scientific and methodological outlook on the basis of 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** | **ѵ** |  |  |  |  |  |  |  |  |  |
| **2** |  | BD | UC | Foreign language (professional) | General scientific, special terminology, grammatical material is considered, sufficient for the implementation of oral and written communication in business and professional communication, using the methods of oral, written and electronic communication in English; explains the stylistic features of oral and written scientific discourse, rational methods of working with texts; analyzes the rules for presenting scientific information in various areas of communication are analyzed | 4 |  | **ѵ** | **ѵ** |  |  |  |  |  |  |  |
| **3** | BD | UC | Psychology of management | Psychological theories and management methods, modern trends in scientific management are considered. The methodological analysis of the problem of personality psychology, the psychological characteristics of the personality, methods of management, taking into account psychological patterns, are discussed. The processes of managerial activity, psychological knowledge and skills are analyzed in the context of their application in the practice of self-knowledge, communication, professional and personal growth. | 4 |  |  | **ѵ** |  |  |  |  |  |  |  |
| **4** | Methodological bases of teaching | BD | UC | Higher school Pedagogy | The regularities of the development of the system of higher education are considered; essence, content, pedagogical patterns of the educational process of higher education; modern approaches to the design of scientific and pedagogical activities are discussed; the main forms, technologies, methods and means of organizing the processes of education and upbringing, methods of pedagogical communication with participants in the educational process are analyzed; examples of the use of digital technologies in the implementation of the educational process are given | **4** |  | **ѵ** |  | **ѵ** |  |  |  |  |  |  |
| **5** | PD | UC | Teaching Methods of special disciplines | The discipline considers the planning and conduct of 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. The ways of implementing modern technologies in education, their choice and design, depending on the age capabilities of students and the content of the material being studied, are analyzed. | 5 |  | **ѵ** |  | **ѵ** |  |  |  |  |  |  |
| **6** |  | BD | UC | Pedagogical practice | During the internship, undergraduates get acquainted with the specifics of teaching at a professional level, carry out pedagogical activities on the basis of the knowledge gained in teaching the disciplines of the specialty of physics; apply innovative and digital technologies, interactive teaching methods, monitor student progress, learn to compose syllabuses and develop teaching materials for physics disciplines, draw up a practice report. | 4 |  | **ѵ** |  | **ѵ** |  |  |  |  |  |  |
| **7** | Solid state physics | PD | EC | Alloys with special physical properties | It is considered the classification of splashes by types of physical properties, application areas and production technologies; describes the basic approaches to the study and formation of the physical properties of splashes; analyzes the features of the formation of the physical properties of splashes and their change under the influence of different factors; examples of research and formation of the physical properties of splashes, rational choice of splashes for the manufacturing parts of structures. | 7 | **ѵ** |  |  |  | **ѵ** | **ѵ** |  |  |  |  |
| **8** | PD | EC | Physics of metals and alloys | On the bases of theoretical representations, the dependence of the physical properties of metals and splashes on the microstructure, composition, density of crystal lattice defects, position in the periodic table of elements, phase state and temperature is analyzed and predicted; discussed  methods of physical analysis for solving problems of physics of metals and alloys; the principles of formation of physical properties in metals and alloys are explained. | **ѵ** |  |  |  | **ѵ** | **ѵ** |  |  |  | **ѵ** |
| **9** |  | DB | EC | Physics of the Surface of Solids | The discipline deals with the theory and features of the physical and chemical properties of the surface of solid bodies. Changes in the atomic structure are discussed in terms of performance —relaxation, reconstruction, facetization. We analyze mechanisms responsible for the structural rearrangement, the transformation of the electronic structure, which is the cause of the appearance of surface states, are analyzed; methods of research and solution of problems in the field of physics of surfaces and thin films. | **6** | **ѵ** |  |  |  | **ѵ** | **ѵ** |  |  |  | **ѵ** |
| **10** | DB | EC | Methods for studying the surface of solids | This discipline discusses the physical and chemical foundations and analytical capabilities of experimental methods for studying the structure, properties and composition of surfaces and thin layers of materials in order to diagnose micro- and nanostructures. Examples of the interpretation of the data obtained and the establishment of the chemical nature of the samples, as well as the application of research methods in the production of electronic equipment are used. | **ѵ** |  |  |  | **ѵ** | **ѵ** |  |  |  | **ѵ** |
| **1 1** | Module selected chapters of the physics course | PD | EC | Selected chapters in solid state physics | 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 are considered; methods for processing the obtained data are discussed; relationships between the structure, conditions of formation and properties of promising crystalline materials are analyzed, as well as the results of theoretical and experimental studies | **6** | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  | **ѵ** |
| **1 2** | PD | EC | Selected chapters of semiconductor physics | Modern physical methods for studying the basic electrophysical and optical properties of semiconductor materials used in electronics, including optoelectronics, are considered; the prospects for the development of semiconductor physics for solving the problems of manufacturing modern electronic and optoelectronic equipment are discussed; A specific example shows the possibilities of micro- and nanoelectronics technologies in controlling the properties of semiconductor materials. | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  | **ѵ** |
| **13** | DB | EC | Selected chapters of the general physics | World-wide and methodological problems of physics are considered, physical models, restrictions and limits of their applicability are considered; methods of mathematical description and methods of studying physical phenomena and processes; the role of physics in solving global problems of mankind is shown: energy, environmental; examples of calculations of scientific and engineering-physical tasks are provided. | 4 | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  |  |
| **14** | DB | EC | Selected chapters of the course of atomic and nuclear physics | The discipline deals with the basic laws and phenomena of the microcosm, the features of multielectron atoms and molecules, the interaction of radiation and matter, the main methods of atomic and nuclear physical research; methods for solving problems from the field of atomic and nuclear physics are outlined; evaluation and engineering calculations of the results of nuclear transformations . | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  |  |
| **1 5** | Physics of modern high tech | PD | EC | Selected heads of high technology physics | The principles of operation of the main elements of semiconductor microelectronics are outlined, modern technologies for the production and assembly of semiconductor microcircuits, and the use of microelectronics are discussed. The quantum theory of radiation and the interaction of light with matter, quantum amplifiers and light generators are considered; practical applications of lasers are discussed. The physical foundations of EMR and EPR are explained, and examples of their application in practice are given. | 7 | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  | **ѵ** |
| **16** | PD | EC | Alternative sources of electrical energy | Alternative sourcesof energy are considered, methods for obtaining and converting energy from non-traditional and renewable sources into electrical energy are considered; discusses the prospects for the development of alternative energy sources, methods of theoretical and experimental research of alternative sources; examples of the calculation of the parameters of installations that convert the energy of alternative sources of energy into electrical ones | **ѵ** | **ѵ** |  |  |  | **ѵ** | **ѵ** |  |  |  |
| **17** |  | PD | EC | The Basic principles of modern physics | The main phenomena of physics and their practical applications are considered; development of nuclear physics and elementary particle physics; discusses the relationship and mutual influence of the basic concepts, principles and theories of physics; concepts of space and time, symmetry principles and conservation laws; research methods in different fields of physics; observable natural phenomena are explained from the standpoint of the laws of physics | **4** | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  |  |
| **1 8** | PD | EC | Modern problems of astrophysics | The physical processes responsible for the nature and observed features of space objects and phenomena are considered; features of the main processes occurring at the stages of the evolution of the Universe are described; the main postulates underlying modern cosmology are outlined; photometric and spectroscopic methods of astronomical observations on large telescopes and processing of observation results, as well as methods for solving problems of astrophysics are analyzed | **ѵ** | **ѵ** |  |  |  | **ѵ** |  |  |  |  |
| **19** | Scientific and experimental research methods | PD | EC | Methods of non-destructive testing in production | The types of technological defects, the physical principles of the operation of diagnostic equipment (ultrasonic flaw detection, magnetic and electrical control methods) are considered; an assessment of the possibilities of research methods is given; the theory of the structure of materials is presented; analyzes modern methods of testing and control at all stages of processing materials, the relationship between the composition, structure and properties of materials, taking into account the operational requirements for the product, are analyzed | **7** |  |  |  |  |  | **ѵ** |  | **ѵ** |  | **ѵ** |
| **20** | PD | EC | Physics of Strength and Plasticity | The theory of strength and plasticity of materials is considered, based on the analysis of the patterns of occurrence, movement and interaction of defects in materials in the field of applied stresses; methods for determining the mechanical characteristics of materials are discussed; the relationship between the properties of the material and its microstructure and features of the dislocation structure is analyzed; solution of applied problems of metal physics, results of mechanical tests of various materials | **ѵ** |  |  |  |  | **ѵ** |  | **ѵ** |  | **ѵ** |
| **21** |  | DB | EC | Experimental methods of solid state physics | Experimental methods for studying the structure and properties of solids are considered , such as various types of microscopy (scanning probe, electron), optical, X-ray research methods, etc. The possibilities of interpreting information obtained using these methods are discussed. The theoretical provisions of the issues under consideration are outlined, and the practical significance of the acquired knowledge is demonstrated using the example of modern achievements in the field of solid state physics. | **5** |  |  |  |  | **ѵ** | **ѵ** |  | **ѵ** | **ѵ** | **ѵ** |
| **22** | DB | EC | Experimental methods for investigation physical phenomena | The fundamentals of the theory of measurement errors are considered; the physical foundations underlying the experimental method of studying this property, the main experimental schemes for measuring this property, the possibilities of improving the classical experimental schemes are discussed;  methods for estimating measurement errors are analyzed, examples of experimental measurements of temperature, pressure, density, viscosity and thermal conductivity of bodies are given. |  |  |  |  | **ѵ** | **ѵ** |  | **ѵ** | **ѵ** | **ѵ** |
| **23** | PD | EC | Diffraction structural analysis | The fundamentals of the theory of diffraction by a crystal are considered, methods for determining the atomic structure of a substance from diffraction data, their possibilities and limitations are outlined. An idea of the technique and possibilities of diffraction analysis of non-crystalline materials is given. The features of the use of various types of radiation - X-rays, neutrons and electrons are shown. | 6 | **ѵ** |  |  |  |  |  |  |  | **ѵ** | **ѵ** |
| **24 \_** | PD | EC | Modern methods of structural analysis | The basic set of physical methods of structural analysis is considered as a single system that allows measuring or calculating most of the known properties, characteristics and parameters of solids; the physical phenomena underlying the methods are discussed; fundamental and real possibilities of various methods; the features of the methods, the requirements for the samples under study and the equipment used are analyzed | **ѵ** |  |  |  |  |  |  |  | **ѵ** | **ѵ** |
| **25** | PD | EC | Research practice | During the research practice, undergraduates study the devices of measuring instruments. Independently prepare samples for measurements and conduct experiments. Sample preparation is carried out for all devices. Must know the theoretical basis of experimental physics and the principles of operation of measuring instruments. Analyze experimental results, use literature and modern information environments, independently supplement and deepen the acquired knowledge, and adapt to changes in the field of knowledge under study. | 7 |  |  | **ѵ** |  | **ѵ** |  | **ѵ** |  |  |  |
| **26** | Module of research work and final attestation |  |  | Research work of a master student, including passing an internship and completing a master's thesis | The student draws up a dissertation plan, a list of used literature; performs a scientific review on the topic of the study, on the basis of which he prepares an article; collects, processes scientific, secondary information on the topic of the dissertation; develops modern research methods, research tools; solves research problems using modern methods of processing, verification and presentation of scientific data; prepares an article, dissertation and abstract. | 24 |  |  |  |  |  |  | **ѵ** | **ѵ** | **ѵ** | **ѵ** |
| **27** |  |  | Execution and defense of the master's project | The undergraduate draws up a dissertation work in accordance with the requirements for such works; delivers a scientific report on the main results of the prepared dissertation, made on the basis of the results of research work. When defending a dissertation, a master student must demonstrate his research and teaching competencies acquired during his studies at the master's program and their compliance with the requirements of the educational program. | 12 |  |  |  |  |  |  |  | **ѵ** |  | **ѵ** |

**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 |

1. **STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION**

|  |  |
| --- | --- |
| **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 .   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. TRAINING AND RESOURCE SUPPORT OF THE 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 link<http://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-kіtаr", "Kitаr.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 preparation of undergraduates in this direction, there is an appropriate material and technical base of the specialty, that is, classrooms, laboratories, a computer class that meets the requirements of the SES. The Department of Physics includes 6 classrooms: mechanics and molecular physics, electromagnetism, the TSE Laboratory and astronomy, optics, atomic and nuclear physics (an interactive whiteboard is installed here) and a computer class.  There is a specialized scientific and technical experimental base in the laboratories of the center "SAPA" and "IRLIP", where EP 7M05310 - "Physics" meets sanitary and technical standards and provides all types of practical, disciplinary training, research work of undergraduates provided for in the working curriculum of the specialty. |

**APPROVAL SHEET**

according to the Educational program 7M05310-"Physics"

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