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РЕСПУБЛИКАСЫ БІЛІМ  
ЖӘНЕ ҒЫЛЫМ  
МИНИСТРЛІГІ

МИНИСТЕРСТВО  
ОБРАЗОВАНИЯ И НАУКИ  
РЕСПУБЛИКИ  
КАЗАХСТАН

THE MINISTRY OF  
EDUCATION AND SCIENCE  
OF THE REPUBLIC OF  
KAZAKHSTAN



SOUTH KAZAKHSTAN STATE  
PEDAGOGICAL UNIVERSITY

ОҢТҮСТІК ҚАЗАҚСТАН  
МЕМЛЕКЕТТІК  
ПЕДАГОГИКАЛЫҚ  
УНИВЕРСИТЕТІ

ЮЖНО-КАЗАХСТАНСКИЙ  
ГОСУДАРСТВЕННЫЙ  
ПЕДАГОГИЧЕСКИЙ  
УНИВЕРСИТЕТ

SOUTH KAZAKHSTAN  
STATE PEDAGOGICAL  
UNIVERSITY

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торағасы Оңтүстік Қазақстан  
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БІЛІМ БЕРУ  
БАҒДАРЛАМАСЫ

6B01510 ФИЗИКА-  
ИНФОРМАТИКА МҰҒАЛІМІН  
ДАЯРЛАУ

ОБРАЗОВАТЕЛЬНАЯ  
ПРОГРАММА

6B01510 ПОДГОТОВКА  
УЧИТЕЛЯ ФИЗИКИ-  
ИНФОРМАТИКИ

EDUCATIONAL  
PROGRAM

6B01510 TEACHER TRAINING OF  
PHYSICS-COMPUTER SCIENCE

Шымкент 2021

## EDUCATIONAL PROGRAM

### 6B01510 TEACHER TRAINING OF PHYSICS- COMPUTER SCIENCE

**Code and Classification of the field of education:** 6B01 Pedagogical Sciences

**Code and classification of training course:** 6B015 Teacher training of in Natural Sciences

**Awarded degree:** Bachelor of Education in the educational program «6B01510 Teacher training of Physics-Computer science»

**Type of program:** Bachelor, the 6<sup>th</sup> level NQF/ SQF / ISCE

**Total amount of credits:** 240 Academic credits / 240 ECTS


The educational program was reviewed at the of the Council of the faculty of Physics and Mathematics and recommended for approval by the Academic Council of the University.

Protocol No 11 «27.06» 2021


The educational program was approved by the decision of the Academic Council of the University and put action.

Protocol No 10 «30.06» 2021

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#### **Abbreviations:**

*NQF - National Qualifications Framework*

*IQF - Industry Qualifications Framework*

*ISCE - International Standard Classification of Education*

*EP - Educational Program*

*WC - Working curriculum*

*PED - Product elective disciplines*

*KC - Key competencies*

*LO - Learning Outcomes*

*ICT - Information and communication technologies*

*LC - Landmark control*

*CC - Current control*

*FG - The final grade*

F7.01-93

GED - General educational disciplines  
 BD - Basic disciplines  
 SD - Specialized disciplines

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## INTRODUCTION

This educational program (hereinafter - EP) is a normative document of a conceptual nature, based on the goals and values of university education, containing general information about the professional activities of graduates, aims and objectives of EP of competence graduate model, the expected learning outcomes and policies of their evaluation of methods and methods of organization of educational process on the content of the program.

The main directions of EP:

- implementation of the educational policy of the University;
- implementation of trilingual education through the organization of educational process in the Kazakh, Russian and English languages;
- improving the quality of the learning process on the basis of competence approach;
- the willingness of students to educate themselves throughout their lives;
- formation of the outlook of students, develop their creativity, communication, critical thinking, research and information capabilities.

EP is the basis for the development of the following documents:

- Catalog elective subjects (CES);
- Academic calendar of the educational process;
- Individual educational plan (IEP);
- Working curriculum (WC);
- Working curriculum subjects (SYLLABUS);
- Teaching materials disciplines (TMD);
- expected results in the disciplines of learning;
- criteria for assessing the results of training in the disciplines;
- organizing all kinds of professional practice, as well as other documents necessary for the educational process.

# 1 SHEET OF THE EDUCATIONAL PROGRAM

## 1.1 Scope of professional activity of graduates

Bachelor of Education OP "Preparation of the teacher of physics-informatics " carries out his professional activities in the field of education.

## 1.2 The objects of professional activity of graduates:

- basic and specialized schools;
- specialized schools;
- the organization of technical and vocational post-secondary education.

## 1.3 Types of professional activity of graduates:

- training;
- educative;
- methodical;
- research;
- social and communicative.

## 1.4 Objectives of professional activity of graduates

### *Training:*

- training and development of students;
- the organization of educational process in professional activities;
- design and management of the pedagogical process;
- diagnosis, correction and prediction of the results of educational activities.

### *Educative:*

- the involvement of students in the system of social values;
- implementation of educational work in accordance with the laws, the laws, the principles of the educational process, educational mechanisms;
- planning extracurricular educational work;
- addressing specific educational objectives;
- the use of various forms and methods of training and education of students in extracurricular activities;
- liaising with groups of students, subject teachers and parents.

### *Methodical:*

- implementation of methodological support of the educational process;
- planning the content of education at different levels;
- identification of methods for the organization and implementation of the educational process;
- the use of new educational technologies in the learning process.

### *Research:*

- the study of the level of assimilation of the content of education, the study of the educational environment;
- the development of scientific and methodical literature;
- analysis and generalization of the advanced pedagogical experience in the field of education;
- conducting of pedagogical experiment, the introduction of its results in the educational process.

### *Social and communicative:*

- the implementation of cooperation with the professional community and all interested education stakeholders;
- the formation of a multicultural identity;

- creation of favorable conditions for education and development of students and provide them with educational support.

## **2 SOFTWARE FEATURES OF EDUCATIONAL**

Subdivision of higher education, "Preparation of the teacher of physics-informatics " was developed in accordance with the European Qualifications Framework, National Qualifications Framework, the Dublin descriptors, Industry frame of qualifications, professional teacher standards to meet the requirements of the regional labor market and employers.

In order to form additional competencies to the main educational program Major added additional educational program Minor: computer physics, physics and astronomy. During the development of the program, the training programs of the leading pedagogical universities of Russia (TSPU, MSPU, MSU) were discussed. Lomonosov), Sakarya state University of Turkey, Belgian University of Europe (University of Lodz), Cambridge, Oxford University.

## **3 PURPOSE AND VALUES EDUCATION PROGRAM**

### **3.1 The purpose and objectives of the educational program**

The main objective of OP is defined in accordance with the objectives of the Strategic Plan and the development of the University's mission.

***Purpose of the Educational Program:*** Preparation of competitive Physics-Computer Science teacher owns the general cultural and professional competences in accordance with the requirements of the labor market and national qualifications systems.

#### ***Tasks of the educational program:***

- formation of core competencies needed for effective implementation of the professional activities of students;
- the formation of social responsibility training based on interpersonal values and professional ethics;
- bringing the level of quality of education in line with the requirements of national and international standards on the basis of motivation of training to professional development, self-realization;
- the formation of students' professional knowledge and practical skills based on the updated content of education;
- providing training of highly educated professionals who are actively involved in the modernization of society on the basis of language trinity, functional literacy, healthy lifestyle.

### **3.2 Values of the Educational Program**

The core values defined in the contents of EP:

- ❖ Kazakhstan patriotism and civic responsibility;
- ❖ honesty;
- ❖ respect;
- ❖ cooperation;
- ❖ openness.

## **4 GRADUATE MODEL**

**1. Subject areas:** widely and deeply understands its subject area, applies knowledge in professional activities.



**2.Organizational and methodological skills:** uses innovative technologies in planning, organization and management of professional activities, shows critical thinking and creativity in solving complex problems.

**3.Research skills:** conducts scientific and methodological work, attracts students to research work.

**4.Leadership and entrepreneurial skills:** able to work in a team, is active in the renewal of society.

**5.Cultural competence:** has the ability to be a cultural and tolerant citizen of his country.

**6.The ability to learn throughout life:** coordinating their talents and interests in accordance with the needs of society.

**7.Information skills:** understands the essence of the information society, uses ICT in professional activities.

## **5 EXPECTED RESULTS training on educational programs**

**Learning outcomes of OP:** Upon successful completion of this OP student must:

**LO1** - It demonstrates knowledge in the field of physics in the interpretation of phenomena and processes in nature and technology, solving problems, the experiment;

**LO2** - Is able to substantiate the role of physics and astronomy in the development of social and economic society, in science; explains physical processes and their dependence.

**LO3** - Knows how to use ICTs, digital educational resources in the modeling of physical processes, processing, analysis of the experimental results, the study of the discipline;

**LO4** - It summarizes the scientific models and evidence, the results of experiment and research to provide projections, statements and explanations;

**LO5** - Knows how to choose the basic mathematical structures and systems of axiomatic methods for solving a given situation;

**LO6** - It uses the methods of teaching and assessment, innovative technologies in accordance with the goals and objectives of training and individual characteristics of the students;

**LO7** - Knows how to use interdisciplinary integration in the description of a holistic image of the world in order to achieve the planned results in the discipline of study; mastering the methods of scientific research and academic writing.

**LO8** - It Solves problems that arise in various areas of interpersonal, social, and professional communication based on pedagogical, psychological, physiological, humanitarian, economic, and environmental knowledge;

**LO9** -It demonstrates interpersonal communication, teamwork skills and information culture; understands the importance of the principles and culture of academic integrity.

**LO10** - It evaluates the creativity of solutions to problems arising in conflict situations, in the practice of technology and inclusive education; uses knowledge in solving practical and professional tasks.

**LO11** - It acquires learning skills that contribute to the independent continuation of physical knowledge, it uses the technology of criteria-based assessment, diagnosis, development of short-term curricular

## **6 POLICY ASSESSMENT OF EDUCATIONAL ACHIEVEMENT**

Assessment of learning outcomes of students carried out various forms of current, boundary control, as well as interim and / or final certification, determined by the University.

Evaluation is carried out in accordance with Table 1 by score-rating letter system.

### Conformity of learning outcomes and evaluation methods

Learning outcome	Evaluation method
ON 1,2,3, 5,6,7,8,10,11	Activity in the classroom
ON 2,4,7	Essay
ON 2,3,9	Group presentation
ON 4,6,9	Project preparation(group work)
ON 1, 3, 5	Personal assignment
ON 1,2,9	Tasks on laboratory works
ON 3, 6, 8	Portfolio
ON 6,8,10,11	Accounting practices
ON 1-11	Boundary control
ON 1-11	Final certification

Ongoing monitoring of learning outcomes is performed on each subject discipline during the classroom and extracurricular activities.

Landmark control is carried out during the academic period twice within a given discipline.

The final grade for the discipline is 30% of the current control, 30% - from the boundary control, the remaining 40% - on the exam. Students who score at least 30 points (a passing score of  $0.15 * (IC1 + CC1 + IC2 + CC2) \geq 30$  points) from interim control and current control are allowed to take the exam.

intermediate certification results calculated by the formula:

$$final\ grade\ (FG) = 0,15 * IC1 + 0,15 * IC1 + 0,15 * IC2 + 0,15 * IC2 + 0,4 * E$$

$$Current\ control\ 1\ (CC1) \leq 100$$

$$Landmark\ control\ 1\ (LC1) \leq 100$$

$$Current\ control\ 2\ (CC2) \leq 100$$

$$Landmark\ control\ 2\ (LC2) \leq 100$$

$$Exam \leq 100\ (e)$$

Table 1. Point-rating alphabetic system of evaluation taking into account educational achievements of students with their transfer to the traditional rating scale and ECTS

### the traditional rating scale and ECTS

Evaluation of letter system	Digital equivalent	Points (% bonus content)	Evaluation of traditional system
A	4.0	95-100	Excellent

A-	3.67	90-94	Good
B+	3.33	85-89	
B	3.0	80-84	
B-	2.67	75-79	
C+	2.33	70-74	
C	2.0	65-69	satisfactorily
C-	1.67	60-64	
D+	1.33	55-59	
D-	1.0	50-54	
FX	0.5	25-49	unsatisfactorily
F	0	0-24	

## 7. ways and methods of organization of educational process

Organization of educational process is carried out on credit technology based on the choice of studying the discipline, order the development of disciplines and modules.

### *Tasks of the organization of educational process:*

- unification of knowledge;
- creation of conditions for maximum individualization of instruction;
- strengthening the role and effectiveness of independent work of students;
- Identification of educational achievements of students on the basis of an efficient and transparent procedures for their control.

### *Training opportunities on credit technology:*

- the introduction of academic credits system to assess the labor costs of students and teachers in each discipline;
- participate in the formation of the individual curriculum;
- the choice of subjects and modules in the catalog of elective courses;
- the freedom to choose teacher training;
- the choice of an educational path with the help of student advisors;
- the use of interactive teaching methods;
- academic freedom in the formation of educational programs;
- providing of training necessary teaching and learning materials;
- the use of effective methods of control of educational achievements of students;
- the use of score-rating system of evaluation of educational achievements of each discipline, and other forms of self-study.

### *The methods and technologies of training:*

- ❖ reflexive techniques considered as a central object of study;
- ❖ competence-based approach to learning;
- ❖ role-playing games;
- ❖ educational discussions;
- ❖ Case Study;
- ❖ design methods.

Types of methods and technologies of training to choose the teachers themselves.

Methods for achieving learning outcomes	Learning outcome										
	ON 1	ON 2	ON 3	ON 4	ON 5	ON 6	ON 7	ON 8	ON 9	ON 10	ON 11
Lecture	+		+		+	+		+			
Practical method	+		+		+						+
Seminar						+		+			+
Laboratory method	+	+			+				+		
Interactive lecture	+		+								
Project method			+	+			+				
Case study	+			+	+			+		+	
Educational debate		+				+				+	
Group work			+						+		+
Problem-based learning						+	+	+			
Method of reflexive learning		+		+		+		+		+	
Dialog training		+					+		+		
Critical learning				+						+	+

**Internal quality assurance system** educational activities aimed at improving the quality of educational services is determined by:

- policy in the field of quality assurance;
- development and approval of ongoing educational programs;
- student-oriented learning, teaching and assessment;
- admission of students, academic performance, recognition and certification;
- teaching staff;
- training resources and support training systems;
- information management;
- informing the public;
- continuous monitoring and periodic program evaluation;
- periodic external quality assurance.

**Professional practice**

Professional practice is a required component of study the student.

In accordance with the specific OP organizes the following practices:

- training;
- language;
- teaching;
- Production; Elements the model of a graduate
- pre-diploma.

***The purpose of the training practice*** - the acquisition of primary professional competences, including the consolidation and deepening of theoretical knowledge acquired during the training, laying the foundations of research, paperwork and working with business correspondence, acquisition of practical skills and work skills.

Teaching practice is organized for all students, is conducted in accordance with the characteristics and direction of the OP, is considered at a meeting of the department and is reflected in the program of practice.

***The purpose of language practice*** is the formation of students' skills of interpretation and translation, business communication skills and networking, including native speakers.

Language practice is conducted for students engaged in training with knowledge of languages, in English and of multilingual groups.

***The purpose of teaching practice*** - consolidation and deepening of knowledge of general scientific, cultural, psychological and pedagogical, methodical and special disciplines, as well as the formation on the basis of theoretical knowledge of pedagogical skills and competences.

***Internship*** held in institutions, organizations and enterprises, relevant profile training of students.

***Undergraduate practice*** carried out on senior year for students who perform graduate work. Manual pre-diploma practical exercises supervisor of the thesis.



## 8 CONTENT OF THE EDUCATIONAL PROGRAM

### 8.1 Matching the learning outcomes of the OP to the graduate model

The results of training determine the graduate's models formed after the completion of the OP

**Matrix of correlation of learning outcomes in the OP with the graduate model**

<b>MB</b>	<b>ON1</b>	<b>ON2</b>	<b>ON3</b>	<b>ON4</b>	<b>ON5</b>	<b>ON6</b>	<b>ON7</b>	<b>ON8</b>	<b>ON9</b>	<b>ON10</b>	<b>ON11</b>
<b>1</b>			+					+	+	+	
<b>2</b>								+	+		
<b>3</b>			+		+	+	+	+		+	+
<b>4</b>			+	+		+		+	+		+
<b>5</b>	+	+	+	+	+	+	+	+	+	+	
<b>6</b>	+	+	+	+				+	+	+	
<b>7</b>		+			+			+			

## 8.2 Information about the modules

№	Name module	learning Outcomes	constituents of module	Short description module	Cycle	Number of loans	The elements of the model of a graduate
1	general cultural training	<p><b>ROM1</b> - assesses the environmental reality on the basis of philosophical principles.</p> <p><b>ROM2</b> - shows citizenship.</p> <p><b>ROM3</b> - Use methods of scientific knowledge.</p> <p><b>ROM4</b>- assesses the situation of social and professional interpersonal communication.</p> <p><b>ROM5</b> - solves the problems that arise in professional communication.</p> <p><b>ROM6</b> - interpret using language means their thoughts in speech and writing</p> <p><b>ROM7</b> - use of ICT in their professional activities.</p> <p><b>ROM8</b> - apply the methods and means of</p>	<p>1. The modern history of Kazakhstan</p> <hr/> <p>2. Philosophy</p> <hr/> <p>3. Socio-political knowledge</p> <hr/> <p>4. Legal, economic and ecological knowledge 5. Kazakh (Russian) language</p> <hr/> <p>6. Foreign Language</p> <hr/> <p>7. Information and communication technologies (in English language)</p>	<p>The module is aimed at the formation of the ideological, civil and moral position of the future expert; increase its competitiveness on the basis of mastering of information and communication technologies; development of the ability to communicate in the state, Russian and foreign languages; promotion of healthy lifestyles, self-improvement and professional success. Describes the analysis of solutions to problems in society, the rationale for the role and</p>	GED	56	1, 2, 7

		physical culture as the foundation of a healthy lifestyle.	8. Physical education	place of the object in a particular life, the integration of multi-disciplinary knowledge, the development of information culture.			
2	Pedagogical, psychological training	<p><b>ROM1</b> - selects pedagogical analysis methodology.</p> <p><b>ROM2</b> - summarizes the results of the study.</p> <p><b>ROM3</b> - uses psychological and pedagogical knowledge in new conditions.</p> <p><b>ROM4</b> - to use national and international experience of educational work</p> <p><b>ROM5</b> - Use professional communicative and teamwork skills</p> <p><b>ROM6</b> - solves the problems associated with age-related disabilities enrolled</p> <p><b>ROM7</b> - apply in practice methods of training and education of children with special educational needs.</p>	<p>1. Psychological and physiological development of pupils</p> <p>2. Pedagogy and methodology of educational work</p> <p>3. Special educational technology in inclusive education</p>	The module examines the essence of the anatomical and physiological, psychological characteristics of children and adolescents, aspects of identity formation through the preservation and promotion of health; actual problems of methodology, stages of development of pedagogical science, the concept of a holistic pedagogical process. Describes methods, forms and means of educational work in modern pedagogy, the specifics of the organization and design of inclusive education.	BD	15	3, 4

3	Mathematical training	<p>ROM1-summarizes mathematical knowledge and concepts in the system of other disciplines;</p> <p>ROM2-applies mathematical knowledge to solving problems, making conclusions, and practicing knowledge based on systematic thinking;</p> <p>ROM3-defines the Basic Laws of physics, mathematical transformations;</p> <p>ROM4-used in calculating the classification of partial differential equations</p>	<p>Mathematics</p> <hr/> <p>1. Methods of mathematical physics 2.Mathematical equations of physics</p>	<p>The module deals with known and unknown integrals, series theory, elements of differential equations and probability theory. At the same time, knowledge of mathematics as a whole science, the role of "mathematical physics equations", the report on the personal derivative equations of Kecha, the existence of solutions of boundary value problems.</p>	BD	12	4, 5
	Fundamental readiness	<p><b>ROM6</b>- accumulates mathematical knowledge and understanding in other disciplines;</p> <p><b>ROM6</b> - applying the knowledge in practice on the basis of systematic thinking, proving mathematical concepts, solving problems, making conclusions;</p> <p><b>ROM6</b>- determines the place and role of mathematics in real life, sciences system;</p> <p><b>ROM6</b> - can define basic laws of physics, mathematical transformation;</p>	<p>Mechanics</p> <hr/> <p>Molecular Physics</p> <hr/> <p>Electricity and magnetism</p> <hr/> <p>Optics</p> <hr/> <p>Atomic and nuclear physics</p> <hr/> <p>Astronomy</p>	<p>Learning this module is to develop the understanding of the fundamental laws of physics as a basis for describing and analyzing the nature of various phenomena around the world; mastering of practical skills of solving practical problems; Formation of fundamental physical concepts for the formation of abilities of students in their own methods of research and</p>	BD	38	4, 5

		<p><b>ROM6</b> - Applies the laws and theories to practical situations in specific situations;</p> <p><b>ROM6</b> - summarizes the scientific model and evidence plan collected for physically dependent, transmitting laws in tables, graphs, messages, presentations;</p> <p><b>ROM6</b> - organizes the level of interaction of teachers and pupils in education in solving tasks of different levels;</p> <p><b>ROM6</b> - can carry out research on various levels of physical experiment and problem solving;</p>	Practice Practice	thinking; Formation of the skills of using knowledge obtained from future professional activities..			
4	Theoretical physics	<p><b>ROM6</b> - Knows basic laws of classical physics, quantum physics;</p> <p>Applies new approaches to improve the</p>	Classic mechanics	The content of this module envisages the acquisition of basic concepts of students in the classical and quantum	BD	12	5, 6



		<p>understanding of <b>ROM6</b>-Theoretical modules;</p> <p><b>ROM6</b>- Organizes the level of interaction of teachers and pupils in education in solving tasks of different levels;</p> <p><b>ROM6</b> - can produce problems of different levels in physical experiments and researches;</p> <p>Knows the application of <b>ROM6</b>-laser technology, theoretical physics.</p>	Quantum Mechanics	<p>levels of the basic methods of describing specific physical processes and phenomena; builds systematic knowledge on condensed state physics and methods of solving practical problems of quantum physics on the basis of modern mathematical models of physical objects description; successfully develops scientific thinking and profound knowledge for successful professional activity in educational institutions. It describes the ways in which organizing, communicating, communicating information on project activities and integrating interdisciplinary knowledge.</p>			
5	Applied Physics Module	<p><b>ROM6</b> - Can perform physical controls and experiments to disclose the nature of phenomena and processes, laws and laws;</p> <p><b>ROM6</b> - studying the model of physical calculations using a computer and changing it accordingly as well as knowing the limits of daily living;</p> <p><b>ROM6</b>- Evaluates the history of physics, the development of various physical theories;</p> <p><b>ROM6</b>- the place of physics in the modern scientific image of the world; explain the role of physics in shaping the field and solving practical tasks</p>	Methods of computer physics	<p>The module develops the system of metatechnical knowledge in the field of Physics for other students of pedagogical specialties in the field of physics in other sciences (biology, chemistry), computer modeling, school physics and develops deeper worldview and technical culture.</p>	BD	6	4, 5

6	Methods of teaching and learning physics at school	<p><b>ROM6</b> - analyzes mathematical knowledge on the modern problems of physics in ON1-;</p> <p><b>ROM6</b> -Self-employment flexibility and the solution of critical issues, adapted to the new situation;</p> <p><b>ROM6</b> - uses experiments and methods of measuring results to determine dependencies between physical quantities;</p> <p><b>ROM6</b>- Demonstrates creative abilities in the production of physical, olympic, experimental reports;</p> <p><b>ROM6</b> - analyzes the ways of effective studying of world-known, best-practiced pedagogues in the field of focus on pupils' attention, study of accountability skills;</p> <p><b>ROM6</b> - Organizes the level of interaction of teachers and students in education in solving tasks of different levels;</p> <p><b>ROM6</b> - Physics can make decisions in choosing the best methodological technologies, using the age-specific features of the schoolchildren, their intellectual abilities, the basic laws and methods of reporting, their pedagogical skills.</p>	<p>Methods of individual and distance learning in physics</p> <p>Practical problem solving in physics</p> <p>Methods of Teaching Physics</p> <p>Methods of teaching informatics</p> <p>Methods of scientific research and information letter</p> <p>Language practice</p> <p>Professional practice</p>	<p>The module focuses on the development of practical skills and abilities for students to teach within the school physics curriculum, such as: mastering the standard and non-standard physical problem solving methodologies, setting up and conducting school experiments and demonstration practice, learning a new subject and objectively evaluating pupils' mastering ways to increase students' activity in physics classes.</p>	SD BD	40	6, 7
7	Programming language	<p><b>ROM6</b> - competently works with Internet resources through ICT;</p> <p><b>ROM6</b>- Describes computer and virtual research methods of physics laws;</p>	<p>Programming Language 1: PYTHON</p> <p>Preparation of mobile applications</p>	<p>The module focuses on the basic disciplines of computer science to form algorithmic thinking. Key management module</p>			





		analysis, use of theoretical, practical literature, the ways of integration of subject knowledge.												
<b>6</b>	Mechanics	Kinematics, dynamics, laws of conservation of energy, momentum, AST, mechanics of solid body, the world law of gravitation, oscillatory motion, waves, practical application, methods of laboratory research are considered. Comparative error made in laboratory work, argumentation a role of discipline in science, ways of integration of subject knowledge are described.	5	+	+	+				+				
<b>7</b>	Molecular physics	Discusses the structure of the bodies in a state of aggregation, the distribution of Maxwell-Boltzmann kinetic molecular theory of gases, the processes, laws of thermodynamics. Methods of problem solving, laboratory work, generalization of results, practical application, substantiation of role of subject in science, ways of integration subject knowledge are described.	7	+	+	+				+				
<b>8</b>	Electricity and Magnetism	Considered are Laws of electrostatics, electric field, Coulomb's law, superposition principle, laws of direct, alternating current, Ohm's law, physical bases Law, magnetic field, methods of solving problems, of measuring the main parameters, the place electricity in particular life, generalization of scientific evidence, ways integrating knowledge are described in laboratory works.	6	+	+	+				+				
<b>9</b>	Optics	Examines main phenomena, patterns, manifested in its interaction with matter, distribution, fault laws, light reflection, properties of lens. Knowledge of wave optics in society, technique, methods of measuring main parameters in laboratory work, methods of integration of subject knowledge, determining the place of an object in particular life are described.	6	+	+					+				
<b>10</b>	Methods of Teaching Physics	Scientific-methodical analysis of sections "Mechanics", "Molecular physics", "Electricity,	7							+			+	+



		magnetism", "Optics", "Atomic, nuclear physics", basic physical concepts, features of methods of teaching physics at profile level, methods of application of knowledge in practice. Describes way defining assessment criteria in solution of problems, demonstrations, information culture, integration of multidisciplinary knowledge.												
11	Technique school experiment	Main problems of school course of physics are considered on an experimental basis: control of physical phenomena; measurement of physical quantities by measuring instruments, technical devices. It describes use of DSP, organization of educational process on basis of ICT, communication in the implementation of project work, provision of information culture	6	+		+							+	
12	Methods of teaching informatics	Subject provides methodological training for teaching computer science to schools; regulatory documents for organization, planning of educational process are considered: textbooks; teaching methods, organization, specialized training, issues of practical application of knowledge. Describes how to develop a lesson plan, the integration of interdisciplinary knowledge, assessment of creativity in inclusive education.	6	+								+		+
<b>Cycle of basic disciplines optionally component</b>														

13	Classical physics	1. General theory of laws motion of bodies, classical concepts of time, space, writing the laws of motion a material point in different coordinates, Lagrange, Maxwell's system of equations, plane electromagnetic waves are considered. the ways of application of innovative technologies, criteria assessment, information culture, integration of interdisciplinary knowledge are described	6						+	+		+		+
14	Quantum mechanics	1. Discusses methods of solution problems of quantum mechanics, concept of wave function, Schrodinger equation, the mathematical apparatus of a physical quantity, operators, elements of relativistic quantum mechanics, thermodynamics embodied macroscopic systems, elements of theory of fluctuations. Described ways of using e-learning materials in solving problems, integration of multidisciplinary knowledge.	6	+		+				+				
15	1. Methods of mathematical physics 2. Mathematical equations of physics	We consider the theory of mathematical models of physical phenomena, a mathematical model for constructing various physical fields and wave functions in electrodynamics, acoustics, elasticity theory, hydrodynamics, and aerodynamics. It is focused on practical application of mathematical knowledge, integration of subjects, development of critical and positive thinking, organization of the educational process using ICT.	6			+	+			+				
		2. various equations, classification of differential equations, methods for solving the Cauchy problem for the wave equation, potential theory, Fourier - a method for solving boundary value problems for hyperbolic and parabolic equations on a scientific basis, focused on the application of mathematical and physical knowledge in practice, the integration of disciplines, the development of critical, positive thinking, the organization of the educational process using ICT.	6			+	+			+				

16	Atomic and nuclear physics	Considered structure of atom, its planetary theory, models of atomic nucleus, theory of elementary particles, basic equations in atomic, nuclear physics, methods of measuring the basic parameters in laboratory work, ways of integrating subject knowledge, determining place of object in a particular life, creativity of solving the problem are described.	6			+	+					+		+		
17	Astronomy	Examines General concepts of structure, movement, development of celestial bodies, motivates the role of developing model of the Universe in development of science. Describes the ways of using digital educational resources in the development of the results of the experiment, the ability to work together with the group, subject integration.	6		+		+					+		+		
18	Methods of individual and distance learning in physics	The purpose of the discipline "Methods of Scientific Research and Academic Writing" is to train students in the structural presentation of their own ideas, to master ways of working with various scientific and scientific-information sources taking into account the specifics of academic discourse. The discipline forms in students a culture of writing, critical thinking skills and linguistic-pragmatic competencies, improves the written language culture through the language of which it is the medium, gives an idea of the principles and culture of academic integrity.	6		+							+		+		+
19	Practical problem solving in physics	Methods of solving physical problems, design features of different types of physics problems, types Olympiad problems, ways of compiling problems, evaluation criteria, ways of their application in practice as didactic materials are considered. Ways using, solving problems, communicative performance of project, information culture, integration of interdisciplinary knowledge are described.	6				+							+		+



	Management Systems	databases in free set of relational data, an overview of current trends data science in connection with advent of BigData. Organization of educational process based on ICT, communicative approach to project, methods for evaluating creative approach to solving problems, role in the science of discipline											
25	Fundamentals of computer graphics and animation	The basic concepts of computer graphics, Adobe Photoshop, software CorelDraw, software Adobe Photoshop, projects for CorelDRAW, presentations, preparation of drawings for web pages. Organization of educational process based on ICT, communicative approach to project work, presentation of information culture, methods for evaluating a creative approach to solving problems.	6	+						+	+		+
26	Educational workshop	LEGO is based on Arduino, data processing, sending them from a computer, to the Internet, smartphones, designing, components, designing circuits, writing and diagnosing software. It describes the simulation of robotics in practice, modeling in cognitive-scientific research, problem analysis, characterization of the place and role of the subject in real life.	6	+	+	+							
<b>CYCLE majors</b> <b>university component / elective component</b>													
27	1.Web-programming 2.Programming on the Internet	We consider web interfaces, NTML for web applications, CSS, JavaScript. Web standards training, web programming, popular web designers: leasing, business cards, business resources. Describes the use of RCCs, communication in project work, information culture and the integration of interdisciplinary knowledge.	6	+		+				+		+	

	leasing, business cards, business resources. Describes the use of RCCs, communication in project work, information culture and the integration of interdisciplinary knowledge.		+		+				+		+		
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**6B01510 «PHYSICS-INFORMATICS PREPARATION LEARNING»**

**8.4 Working curriculum of the educational program**