

**CATALOGUE OF ELECTIVE DISCIPLINES**  
**MASTER'S LEVEL**  
**"7M01504 - training of teachers in natural science subjects»**

<b>The abbreviated name of the cycles of disciplines</b>	<b>Name of disciplines and their main sections</b>	<b>Labor intensity of total credits (ECTS)</b>
<b>CCh</b>	<b>COMPONENT OF CHOICE (CC)</b>	<b>15</b>
<b>1.</b>	<b>Research methods of nanomaterials</b>	<b>5</b>
	Discipline "methods of research of nanomaterials" will acquaint undergraduates with modern experimental methods of nuclear physics. The main approaches and representations of modern methods of detection and establishment of crystal structure, elemental and phase composition of condensed systems will be considered within the discipline: diffraction methods; optical, scanning and electronic diffraction microscopy; probe microscopy, scanning tunneling microscopy, atomic force microscopy; auger emission and absorption spectroscopy; application of computer programs for processing experimental results.	
<b>2.</b>	<b>Mossbauer effect</b>	<b>5</b>
	Theoretical methods of research. Atom in computational methods. Basis function. A molecule in the calculation methods. Rutan Equations. Density functional theory. Topological methods of analysis of the electron density. The concept of deformation electron density. An atom in a molecule. Topological theory. Electron density localization function (ELF). Calculation of molecular properties-formation energies, molecular orbitals, ionization potentials. Nuclear transitions. Is what makes the spectroscopy. The transitions of the inner electrons of the atoms. X-ray spectroscopy. Transitions of valence electrons. Oscillatory transitions. Reorientation of nuclear or electron spin.	
<b>3.</b>	<b>Fundamentals of nuclear energy</b>	<b>5</b>
	"Fundamentals of nuclear energy" is an educational course in the field of nuclear energy. The most important task of the course is to apply knowledge in the field of atomic and nuclear physics to understand the physical foundations of nuclear power. In this course, the basics of nuclear physics, the interaction of nuclear particles with matter, the properties of neutrons, alpha, beta particles and gamma radiation are studied in depth.	
<b>4</b>	<b>Physical foundations of modern technology</b>	<b>5</b>
	Semiconductor microelectronics. Nanotechnology and nanoelectronics. Quantum and nonlinear optics. Superconducting technology. Electronic and nuclear magnetic resonance. Modern technologies in computer	

	engineering, communication and management. Quantum information.	
<b>5</b>	<b>Nuclear physics research methods</b>	<b>5</b>
	<p>"Nuclear physics research methods" will acquaint undergraduates with modern experimental methods of nuclear physics. The most important task of the course is to improve the methodological and pedagogical training of teachers by strengthening the theoretical foundations of this course.</p> <p>The teacher should be guided by a wide range of new technologies, ideas, directions, and be ready to use them in their teaching practice.</p>	
<b>6</b>	<b>History and methodology of physical science</b>	<b>5</b>
	The role of historicism in teaching is now objectively increasing. The use of historical material in the teaching of physics just allows us to solve such important educational tasks as the formation of scientific worldview, morality, ideological conviction, patriotism, internationalism, love of science. If possible, a complete exposition of the problem of historicism in the teaching of physics and show how you can use historical material to solve the educational and educational tasks that are now facing the teaching of physics in higher education institutions	
<b>PD</b>	<b>CYCLE OF PROFILE DISCIPLINES (PD)</b>	
<b>7</b>	<b>Interdisciplinary connections of physics</b>	<b>5</b>
	The discipline "interdisciplinary connections of physics" is a "reflection in the content of academic disciplines of those dialectical relationships that objectively operate in nature and are known by modern Sciences." Interdisciplinary connections are a didactic condition and a means of deep and comprehensive assimilation of the basics of Sciences. They contribute to improving the scientific level of knowledge of undergraduates, the development of logical thinking and their creative abilities.	
<b>8</b>	<b>Methodical bases of the decision of physical problems of the applied orientation</b>	<b>5</b>
	<p>Physical problems and the essence of the problem solving process. Classification of physical problems. Methods and techniques for solving physical problems. Stages of the process of solving physical problems. Methods for solving physical problems. Methods of training to solve physical problems of different types. Teaching methods for solving qualitative problems. Methods of teaching students to solve experimental problems</p> <p>Methods of teaching the solution of graphical problems. Analysis of the content and structure of physical problems.</p> <p>The creation of new physical problems. Methods of conducting classes to solve physical problems. Control and consolidation of knowledge and skills of students. Independent work of students in solving physical problems.</p>	
<b>9</b>	<b>Methodical bases of physical education of higher and secondary schools</b>	<b>5</b>

	The study of this discipline allows students to master the methodology of teaching physics in higher and secondary schools. The objective necessity of system change of a course of physics in the higher and secondary school, the main maintenance and structure of a course of physics in comprehensive schools and higher educational institutions is considered. When studying the discipline, undergraduates get acquainted with new forms of educational work, methodological foundations of physical education, changes in the structures of classes, types of planning, etc.	
<b>10</b>	<b>Organization and content of teaching physics in specialized classes</b>	<b>5</b>
	Study of physics in a specialized school. Differentiation of training in profile school. Profile course of physics. Basic physics course. New elements of teaching physics in classes of different profiles	
<b>11</b>	<b>Methods of computer modeling of physical processes</b>	<b>5</b>
	The method of computer modeling is both a tool for scientific research and a method of education. This method contributes to the development of research training, the approximation of the learning process to the scientific search, which is fundamentally important from the point of view of pedagogy.	
<b>12</b>	<b>Innovative technologies in physical education</b>	<b>5</b>
	Subject, tasks and methods of pedagogy of higher school. Psychological and pedagogical characteristics of the student. High school teacher. The process of studying at the University. Typical programs for the specialty "Physics". Principles of University didactics. General characteristics of teaching methods of the General course of physics at the University. Lecture of the General course of physics. Work with a book and reference material on the General course of physics. General cognitive methods of the General course of physics. Independent work of students on the General course of physics. Research work of students on the General course of physics. Introduction of new pedagogical technologies in the University. Checking the knowledge, skills and abilities of students in the General course of physics.	
<b>13</b>	<b>Selected topics in General physics</b>	<b>5</b>
	"Selected questions of General physics" is to familiarize the students with contemporary methodological content of science, methods of studying individual topics of physics courses in high school at the profile level, with modern methods and techniques of organization of cognitive activity of senior pupils of secondary educational institutions.	
<b>14</b>	<b>Modern methods of teaching General physics course</b>	<b>5</b>
	General questions of theory and methods of teaching physics. The main tasks of teaching physics in institutions of secondary General education. Forms of organization of training sessions in physics. Methods and techniques of teaching physics. Means of teaching physics. Extracurricular work in physics. Elements of research work in the work of a physics teacher. Methods of teaching physics at school. Methods of teaching physics as a pedagogical science. State educational standard of complete secondary education.	

	<p>Methods of studying the section " Mechanics" in the General course of physics. The basic concepts and laws studied in the section "Mechanics". Scientific and methodological analysis and methods of studying the equations of motion, Newton's laws, conservation laws, mechanical vibrations and waves. Methods of studying the section "Molecular physics" and "Thermodynamics". Scientific and methodological analysis of the section, the basic concepts and laws studied in the section. Formation of students ' ideas about the structure of physical theory. Methods of studying the sections "Electrodynamics". Audiovisual technologies of teaching physics. Formation of the concept of electromagnetic field, reflection of Maxwell's theory, questions of classical electronic theory of conductivity in the section. Scientific and methodological analysis and methods of studying electrodynamics</p> <p>Methods of studying the section " Optics" in the General course of physics. The basic concepts and laws studied in the section "Optics". Methods of studying the section " Atomic and nuclear physics" in the General course of physics.</p> <p>The basic concepts and laws studied in the section "Atomic and nuclear physics".</p>	
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