CATALOG OF ELECTIVE DISCIPLINES

6B01 - Pedagogical sciences
(Code and classification of the field of education)

6B015 - Training of teachers in Natural science subjects
(Code and classification of the direction of training)

0114
(Code in the International Standard Classification of Education)

B010 - Physics teacher training
(Code and classification of the educational program group)

6B01514 - Physics (IP)
(Code and name of the educational program)

bachelor
(Level of preparation)

set of 2024

Semey 2024

Developed
By the Academic Committee of the EP
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Reviewed
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Natural and Mathematical of the faculty
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Algebra and numbers theory

Discipline cycle	Profiling discipline
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

During the course, pre- service teachers build their understanding of the fundamental concepts and methods of higher algebra and number theory. They also develop their abstract and analytical thinking, as well as a general mathematical culture. Pre-service teachers develop their skills in using abstract mathematical apparatus necessary for analyzing and modeling processes and phenomena. They also learn to master methods of processing and analyzing results using algebra and number theory.

Purpose of studying of the discipline

The purpose of studying the discipline is to teach students the basics of modern number theory, as well as the application of acquired knowledge and skills to solving a number of professional tasks.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

- In-depth understanding of structures such as groups, rings and fields, which allows you to solve complex problems. Skills in solving various types of equations and inequalities, including polynomial, linear and diophantine;
- understanding the properties of integers such as divisibility, prime numbers, residuals;
- development of logical thinking and proof skills, including induction and contradiction;
- knowledge of numerical structures used in modern encryption and data protection systems. The ability to apply algebraic concepts to solve practical problems;
-improving the general level of mathematical thinking and the ability to abstraction.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Analytical geometry and linear algebra

Discipline cycle	Profiling discipline
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The purpose of the discipline is to form ideas about the theory of determinants, matrix analysis, and methods for solving systems of linear equations. Elements of set theory. Linear equation system. Determinants. Complex number. Scalar, vector, and mixed product of vectors and their applications. Method of coordinates on the plane. Second-order curves on the plane. Equations of a surface and a line in space. Second-order surfaces and their canonical equations. Mastering the mathematical apparatus of linear algebra for further use in the process of future scientific work.

Purpose of studying of the discipline

- to give a future specialist a certain amount of knowledge in mathematics, necessary both for studying related disciplines and special courses;
- develop mathematical intuition;
- the ability to use the studied mathematical methods in solving problems of an applied nature related to the student`s future specialty;

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

To know:
-basic concepts of the theory of determinants, matrices and systems of linear equations, definitions and properties of mathematical objects in these fields, formulations of statements, methods
of proving the main ones, possible areas of their applications in school mathematics;
- basic geometric concepts and relations: axiomatics of the corresponding sections of geometry, basic definitions and theorems: equations of a straight line and a plane, operations on
vectors;
-equations of curves and planes of the second order;
- coordinate method and use it to solve standard problems of analytical geometry.
Mastering the elements of analytical geometry on the plane and in space;
- analyze the tasks presented on straight, flat, curves and surfaces, be able to choose effective solutions, present the results in an

understandable form;
- application of the acquired theoretical material in the school mathematics course generalization of theorems, proofs, formulas considered in the course, use of the proposed literature, description of mathematical concepts through formal language, consolidation of acquired knowledge in other areas of mathematics:
application in theoretical computer science, theory of artificial intelligence, logical programming, etc.
- the student has the skills to master simple numerical methods and achieve the level of their implementation on computers;
- to know the basic concepts, definitions and formulas, the main methods of solving problems, to build hypotheses about the further course of solving the problem;

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Mathematical logic and discrete mathematics

Discipline cycle	Profiling discipline
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
Teaching methods for solving discrete mathematics problems. To give students a stock of basic knowledge on the main sections of discrete mathematics, to teach rational and effective use of the acquired knowledge in solving typical problems of discrete mathematics and mathematical logic; to form students` understanding of discrete mathematics and mathematical logic as methods of studying a wide range of objects and processes.

Purpose of studying of the discipline
The main goal of mastering the discipline "Discrete Mathematics and Mathematical Logic" is to teach students methods of solving discrete mathematics problems and appropriate thinking. In the learning process, it is required to give students a stock of basic knowledge in the main sections of discrete mathematics, to teach the rational and effective use of acquired knowledge in solving typical problems of discrete mathematics and mathematical logic; to form students` understanding of discrete mathematics and mathematical logic as methods of studying a wide range of objects and processes characterized by the absence of the property of continuity; to form knowledge, skills and abilities of using the basic concepts of graph theory, the theory of Boolean functions.

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
be able to:
the importance of mathematical logic in professional activity;
– basic principles of mathematical logic, set theory and algorithm theory;
– formulas of the algebra of statements;
– methods for minimizing algebraic transformations;
– basic classes of functions, completeness of the set of functions, Post`s theorem
– fundamentals of language and predicate algebra,
– elements of the theory of algorithms.
ON - 7. Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge of various abilities.
ON - 8. Conduct scientific research in the chosen field of experiments and theoretical physical research with the help of modern technology.instrumentation.

Prerequisites
Mathematical analysis

Postrequisites
Mathematical logic and discrete mathematics

Mathematical analysis

Discipline cycle	Profiling discipline
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
The purpose of mastering the discipline "Mathematical analysis" is to form the knowledge and ability of future specialists to apply mathematical apparatus and mathematical methods in the analysis of physical phenomena and processes. Limit of the numerical sequence. Limit, continuity, uniform continuity of the function. Fundamentals of differential calculus. Basic integration methods. A definite integral and its physical applications. Improper integral. Functions of many variables. Multiple integrals. has skills in using mathematical methods to solve physical problems

Purpose of studying of the discipline
The study of the basics of the theory of integration of functions and the theory of differential calculus of functions of many variables. Their applications are in various fields. Mastering techniques and methods for solving specific tasks and their practical application, activation of independent work of students. The development of mathematical and algorithmic thinking among students.

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
1. must know: the theoretical foundations of mathematical analysis
2. must be able to: use knowledge of the theoretical foundations of mathematical analysis in the analysis of various functions, use theoretical concepts and practical methods in solving problems arising in various physics courses
3. must master: the basic concepts of the theory of functions of one and many variables, methods of differentiation and integration of functions, techniques for working with series and integrals of functions of many variables.
To know the basic definitions and concepts of mathematical analysis such as: the limit of a sequence, the concept of a convergent series and its sum, the limit of a function, the definition of the derivative of functions of one and many variables, the definition of the Riemann integral, the concept of uniform convergence of functional sequences and series. Be able to apply theoretical knowledge and knowledge of various proof methods to solve qualitative problems.

Prerequisites
Mathematical logic and discrete mathematics

Postrequisites
Mathematical analysis

Molecular physics

Discipline cycle	Profiling discipline
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
During the course, future teachers get acquainted with the basics of molecular kinetic theory and thermodynamics. They study the basic models of molecular physics, models and patterns of ideal and real gases, as well as the classical distribution of molecules. They also study methods of thermodynamics, basic thermodynamic relations and modern concepts in thermodynamics and molecular physics.

Purpose of studying of the discipline
the formation of a clear understanding of the underlying physical phenomena, laws and processes, the ability to express the relationship between the physical phenomena and the values in mathematical form , to apply the general laws of physics to solve specific theoretical and practical. To acquaint with the basic stages of development of physics, the principles and laws of physics; to give the student an idea of the limits of applicability of physical models and hypotheses

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
1. must know:
- the physical foundations of phenomena related to the atomic- corpuscular structure of matter; - the main classical and modern experimental results in the field of thermal phenomena, transport phenomena, and phase transitions; - basic laws of thermodynamics, methods of thermodynamic and statistical description of multiparticle systems; - principles of operation and device of modern experimental equipment for the study of thermal phenomena, transfer phenomena, and phase transitions.
2. must be able to:
- apply statistical and thermodynamic methods to the description of phenomena related to the atomic-corpuscular structure of matter; - to use methods of physical research to study thermodynamic processes; - establish the relationship of molecular phenomena with other branches of physics, and especially in the borderline areas - physical chemistry and chemical physics; - use modern educational and information technologies to acquire new knowledge
3. must possess:
- calculation skills within the framework of thermodynamic and statistical methods of description; - skills of working with the simplest measuring equipment; - skills works with educational and scientific literature.
4. must demonstrate the ability and willingness to:
- solve problems related to the atomic-corpuscular structure of matter - operate modern physical equipment and equipment - work with modern educational and information technologies

ON3 Use the fundamental knowledge of physics in solving the basic problems of physics, physical phenomena, in explaining the basic physical terms, quantities, their mathematical expression and units of measurement.
ON4 Conducting experiments in the classical sections of physics, solving typical problems comprehensively, using physical terms. Creating an algorithm for the structure of physical problems, competent formulation of proofs

Prerequisites

Mechanics

Postrequisites

Workshop on solving physical problems 1

Methods and technologies of teaching physics

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

Purpose: to increase competencies in the field of pedagogy and didactics. Students have a holistic understanding of the methodological system of education, can model strategies and technologies for solving specific pedagogical problems, planning, guidance, teaching and evaluation, are able to use knowledge, forms, methods and technologies of teaching in accordance with the conditions of a particular school and the capabilities of students. Students can: • choose pedagogical models suitable for their training • apply teaching methods creatively and in a variety of ways, taking into account the opportunities offered by technology • use a suitable learning environment in your teaching • know and apply the rules and principles of copyright and data protection

Purpose of studying of the discipline

The purpose of this course is to develop students` skills and abilities necessary for the implementation of the educational process in physics lessons. It is necessary to create the best conditions for students to deeply penetrate into the ideological side of the taught subject, to realize the connection of physical science with its foundations reflected in the academic subject, taking into account modern pedagogical science and the experience of schools.

Learning Outcomes

ON 3 Critically select theoretical knowledge based on advanced concepts of physics with the help of various information and communication technologies and use the knowledge to improve physics education and their own professional growth.
ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 11 Work in interdisciplinary teams, have the skills to apply scientific knowledge in solving social problems.

Learning outcomes by discipline

- is able to determine the range of tasks within the framework of the set goal and choose the best ways to solve them, based on current legal norms, available resources and limitations; -is able to manage his time, build and implement a trajectory of self–development based on the principles of lifelong education;
- is able to participate in the development of basic and additional educational programs, develop their individual components (including using information and communication technologies);
ON2 Apply modern technologies of training and criterion- based assessment, taking into account individual, physiologicaland psychological characteristics of students

Prerequisites

Education Science and Key Learning Theories

Postrequisites

Pedagogical methods

Computer graphics

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

To introduce students to the modern principles of creating graphic systems for converting two- dimensional and three- dimensional images. To study graphical algorithms. Master the methods of creating realistic three-dimensional images.

Purpose of studying of the discipline

The purpose of the discipline "Computer Graphics and Graphics Packages" is to study modern methods of creating computer graphics and the formation of skills to use them in professional activities. Within this discipline, students gain the necessary knowledge to work with raster and vector graphics, which they can effectively use in their professional activities in the future.

Learning Outcomes

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік- тілдік оқыту технологиясын CLIL пайдалану.

Learning outcomes by discipline

ON 8 To develop the ability to theoretical and experimental research in a chosen field of physics, to take into account current trends in the development of physics in their professional activities.
ON9 To conduct experiments in the field of classical sections of physics, to describe research methods in physics. ON10 To carry out pedagogical, research and educational work.

1. Use knowledge in the field of computer graphics;
2. Work with graphic packages;
3. Create graphic images of various types and complexity.

Prerequisites
Information and communication technology

Postrequisites
Computer graphics

Programming

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
During the course, pre- service teachers develop their understanding of the fundamental Python programming concepts. They also develop their algorithmic thinking skills as well as coding skills by using commonly used data structures, writing custom functions, and reading and writing results to files.

Purpose of studying of the discipline
Formation of ideas about programming languages; acquaintance with the fundamental concepts of algorithms and programming languages; learning how to write programs in a high-level language; mastering the Python programming methodology.

Learning Outcomes
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік- тілдік оқыту технологиясын CLIL пайдалану.

Learning outcomes by discipline
ON 8 To develop the ability to theoretical and experimental research in a chosen field of physics, to take into account current trends in the development of physics in their professional activities.
ON9 To conduct experiments in the field of classical sections of physics, to describe research methods in physics. ON10 To carry out pedagogical, research and educational work.
1. Write and analyze programs and applications;
2. Apply different algorithms to solve problems;
3. Use Python libraries.

Prerequisites
School course

Postrequisites
Computer graphics

Research skills in law and anti-corruption culture

Discipline cycle	General educational disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The main provisions of the Constitution, the current legislation of the Republic of Kazakhstan; the system of government bodies, terms of reference, goals, methods of state regulation of the economy, the role of the public sector in the economy; financial law and finance; the mechanism of interaction between substantive and procedural law; the essence of corruption, the reasons for its origin; measure of moral and legal responsibility for corruption offenses; current anti-corruption legislation.

Purpose of studying of the discipline
-to form a system of knowledge on combating corruption and develop on this basis a civil position in relation to this phenomenon;
- to implement an anti-corruption policy in all areas of the university`s activities, to successfully implement the Anti-Corruption Strategy of Shakarim University

Learning Outcomes
ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 6 To cover holistically and objectively the main stages of the history, evolution of the forms of statehood and civilization of the Kazakh people, to know the methods of scientific research and academic writing, to understand the importance of the principles and culture of academic honesty.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
ҚР Constitution, son, koldanystagy zaңnamasynyn negizgi zheleri; memlekettik baskar organdaryn zhuyesi, okilettikter shenberi, economics memlekettik retteudin maksattara, adisteri, economicsdagi memlekettik sektordyn roli; karzhylyk құқық zәne karzhy; the material is the same; sybaylas zhemkorlyktyn mani, onyyn payda bolu septeri; sybaylas zhemkorlyk kuzushylyktar ushin moraldyk-adamgershilik, kukukyktyk zhauaupkershilik sharalars; Please contact us.
to develop own moral and civic position, acting in accordance with the social, business, cultural, legal and ethical standards of the

Kazakh society, using the foundations of socio- political, economic and legal knowledge, demonstrating personal and professional competitiveness

Prerequisites

Research skills in law and anti-corruption culture

Postrequisites

Research skills in law and anti-corruption culture

Economic and Business Research Methods

Discipline cycle	General educational disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

General principles, techniques and methods for collecting, processing and analyzing data, studying patterns and trends in the development of mass economic phenomena and processes. Essence, forms, structure of capital. Production. production costs. Income production in a market economy. Business concept. Types of entrepreneurial activity. The theory of property, social forms of management. Goods, money. Socio-economic system. The emergence of the market. Financial system. The role of the state in business development. Macroeconomics. Resource saving. The cycle of economic development. inflation and unemployment. Kazakhstan in the system of world economic relations.

Purpose of studying of the discipline

Familiarization of students with the main objectives of science, its content and methods, mastery of scientific research methods, as well as practical skills in conducting scientific research of economic processes.

Learning Outcomes

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.

ON 6 To cover holistically and objectively the main stages of the history, evolution of the forms of statehood and civilization of the Kazakh people, to know the methods of scientific research and academic writing, to understand the importance of the principles and culture of academic honesty.

ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

General principles, methods and techniques for collecting and processing data, research into patterns and trends in the development of mass economic phenomena and processes. Meaning, forms, capital structure. Production. Production costs. Production income in a market economy. Business concept. Types of business activities. Property theory, social forms of management. Goods, money. Socio-economic system. Emergence of the market. Financial system. The role of the state in business development. Macroeconomics. Saving resources. The cyclical nature of economic development. Inflation and unemployment. Kazakhstan is in the system of world economic relations.

recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the natural and mathematical sciences, argue their own position on the application and integration of knowledge from other fields of science to solve global and local problems of mathematics education

- holistically and objectively cover the main stages of history, the evolution of forms of statehood and civilization of the Kazakh people, know the methods of scientific research and academic writing, understand the importance of the principles and culture of academic integrity

Prerequisites

Economic and Business Research Methods

Postrequisites

Economic and Business Research Methods

Fundamentals of research in ecology and safe life

Discipline cycle	General educational disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The main patterns of functioning of living organisms, ecosystems of various levels of organization, the biosphere as a whole, their stability; the interaction of the components of the biosphere and the environmental consequences of human economic activity, especially in the context of the intensification of nature management; modern ideas about the concepts, strategies and practical tasks of sustainable development in various countries and the Republic of Kazakhstan; problems of ecology, environmental protection, sustainable development. Life safety, its main provisions. Dangers, emergencies. Risk analysis, risk management. Human security systems. Destabilizing factors of the present. Social dangers, protection from them: dangers in the spiritual sphere, politics, protection from them: dangers in the economic sphere, dangers in everyday life, everyday life. The system of bodies for ensuring life safety, and the legal regulation of their activities

Purpose of studying of the discipline

Training in creative activity and self-management, which can continuously deepen and supplement their knowledge, raise their opinions, theoretical and professional level, openly participate in the improvement of scientific and technical progress

Learning Outcomes

ON 1 Possess intercultural and communicative competence, apply skills of independent continuation of further education and build professional relationships in pedagogical and social activities; purposefully use means and methods that ensure the preservation and strengthening of health in professional activities.

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 6 To cover holistically and objectively the main stages of the history, evolution of the forms of statehood and civilization of the Kazakh people, to know the methods of scientific research and academic writing, to understand the importance of the principles and culture of academic honesty.

Learning outcomes by discipline

Basic laws of living organisms, ecosystems at different levels of organization, the biosphere as a whole and their stability; The interaction of biosphere components and the environmental consequences of human activity, especially in the case of enhanced environmental management; issues of ecology, environmental protection, sustainable development. Life safety, its basic rules. Dangers, Emergencies. Risk analysis, risk management. Human security systems. Social threats, threats in the spiritual sphere, politics, protection against them: threats in the economic sphere, threats in everyday life.
to recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering natural and mathematical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of mathematical education
- to comprehensively and objectively cover the main stages of the history, evolution of the forms of statehood and civilization of the Kazakh people, to know the methods of scientific research and academic writing, to understand the importance of the principles and culture of academic honesty
- possess intercultural and communicative competence, apply skills of independent continuation of further education and build professional relationships in pedagogical and social activities; purposefully use means and methods that ensure the preservation and strengthening of health in professional activities

Prerequisites

Fundamentals of research in ecology and safe life

Postrequisites

Fundamentals of research in ecology and safe life

Methods of mathematical physics

Discipline cycle	Profiling discipline
Course	3
Credits count	3
Knowledge control form	Examination

Short description of discipline

During the course, future teachers study the basics of field theory and the necessary mathematical methods. They master the basic types of partial differential equations used in physical problems, including nonlinear equations, and some types of special functions of mathematical physics and their properties, the basics of the finite difference method. This course develops the skills of future teachers to build mathematical models of physical phenomena and analytical and numerical problem solving.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

Fundamental solutions of unstudied non-classical equations of high-order mathematical physics will be constructed and their features will be investigated;
The unique solvability of a number of boundary value problems for the equations under consideration will be investigated both on infinite and finite domains using the Green`s function method;
During the course, future teachers learn the basics of field theory and the necessary mathematical methods. They master the basic types of semi- differential equations used in physical problems, including nonlinear equations and some types of special functions of mathematical physics and their properties, the basics of the finite difference method.

Prerequisites

Methods of mathematical physics

Postrequisites

Methods of mathematical physics

Special functions and their applications

Discipline cycle	Profiling discipline
Course	3
Credits count	3
Knowledge control form	Examination

Short description of discipline

To provide the necessary theoretical material on the theory of special functions. To give the concept of generalized functions. To introduce applications of special and generalized functions. To introduce the methods of computing special and generalized functions in computer mathematics systems.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

Give the necessary theoretical material on the theory of special functions. Explain common functions. Introduction to applications of special and generalized functions. Introduction to methods for calculating special and generalized functions in computer mathematics systems.

Prerequisites

Special functions and their applications

Postrequisites

Special functions and their applications

Planning of teaching and individualization of teaching physics

Discipline cycle	Basic disciplines
Course	3
Credits count	4
Knowledge control form	Examination

Short description of discipline

Purpose: formation of skills of individualization of teaching, taking into account the diversity of students and the use of teaching technologies, based on pedagogical and independent research. Students can: • understand the requirements of competence, entrepreneurship and sustainable development in their pedagogical and subject area when planning and conducting training; • plan and predict other conditions that affect learning; • apply the principles of individual learning and guidance in practice, take into account the needs of their students, support the development of their personality and self-esteem.

Purpose of studying of the discipline

Training of physics teachers capable of carrying out professional activities in English in the following areas: education and formation of a comprehensively developed student's personality; formation of systematized knowledge in the field of physics; organization of the educational process in physics at a modern scientific and methodological level; carrying out scientific research.

Learning Outcomes

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 11 Work in interdisciplinary teams, have the skills to apply scientific knowledge in solving social problems.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline

During the course, future teachers will learn to integrate knowledge about the content of physics in the secondary school curriculum and knowledge about the forms, methods and technologies of teaching to develop physics lessons, teaching and assessment methods, and conduct scientific and methodological analysis of topics and sections of the school physics course.
ON 5 To form personal qualities that provide in-depth special empirical and theoretical knowledge, skills and abilities of practical and theoretical actions on the theory and technology of teaching physics, on innovative pedagogical technologies.

Prerequisites

Planning of teaching and individualization of teaching physics

Postrequisites

Planning of teaching and individualization of teaching physics

Workshop on solving physical problems 1

Discipline cycle	Basic disciplines
Course	3
Credits count	4
Knowledge control form	Examination

Short description of discipline

During the course, future teachers develop their competencies of forming the skill of solving physical problems, common approaches to solving any physical problem.

Purpose of studying of the discipline

completion of writing a thesis (project).

Learning Outcomes

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL

пайдалану.

Learning outcomes by discipline

ON9 Perform experiments in the field of classical branches of physics, describe research methods in physics.
ON10 To carry out pedagogical, research and educational work.

Prerequisites

Physical practice 1

Postrequisites

Physical practicum 2

Technique of the school experiment

Discipline cycle	Basic disciplines
Course	3
Credits count	3
Knowledge control form	Examination

Short description of discipline

The course introduces students to the methods of planning, conducting and analyzing physical experiments. Covers the selection of equipment, measuring instruments, safety. Students master the skills of setting up experimental installations, data processing. Raises questions of accuracy, errors, interpretation of results. Develops the ability to systematize experimental research.

Purpose of studying of the discipline

Physical workshop to deepen,expand and summarize the acquired knowledge on various topics, depending on the tools used and depending on the didactic purpose.development of experimental skills in students by working with complex installations.

Learning Outcomes

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline

- Perform experiments in the field of classical branches of physics, describe research methods in physics.
-Carry out pedagogical, research and educational work.
The practical course is also a training course. The physics course includes: mechanics, molecular physics and thermodynamics, electricity, optics. The student directs the experimenter, measures and analyzes data, and understands the principles of physics. Develops observation, measurement, logical thinking.

Prerequisites

A school physics experiment.

Postrequisites

Technique of the school experiment

Physical practice 1

Discipline cycle	Basic disciplines
Course	3
Credits count	4
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at the formation and constant control of the knowledge, skills and abilities of future teachers in the school physics course, which provides kinematics, dynamics, statics; mastering various methods of solving problems (analytical, graphical, experimental, etc.).

Purpose of studying of the discipline

Deepening, expanding and generalizing acquired knowledge on various topics depending on the means used physical workshop and depending on the didactic purpose. development of experimental skills in students through working with complex installations.

Learning Outcomes

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline

-Conducting a theoretical analysis of educational achievements in the training of future physics teachers in pedagogical universities according to the national qualification testing of teachers in universities in Kazakhstan.
-Determination of the structure and content features of the course “workshop on solving physical problems” with the definition of the expected result of secondary education.
-To develop a methodology for preparing for training “workshop on solving physical problems” in accordance with the expected result of secondary education for future teachers.
ON9 Perform experiments in the field of classical branches of physics, describe research methods in physics.
ON10 Carry out teaching, research and educational work.

Prerequisites

Workshop on solving physical problems 1

Postrequisites

Physical practice 1

A school physics experiment.

Discipline cycle	Basic disciplines
Course	3
Credits count	3
Knowledge control form	Examination

Short description of discipline

The course covers the basic physical phenomena and laws, through practical experiments. It includes sections of the general physics course: mechanics, molecular physics and thermodynamics, electricity, optics. Students conduct experiments, measure and analyze data, and understand physical principles. Develops the skills of observation, measurement, logical thinking.

Purpose of studying of the discipline

Techniques and methods for conducting laboratory experiments and demonstration practices in a modern school.
- Observation of a physical phenomenon, measurement of physical quantities with measuring instruments; appointment
quantitative relationships between physical quantities; definition of physical constants, explanation on experimental basis of the main objectives of the course, such as familiarization with technical means.

Learning Outcomes

ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline

The course examines basic physical phenomena and laws through hands-on experiments. Includes sections of the general physics course: mechanics, molecular physics and thermodynamics, electricity, optics. Students conduct experiments, measure and analyze data, and understand physical principles. Develops observation, measurement, logical thinking.
Uses theoretical and practical knowledge in the fields of mathematics and computer science to formulate and solve research problems. Applies knowledge of mathematics and computer science to explain current issues and trends in education. Applies complex search, analysis and systematization of information on the studied problems of mathematics and computer science using scientific and textual, scientific and educational literature, information data.

Prerequisites

A school physics experiment.

Postrequisites

Technique of the school experiment

Theoretical mechanics

Discipline cycle	Profiling discipline
Course	3
Credits count	6
Knowledge control form	Examination

Short description of discipline

Consideration of the general laws of the mechanical movement of bodies and their equilibrium, establishes general techniques and methods for solving issues related to this movement and equilibrium. To teach how to apply the methods of theoretical mechanics in solving physical problems related to motion.

Purpose of studying of the discipline

learning the theoretical foundations of classical and modern mechanics;
- formation of students` modern physical and scientific worldview;
- to teach students to formulate and solve problems quantitatively using the basic laws of mechanics;
- to teach certain skills and abilities of experimental research using modern laboratory devices and information technologies.

Learning Outcomes

Learning outcomes by discipline

Consideration of the general laws of mechanical motion of bodies and their equilibrium establishes general methods and techniques for solving problems related to this motion and equilibrium. To teach how to apply the methods of theoretical mechanics in solving physical problems related to motion.
ON3 Use fundamental knowledge of physics in solving basic problems of physics, physical phenomena, in explaining basic physical terms, quantities, their mathematical expression and units of measurement.
ON4 Conducting experiments on classical branches of physics, comprehensively solving typical problems using physical terms. Creation of an algorithm for the structure of physical problems, competent formulation of proofs.

Prerequisites

School course

Postrequisites

Workshop on electricity and magnetism

Theoretical Physics-1

Discipline cycle	Profiling discipline
Course	3

Credits count	6
Knowledge control form	Examination

Short description of discipline
During the course, future teachers learn to create theoretical (primarily mathematical) models of phenomena in classical mechanics and electrodynamics, comparing them with reality as the main way to understand nature. Future teachers also study the historical aspect: the development of fundamental physics as a generalization of experimental laws, their transformation from an integral form into a differential one, the expression of physical content in the language of modern mathematics and the development of physical science as stages in the formation of fundamental theories: classical mechanics, thermodynamics, and Maxwell`s electrodynamics. They will also learn about the role of fundamental interactions (strong, electromagnetic, weak and gravitational) in the physical representation of the world.

Purpose of studying of the discipline
To form skills for the effective use of new modern teaching tools, to show the meaning of the reform of secondary schools and the ways of its implementation in teaching physics; to show its connection with scientific and technological progress.

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
Identify and systematize the main ideas in scientific texts; critically evaluate any incoming information, regardless of the source; avoid the automatic
application of standard formulas and techniques in solving problems.
ON 5 To form personal qualities that provide in-depth special empirical and theoretical knowledge, skills and abilities of practical and theoretical actions on the theory and technology of teaching physics, on innovative pedagogical technologies.
ON 6 Plan the current tasks of the development of the education system, training sessions, taking into account the principles of integration and continuity of education at all levels of secondary education.

Prerequisites
Methods of teaching physics: private issues

Postrequisites
Planning of teaching and individualization of teaching physics

Research, development and innovation of physics.

Discipline cycle	Basic disciplines
Course	4
Credits count	4
Knowledge control form	Examination

Short description of discipline
Objective: formation of research- and development-oriented thinking, the ability to develop, update and apply innovative approaches and learning technologies in the context of ongoing changes in society and the educational environment. Students can: • Develop their own teaching skills through research-based approaches • apply critical thinking when collecting and using data for software development • participate in scientific research and/ or develop cooperation between universities and stakeholders • document your own research activities and present the results using various forms of communication.

Purpose of studying of the discipline
The study of the theoretical foundations of innovative activity of a teacher, general trends in the development of innovative processes, the content and structure of innovative activity of teaching staff, methods for diagnosing a teacher`s readiness for innovation and technology for preparing a teacher to work in the system of innovative education.

Learning Outcomes
ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline
Informatization of Education. Modern digital technologies and their application in education. Multimedia technologies. 3D technologies in education. Classification of digital educational resources. Development of quality digital educational resources. Virtual reality. Digital robotics. Methodology the use of digital educational resources in the educational process. Digitalization of learning outcomes. Problems of digitalization of extracurricular and research work. Digitalization of administrative and managerial activities of Education. Digital educational resources of AEO NIS
ON3 Use fundamental knowledge of physics in solving basic problems of physics, physical phenomena, in explaining basic physical terms, quantities, their mathematical expression and units of measurement.
ON4 Conducting experiments on classical branches of physics, comprehensively solving typical problems using physical terms. Creation of an algorithm for the structure of physical problems, competent formulation of proofs.

Prerequisites
Information and communication technology

Postrequisites
Research, development and innovation of physics.

Workshop on solving physical problems 2

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course contributes to a deeper study of the physics course through problem solving, the formation of methodological knowledge in solving physical problems. In the process of studying the course, they master the methods of studying various natural phenomena, get acquainted with new progressive ideas and views, with the discoveries of domestic scientists, with the achievements of domestic science and technology, with new professions.

Purpose of studying of the discipline
The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline
•mastering the mental operations of problem solving;
•development of independence, skills to use reference literature and others sources of information;
• improving the personal effectiveness of participation in Olympiads and competitions in physics.
This course contributes to a deeper study of the physics course through problem solving, the formation of methodological knowledge in solving physical problems. During the course, they master the methods of studying various natural phenomena, get acquainted with new progressive ideas and views, discoveries of domestic scientists, achievements of domestic science and technology, new professions

Prerequisites
Workshop on solving physical problems 1

Postrequisites
Workshop on solving physical problems 2

Project approach in scientific education

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
During the course, students are grouped together to solve learning tasks together. Working in a team on a project, they gain experience that is as close as possible to their future profession. Future teachers are implementing a project to solve and identify a genuine scientific problem. They will learn how to develop a similar project for secondary school students.

Purpose of studying of the discipline
Creating conditions for students to successfully master the basics of design and research activities.

Learning Outcomes
ON 5 To recognize and understand fundamental scientific concepts that have fundamental methodological and theoretical significance for understanding and mastering the physical sciences, to argue their own position of applying and integrating knowledge from other fields of sciences to solve global and local problems of physics.
ON 11 Work in interdisciplinary teams, have the skills to apply scientific knowledge in solving social problems.
ON 12 Understand the scientific principles and logic of developing a school physics course, apply various learning technologies in their diversity and to the place.

Learning outcomes by discipline
During the course, the skills and abilities of independent research are formed; the ability to formulate a research problem, put forward a hypothesis; the skills of mastering the methodology of collecting and processing the found material; the skills of mastering scientific terms in the field of knowledge in which the research is conducted; the skills of mastering theoretical knowledge on the topic of their work and more broadly; the ability to design a report, an abstract, research work.
During the course, students are united in groups to jointly solve educational tasks. Working in a team on a project, they gain experience as close as possible to their future profession. Future teachers implement the project to solve and identify a truly scientific problem. They are learning to develop a similar project for high school students.

Prerequisites
Project approach in scientific education

Postrequisites
Project approach in scientific education

Theoretical physics-2

Discipline cycle	Basic disciplines
Course	4

Credits count	6
Knowledge control form	Examination

Short description of discipline
Theoretical Physics-2. During the course, future teachers will learn about the mathematical formulation of the laws of quantum and statistical phenomena observed experimentally. They also learn about theoretical physics as a unified science, the internal connections of which are established through analytical calculations or numerical calculations and comparison with experimental data. Future teachers study the description of fundamental physical laws in six areas of research

Purpose of studying of the discipline
The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
During the course, future teachers will learn about the mathematical concept of the laws of experimentally observed quantum and statistical phenomena. They also know about theoretical physics as a holistic science, the internal relationships of which are determined by analytical calculations or numerical calculations and comparison with experimental data. Future teachers study the description of basic physical laws in six areas of research.
ON 5 To form personal qualities that provide in-depth special empirical and theoretical knowledge, skills and abilities of practical and theoretical actions on the theory and technology of teaching physics, on innovative pedagogical technologies.
ON 6 Plan the current tasks of the development of the education system, training sessions, taking into account the principles of integration and continuity of education at all levels of secondary education.

Prerequisites
Methods of teaching physics: private issues

Postrequisites
Research, development and innovation of physics.

Physical practicum 2

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at the formation and constant monitoring of the knowledge, skills and abilities of future teachers in the school physics course, which provides for the basics of MKT, electricity and magnetism, optics; mastering various methods of solving problems (analytical, graphical, experimental, etc.).

Purpose of studying of the discipline
Physical workshop to deepen, expand and summarize the acquired knowledge on various topics, depending on the tools used and depending on the didactic purpose. development of experimental skills in students by working with complex installations.

Learning Outcomes
ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline
Deepening, expanding and generalizing the knowledge gained on various topics, depending on the means of physical practice used and depending on the didactic purpose, the development of students` experimental skills through working with complex installations.
1) be able to correctly apply the laws of physics to analyze and solve specific practical problems;
2) formation of skills to work with scientific, educational, methodological and reference literature
3) Preparation for the application of basic and special knowledge in the field of basic sciences in scientific activity, experiment planning;

Prerequisites
Physical practice 1

Postrequisites
Physical practicum 2

Physics on STEM

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
A complete introduction to Physics for students in the STEM field. It covers major topics including mechanics, thermodynamics, electricity and magnetism, optics and quantum physics.
Purpose of studying of the discipline
To prepare students for the application of STEM learning technology in the educational process, to teach them to use various forms and methods of STEM learning in practice and to integrate STEM activities into the learning process
Learning Outcomes
ON 3 Critically select theoretical knowledge based on advanced concepts of physics with the help of various information and communication technologies and use the knowledge to improve physics education and their own professional growth.
ON 4 Understand the psychological and pedagogical problems of teaching and educating students with disabilities in inclusive education, take into account the diverse abilities of students in the learning process, ethically support their psychological well-being in the life and educational context.
Learning outcomes by discipline
- globalization of the world economy;
-Global ethnic and demographic problems (an aging population in
developed countries, an increasing proportion of young people in developing
countries);
-increasing migration flows and increasing social
stratification;
- the increasing importance of improving the quality of life, ecology,
health and safety, and reducing energy consumption;
-development of information and communication technologies;
ON3 Использовать фундаментальные знания физики при решений основных задач физики, физических явлений, при объяснений основных физических терминов, величин, их математическое выражение и единицы измерения.
ON4 Проведение экспериментов по классическим разделам физики, комплексно решать типовые задачи с использованием физических терминов. Создание алгоритма структуры физических задач, грамотная формулировка доказательств.
Prerequisites
Information and communication technology
Postrequisites
Physics on STEM

Physics of micro-objects

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination

Short description of discipline
Formation of students` ideas about the quantum-mechanical laws underlying modern physics and its fundamental applications in the study of one of the fundamental sections of theoretical physics. The acquisition of theoretical knowledge and practical skills will allow students to independently solve specific physical problems in the physics of micro-objects
Purpose of studying of the discipline
The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.
Learning Outcomes
Learning outcomes by discipline
To study one of the main sections of Theoretical Physics and form students ` understanding of the quantum mechanical laws underlying modern physics and its main applications. The tasks of the discipline-the acquisition of theoretical knowledge and practical skills allows students to independently solve specific physical problems in the physics of microbeads.
HE 7-To demonstrate academic strengths in the field of physics, to operate with forms and methods of scientific knowledge.
HE 8- To conduct scientific research in the chosen field of experimental and theoretical physical research using modern instrumentation.
Prerequisites
Physics of the atom, atomic nucleus and solid body
Postrequisites
Physics of micro-objects

Educational Robotics and Mechatronics

Discipline cycle	Basic disciplines
Course	4
Credits count	4
Knowledge control form	Examination

Short description of discipline
This course is aimed at providing students with some of the basic tools necessary to include science and technology (using robotics) in teaching methods, developing interest in the use of educational robotics in the learning process. Introduce the basics of robot programming, which allows you to continue studying this topic on your own, and introduce them to the world of technology and artificial intelligence. Considerable attention is paid to familiarization with the possibilities and methodological features of the application of educational robotics and mechatronics in the project activities of students.
Purpose of studying of the discipline
The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity,

and ambiguity.

Learning Outcomes

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.

Learning outcomes by discipline

-development and optimization of field experimental studies of robotic and mechatronic systems, taking into account the criteria of their reliability;
- preparation of scientific and technical reports, reviews, and publications based on the results of completed research;
- application of the results of research activities and the use of intellectual property rights;

Prerequisites

Digital technologies in education

Postrequisites

Educational Robotics and Mechatronics

Digital technologies in education

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

Informatization of education. Modern digital technologies and their use in education. Multimedia technologies. 3D-technologies in education. Classification of digital educational resources. Development of high-quality digital educational resources. Virtual reality. Digital robotics. Methods the use of digital educational resources in the learning process. Problems of digitalization of extracurricular and research activities.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 3 Critically select theoretical knowledge based on advanced concepts of physics with the help of various information and communication technologies and use the knowledge to improve physics education and their own professional growth.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

implementation of teaching and learning processes on a digital (non-industrial) platform, including online and mixed teaching and learning models;

• inclusion in the educational process of orientation skills simulators (indicative basis of action, basic skills) and individual decision-making skills for dangerous professions and training programs with a high cost of "analog"
IT is 3-Critical to select theoretical knowledge based on advanced physics concepts through various ICTs.
HE 9- Apply modern methods of processing, analysis and physical information in their chosen field of physical research,

Prerequisites

Information and communication technology

Postrequisites

Digital technologies in education

Astronomy

Discipline cycle	Profiling discipline
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

During the course, future teachers study basic information about the celestial sphere and coordinate systems, the structure of the Solar System and the phenomena occurring in it, the structure of our Galaxy, the structure of the Universe - initial information about astrophysics and methods of astronomical research. Future teachers also get acquainted with the history of the development of ideas about the Universe. They build their modern scientific understanding of the structure of the universe and the history of the development of astronomy.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

During the course, future teachers study basic information about the celestial sphere and coordinate systems, the structure of the Solar System and the phenomena occurring in it, the structure of our Galaxy, the structure of the Universe, primary information about astrophysics and methods of astronomical research. Future teachers will also get acquainted with the history of the development of ideas about the Universe. They form modern scientific ideas about the structure of the universe and the history of the development of astronomy.
ON 5 To form personal qualities that provide in-depth special empirical and theoretical knowledge, skills and abilities of practical and theoretical actions on the theory and technology of teaching physics, on innovative pedagogical technologies.
ON 6 Plan the current tasks of the development of the education system, training sessions, taking into account the principles of integration and continuity of education at all levels of secondary education.

Prerequisites

Optics

Postrequisites

Astronomy

Basics of Radio Electronics

Discipline cycle	Profiling discipline
Course	4
Credits count	4
Knowledge control form	Examination

Short description of discipline

The course is designed to study the processes and laws of signal conversion in circuits and systems, the formation of skills for calculating, developing and measuring parameters and characteristics of analog and digital electronic devices. It is assumed that students will consolidate their knowledge in the disciplines of discrete mathematics, methods of mathematical physics, electricity and magnetism.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

The course is designed to study the processes and laws of signal transformation in circuits and systems, to form the skills of calculating, developing and measuring the parameters and characteristics of analog and digital radio-electronic devices. Students are expected to refine their knowledge of discrete mathematics, methods of mathematical physics, electricity and magnetism.
ON9 Perform experiments in the field of classical branches of physics, describe research methods in physics.
ON10 Carry out teaching, research and educational work.

Prerequisites

Electricity and magnetism

Postrequisites

Basics of Radio Electronics

Problems of cosmology

Discipline cycle	Profiling discipline
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The course includes basic questions about the structure, origin and evolution of the universe. The theories of the big bang, dark matter and energy, the formation of aggregates and cosmic structures are considered. Students study current research and philosophical aspects of cosmology, expanding their understanding of our place in the universe.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.
ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.

ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

The course covers fundamental questions about the structure, origin and evolution of the Universe. Theories about the Big Bang, dark matter and energy, the formation of populations and cosmic structures are considered. Students explore current research and philosophical aspects of cosmology, expanding our understanding of our place in the Universe.
PO 7 - demonstrate strong academic and practical knowledge in the field of physics, work with the forms and methods of scientific knowledge, various ways of mastering the world around us, understand the role of science in the development of society;
PO 8 - taking into account domestic and foreign experience, conducting scientific research in the chosen field of experimental and (or) theoretical physical research using modern instruments and information technologies;
PO 9 - is able to apply modern methods of processing, analysis and synthesis of physical information in the chosen area of physical research, work with basic mathematical concepts and operations and use them in solving physical problems, implement analytical and technological solutions in the field of experimental research. research. and theoretical physics;

Prerequisites

Astronomy

Postrequisites

Problems of cosmology

Physics and Sustainable Development Education

Discipline cycle	Profiling discipline
Course	4
Credits count	4
Knowledge control form	Examination

Short description of discipline

This course is an interdisciplinary study of physics in conditions of unstable development. Natural resources and technologies in the field of ecology, the interaction between social laws and environmental problems, as well as the application of physical laws for sustainable development are considered. The focus is on the analysis of modern energy and environmental problems, the study of energy sources, the efficient use of resources and the development of technologies to reduce the negative impact on the environment.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.
ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.
ON 10 STEM оқыту элементтерімен біріктірілген сабақтар өткізу, табиғи пәндерді пәндік-тілдік оқыту технологиясын CLIL пайдалану.

Learning outcomes by discipline

This course is an interdisciplinary study of physics in the context of developmental instability. The interaction of natural resources and technologies in the field of ecology, social laws and environmental problems, as well as the application of physical laws for sustainable development, is considered. The main focus is on the analysis of modern energy and environmental problems, the study of energy sources, the efficient use of resources and the development of technologies to reduce the negative impact on the environment.
PO 8 - taking into account domestic and foreign experience, conducting scientific research in the chosen field of experimental and (or) theoretical physical research using modern instruments and information technologies;
PO 9 – can use modern methods of processing, analysis and synthesis of physical information in the chosen area of physical research, work with basic mathematical concepts and operations and use them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics;
OH 10- Conducting classes in combination with elements of STEM education, using the technology of subject-language teaching of natural subjects CLIL;

Prerequisites

School course

Postrequisites

Physics and Sustainable Development Education

Electronics

Discipline cycle	Profiling discipline
Course	4
Credits count	4
Knowledge control form	Examination

Short description of discipline

During the course, future teachers develop their theoretical knowledge about the physical foundations of the functioning of electronic elements, the principles of electronic devices, circuits and functional blocks of analog and digital electronics and microelectronics. They acquire practical skills in the field of physical experiment to calculate and study the characteristics of electronic devices.

Purpose of studying of the discipline

The goal of the educational program is to prepare physics teachers with competencies in new areas that meet modern challenges in the field of education and are necessary for teachers of the 21st century who live and work in a world of variability, uncertainty, complexity, and ambiguity.

Learning Outcomes

ON 7 Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, various ways of mastering the surrounding world, understand the role of science in the development of society.

ON 8 To conduct scientific research in the chosen field of experimental and (or) theoretical physical research with the help of modern instrumentation and information technology, taking into account domestic and foreign experience.

ON 9 Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research, operate with basic mathematical concepts and operations and are able to apply them in solving physical problems, implement analytical and technological solutions in the field of experimental and theoretical physics.

Learning outcomes by discipline

Have communicative competence in communication and cooperation with peers, older and younger children, adults in the process of educational, socially useful, educational, research, creative and other activities;

OH 7- Demonstrate strong academic and practical knowledge in the field of physics, operate with forms and methods of scientific knowledge, in a variety of ways.

OH 8- Conduct scientific research in a chosen field of experimental or theoretical research using modern instrumentation.

OH 9- Apply modern methods of processing, analysis and synthesis of physical information in their chosen field of physical research.

Prerequisites

Electronics

Postrequisites

Electronics