CATALOG OF ELECTIVE DISCIPLINES

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

6B015 - Teacher training in natural science subjects
(Code and classification of the direction of training)

0114
(Code in the International Standard Classification of Education)

B009 - Math teacher training
(Code and classification of the educational program group)

6B01502 - Mathematics-Informatics
(Code and name of the educational program)

bachelor
(Level of preparation)

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Chairman of the Commission Zheldybaeva B.S.

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Chairman of the Academic Council Oralkanova I.A.

Management in education

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

Short description of discipline
To study the general concepts of management, its functions and historical aspects of the development of the theory and practice of management, the place and role of the leader`s personality in organizational structures. Consider the general characteristics of pedagogical management; basic concepts, goals, objectives, functions and principles of pedagogical management. Methods of pedagogical management: economic, organizational and managerial, psychological and pedagogical influence. Factors that determine the effectiveness of pedagogical management; the results of the activities of the subjects of pedagogical management and their evaluation.

Purpose of studying of the discipline
The purpose of mastering the discipline is to study by students the theoretical foundations of management in the structure of the educational system. The study of the discipline contributes to the formation of the student`s skills in using the basic principles, methods and mechanisms of management in the field of education, which, in turn, will improve the professional qualities of future teachers and help them in their professional growth.

Learning Outcomes
ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline
able to organize professional and pedagogical activities on a legal basis;
able to identify the essence of the problems that arise in the course of professional and pedagogical activities

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Pregraduation practice

Pregraduation practice

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline
During this type of practice, the student will systematize the material on the research topic. He will learn how to analyze the results of his research activities and introduce them into the production process, formulate the results in the form of research articles and reports on the topic. He will also receive qualified assistance in the registration of work in accordance with the established norms and rules for the preparation of work for the passage of norm control, pre-protection and anti-plagiarism..

Purpose of studying of the discipline
Formation and consolidation of students` skills in performing scientific and methodological research work, completion of writing a thesis (project).

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.
ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.
ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline
- to process and summarize practical materials on the topic of the thesis (project);
- analyze statistical data and practical materials on the topics of the thesis research;
- formulate conclusions, patterns, recommendations and suggestions on the topic of the thesis (project);
- to draw up a thesis (project) in accordance with the established requirements.

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Final examination

Professional (pedagogical)

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline
During this type of practice, students will learn how to apply their knowledge in the disciplines of the profile cycle. During the practice, there is a close acquaintance with the features of the school curriculum, with all the necessary documentation accompanying the educational process. In addition to the educational process, practice also implies the implementation of educational work, teaches qualified use of modern teaching technologies, based on the age characteristics of secondary school students.

Purpose of studying of the discipline
Consolidation of professional competencies, acquisition of practical skills and professional experience.

Learning Outcomes

ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline

- possess the skills of using theoretical knowledge in practical activities;

- master innovative technologies, advanced methods of labor and production;

- to master the skills to independently plan their activities, establish useful contacts with colleagues, determine a professional role position, form a sense of responsibility;

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Final examination

Algebra and number theory

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

Short description of discipline

When studying this discipline, students master such topics as second- and higher-order determinants, elements of matrix theory that are widely used in practical problems using Kramer, Gauss, Jordano-Gauss methods in solving. Also during the course the basic algebraic structures are considered: groups, rings, fields, algebras. In the course of mastering these sections, applied mathematical programs are actively used.

Purpose of studying of the discipline

To develop logical thinking, to teach how to build logical chains of reasoning, at the beginning of which there are no doubtful facts and positions, and at the end – the right conclusions;

Learning Outcomes

ON3 Apply fundamental knowledge of modern mathematics in solving practical problems in various fields of human activity. Interpret the results obtained, build hypotheses about the further course of solving the problem.

Learning outcomes by discipline

- know the basic concepts and theorems of the theory of matrices and determinants, apply methods for solving systems of linear equations;

- know and apply the basic principles of vector analysis and the coordinate method, apply elements of the theory of linear spaces and linear operators;

- be able to apply techniques to a set of complex numbers;

- use the apparatus of the theory of linear spaces and linear operators to solve applied problems;

- application of modern mathematical tools

Prerequisites

Elementary mathematic

Postrequisites

Basic and profile disciplines of the EP

Vector and Euclidean space

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

Short description of discipline

The concept of vector space. Completeness and independence of the vector system. The basis of vectors in space, isomorphism of vector space, vector subspace are considered. A scalar product in Euclidean space, an orthogonal basis, and an orthogonal projection are considered. Linear mappings. Linear mapping matrices. Classification of second-order lines. Transition from one basis to another. Orthogonal transformations. Affine classification of second-order hypersurfaces

Purpose of studying of the discipline

selected chapters of algebra and number theory, mathematical logic and discrete mathematics.

Learning Outcomes

ON3 Apply fundamental knowledge of modern mathematics in solving practical problems in various fields of human activity. Interpret the results obtained, build hypotheses about the further course of solving the problem.

Learning outcomes by discipline

- he has a culture of thinking, is able to generalize, analyze, perceive information, set goals and choose ways to achieve it;

- can logically correctly, argumentatively and clearly build oral and written speech;

- is able to implement training programs of basic and elective courses in various educational institutions

Prerequisites

Elementary mathematic

Postrequisites

Basic and profile disciplines of the EP

Linear algebra

Discipline cycle	Basic disciplines

Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The program is designed for students who have mastered a full course of mathematics at school. The results of studying the discipline can serve as a basis for such disciplines as mathematical logic and discrete mathematics, programming languages. It is planned to get acquainted with the concept of linear algebra and methods of solving problems.Familiarity with the basic concepts of algebra, teach how to solve linear algebra problems encountered in the polynomial ring. Concepts of linear space, linear independence and linear dependence, concepts of dimension, basis, rank.

Purpose of studying of the discipline

The purpose of this course is to inform the student of a known stock of information (definitions, formulas, theorems, connections between them and methods of solving problems) for the development of logical thinking and the achievement of the mathematical culture that is necessary for the study of other disciplines and subsequent work in the specialty.

Learning Outcomes

ON3 Apply fundamental knowledge of modern mathematics in solving practical problems in various fields of human activity. Interpret the results obtained, build hypotheses about the further course of solving the problem.

Learning outcomes by discipline

- to know theorems, proofs, generalization of formulas considered in the course, use of the proposed literature, description of mathematical concepts through formal language, application of the acquired knowledge in other areas of mathematics: 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;
- apply the Kramer method, the inverse matrix method, the Gauss method to solve a system of linear equations;
- perform linear actions with vectors, find the decomposition of the vector by the basis;
- to apply vector calculus in solving geometric problems, to study curves of the 2nd order according to their canonical equations;

Prerequisites
Elementary mathematic

Postrequisites
Basic and profile disciplines of the EP

Multiple integrals

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

Short description of discipline

The student expands his knowledge of integral calculus, namely integral calculus of a function of several variables. He gets the skills of finding the volume of a body in space through a double integral, the mass of a body through a triple integral, the surface area in space through surface integrals, the mass of an arc through a curved integral. In the future, the student uses the knowledge gained on multiple integrals in the theory of vector analysis.

Purpose of studying of the discipline

To provide students with information about multiple integrals, methods of their calculation and application of multiple integrals;
Education of a sufficiently high mathematical culture that allows you to independently expand mathematical knowledge and conduct mathematical analysis of applied problems.

Learning Outcomes

ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- know the definitions of multiple (double and triple) integrals, basic properties, calculation rules, formula for replacing variables in multiple integrals, basic physical and geometric applications of multiple integrals;
- be able to calculate multiple integrals by reducing them to the corresponding repeated integrals, calculate double integrals by moving to polar coordinates, calculate triple integrals by moving to cylindrical and spherical coordinates;
- apply multiple integrals to the calculation of area, volume, mass, moments of inertia, static moments and coordinates of the center of mass of material bodies and flat figures.

Prerequisites
Mathematical analysis 2

Postrequisites
Differential eguation

Mathematical analysis 3

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

Short description of discipline

The discipline is designed to study the theory of series, multiple integrals and their application. In the educational process, students study numerical series, signs of their research on convergence, determination of the area of convergence of functional series, the use of series in the calculation of limits, the values of some integrals, approximate calculations. Having studied the methods of calculating two and three-fold integrals, graphic skills are formed by constructing schemes for a given area of integration on the plane and in space.

Purpose of studying of the discipline
To give students theoretical knowledge about numerical series, functional series, multiple integrals, to study series for convergence, to teach methods of calculation and application of multiple integrals; to form students` mathematical culture, fundamental training in the field of mathematical analysis.

Learning Outcomes
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- possess methods of numerical and functional series research on convergence;
- be able to apply the theory of series in the calculation of limits, approximate calculations, calculation of integrals;
- be able to calculate multiple integrals in polar, cylindrical, spherical coordinate systems.

Prerequisites
Mathematical analysis 2

Postrequisites
Differential eguation

Theory of functions of several variables

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

Short description of discipline
This course is dedicated to the study of the functions of several variables. In the course of studying this course, students, in addition to basic concepts such as the domain of definition and the set of values, get acquainted with the features of the theory of limits, as well as with the differential calculus of such functions. Considers the extremes of a function of several variables. Particular attention in this course is paid to the applications of functions of many variables to problems of an applied nature.

Purpose of studying of the discipline
Formation of systematic knowledge about modern methods of the theory of functions,

Learning Outcomes
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- builds functions of several variables and conducts their research
- applies the apparatus of mathematical analysis in applied problems
- interprets the results of a mathematical study.

Prerequisites
Mathematical analysis 2

Postrequisites
Differential eguation

Differential and integral calculations in tasks of the physics and mathematics equations

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

Short description of discipline
Differential and integral calculus reflects a rich mathematical apparatus in modeling and research of processes occurring in economics and natural sciences. The study of this discipline contributes to the formation of students` systematic knowledge both in the field of differential and integral calculus, and about its place and role in the system of mathematical sciences, applications in economics and physics.

Purpose of studying of the discipline
The purpose of the discipline is to study the basic concepts and methods of solving differential equations; to develop practical skills in solving and composing differential equations; to study the application of equations to various fields of economics and physics

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

Learning outcomes by discipline
- general methods for solving differential equations, have a concept of the Cauchy problem and the theorem of the existence and uniqueness of the solution of the Cauchy problem for differential equations and systems; basic methods for integrating ordinary differential equations;
- solve problems in sections of the course, apply theoretical material, creatively approach the solution of professional problems, analyze emerging problems; find a partial solution of an inhomogeneous linear differential equation with constant coefficients.
- methods and techniques for solving practical problems and proving statements; work skills and be ready to understand sections of educational and scientific literature related to the use of ordinary differential equations and systems

Prerequisites
Mathematical analysis 3 Mathematical analysis 1 Mathematical analysis 2

Postrequisites
Basic and profile disciplines of the EP

Differential eguation

Discipline cycle	Basic disciplines

Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course studies methods for solving ordinary differential equations. In the course of studying the discipline, students master the mathematical apparatus of the theory of ordinary differential equations, which is necessary for solving theoretical and practical problems, as well as the development of logical thinking, which will allow mathematically correctly formulate the problems to be solved and find their solutions.

Purpose of studying of the discipline
The purpose of the discipline is to study the basic concepts of the theory of differential equations and master the basic techniques for solving practical problems on the topics of the discipline

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

Learning outcomes by discipline
- the basic concepts of the theory of differential equations; the scope of differential equations as a tool for mathematical description of the natural-scientific picture of the world; the main classes of ordinary differential equations and methods of their solution.
- classify differential equations and apply the necessary methods to solve these equations.
- the professional language of the subject area of knowledge; the main methods of solving differential equations; methods of constructing and solving mathematical models of phenomena of various nature using differential equations; to apply the knowledge gained in practice.

Prerequisites
Mathematical analysis 3 Mathematical analysis 1 Mathematical analysis 2

Postrequisites
Basic and profile disciplines of the EP

Non-standardt asks of school geometry

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

Short description of discipline
This discipline provides familiarity with the questions of the extracurricular geometry program. In the process of studying the discipline, geometric problems related to logical thinking are considered. The content of the subject of the discipline is aimed at mastering mathematical terms suitable for further use and at solving such problems that will help students participate in various competitions and Olympiads.

Purpose of studying of the discipline
The purpose of the discipline is to organize intellectual, practical and research activities of students aimed at the development of spatial representations, imaginative thinking, pictorial and graphic skills, techniques of constructive activity, the ability to overcome difficulties in solving mathematical problems; to form logical and abstract thinking

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

Learning outcomes by discipline
- different methods of actions for solving non-standard geometry problems
- choose convenient ways to perform a specific task; discuss problematic issues; express your own opinion and argue it
- methods and techniques for solving non-standard problems and proving statements

Prerequisites
Elementary mathematic

Postrequisites
Basic and profile disciplines of the EP

Mathematical logic

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
In the course of studying this course, students will learn how to formulate hypotheses, not only make logical conclusions, but also check and evaluate the correctness of logical reasoning based on the laws and formulas of the logic of statements. The course provides skills in working with Boolean functions, introduces students to the elements of coding theory

Purpose of studying of the discipline
To form students` clear understanding of the role and place of mathematical logic in the system of sciences; understanding of the universality of the laws of logic of mathematical reasoning; development of abstract thinking, general mathematical and information culture.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- formulates logical problems and applies mathematical logic tools to solve them
- identifies and distinguishes the necessary and sufficient conditions of the task;
- translates information from natural language to logical and mathematical language and vice versa;
- checks the reasoning for correctness from the point of view of logic

Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Mathematical logic and discrete mathematics

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course is aimed at studying set theory, logical functions, coding and algorithms, formulas and tautologies of the algebra of statements and predicates, mastering the basics of modern mathematics, mastering formal axiomatic theory, forming students` logical thinking skills. It contains the use of logical operations, formulas and laws of the algebra of logic in the study of other mathematical disciplines, the formulation of various tasks in the language of mathematical logic.

Purpose of studying of the discipline
The study of the basic methods of solving combinatorial and logical problems, as well as the basics of the theory of algorithms.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- determine graph types and gives their characteristics;
- build the simplest automata
- develop models of objects and concepts, which are processed using standard algorithms used in graph theory using modern programming languages

Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Applied graph theory

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course provides familiarity with the basic concepts of graph theory, the study of the main tasks of graph theory, algorithms for finding the main characteristics of graph structures, teaches the basic methods of graph theory, forms the skills of using algorithms to solve applied problems, the use of modern tools for the implementation of graph algorithms.

Purpose of studying of the discipline
The purpose of the discipline is to teach students methods of graph theory, to study algorithms for finding structural and numerical characteristics of graph structures; to get acquainted with the fundamental concepts and mathematical apparatus of graph theory for their subsequent use; to study the main problems of graph theory and methods of their solution

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- the main types of graphs, their characteristic features, the main provisions of graph theory and its basic algorithms;
- applied graph models in the information sphere;
- analyze the description of the applied problem and determine the feasibility of developing a graph model, use graph models to describe applied tasks; basic algorithms of graph theory to solve applied problems
- skills in developing graph models for solving applied problems, skills in programming algorithms of graph theory.

Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Multimedia Processing Technology

Discipline cycle	Basic disciplines
Course	3
Credits count	5

Knowledge control form   Examination

Short description of discipline
As part of the study of the discipline, students get acquainted with the general concepts and definitions in the field of multimedia technologies, the scope, history of development, directions and application of multimedia technologies. The laws and principles of constructing animation, timing rules, calculating the playback time of an animation fragment, the rules for overlaying sound and building multimedia clips, including video, animation and sound, are studied. The means of stylistic integrity of multimedia design are considered.

Purpose of studying of the discipline
Formation of theoretical ideas about the history of multimedia development, scope, obtaining practical skills in creating and processing multimedia information

Learning Outcomes
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
1. Operate with basic concepts and definitions in the field of multimedia technologies;
2. Create high-quality multimedia content;
3. Work with modern tools focused on the creation and processing of multimedia content.

Prerequisites
Theory and methodology of teaching mathematics

Postrequisites
Pedagogical practice

Forms and methods of STEM learning

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

Short description of discipline
The discipline is aimed at the formation of knowledge and skills in the use of various forms and methods of STEM education, as well as the ability to evaluate the effectiveness of their application. Students learn the basic concepts, learning objectives within STEM. In the course of studying the discipline, students learn to apply modern educational technologies as part of the implementation of STEM education, learn the methods of organizing and conducting project work.

Purpose of studying of the discipline
Prepare students for the use of STEM learning technology in the educational process, teach them how to use various forms and methods of STEM learning in practice, and integrate STEM activities into the learning process.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
1. Compare and describe the forms and methods of STEM education;
2. Apply various learning technologies in STEM education;
3. Organize and conduct the integration of STEM events into the learning process.

Prerequisites
Theory and methodology of teaching mathematics

Postrequisites
Pedagogical practice

Electronic educational resources

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

Short description of discipline
This discipline is focused on familiarizing students with the possibilities of electronic educational resources, their types and features of use in future professional activities, both as a teaching tool and as a management of the educational process. Also, in the course of studying the discipline, students will master the practical skills of developing educational resources in their specialization using modern tools and study the methodology for organizing educational activities based on them.

Purpose of studying of the discipline
Formation of systematized knowledge in the field of development and use of various kinds of electronic educational resources in the future professional activity of a teacher

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- owns the technology of designing the structure of web pages

- owns the technology of creating a website by means of programming
- uses modern development tools and software solutions, techniques and models used in web development

Prerequisites
Theory and methodology of teaching mathematics
Postrequisites
Pedagogical practice

Information and communication technologies in the specialized school

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

Short description of discipline
The discipline is designed to study the features of the use of modern information, communication and educational technologies in the process of teaching in specialized schools. The content of the discipline considers the methodology of application of modern information and communication technologies in the system of general education. It is focused on teaching practical use of theoretical knowledge in the field of ICT in accordance with the program of the profile school. Has the ability to effectively choose various pedagogical approaches to improve the effectiveness of teaching in the discipline.

Purpose of studying of the discipline
Formation of students` skills and abilities in the field of modern information, communication and educational technologies during classes at a specialized school.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- to know the basic concepts and definitions of ICT, the main didactic tasks in teaching various disciplines solved with the help of ICT, methodological and didactic possibilities of using a computer in the educational process in a specialized school;
- be able to use ICT at different stages of the educational process in combination with traditional forms of education;
-to apply the COR to implement the principle of visibility when teaching disciplines in a specialized school.

Prerequisites
Introduction to the profession of a teacher of mathematics and computer science
Postrequisites
Pedagogical practice

Methods of using ICT in the educational process

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

Short description of discipline
The discipline is aimed at training students to develop skills and abilities in the field of modern information, communication and educational technologies. In the course of studying the discipline, the ways and features of the use of ICT in pedagogical activity are outlined, methods of solving pedagogical problems by modern means of ICT are proposed. Students master the use of ICT tools and methods in order to improve the effectiveness of teaching the subject they conduct in their future activities.

Purpose of studying of the discipline
Formation of students` skills and abilities in the field of modern information, communication and educational technologies.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- to know the methodological and didactic possibilities of using a computer in the educational process, pedagogical technologies involving the inclusion of digital educational resources in the learning process, techniques for using electronic learning resources at different stages of the lesson;
- be able to model training sessions of various types using the COR and methods of pedagogical design, to give a methodological description of the training session using the COR;
- to master the methodology of using ICT in future professional activities when teaching students a discipline corresponding to the acquired qualifications.

Prerequisites
Introduction to the profession of a teacher of mathematics and computer science
Postrequisites
Pedagogical practice

Teaching Techniques of Informatics

Discipline cycle	Basic disciplines
Course	3
Credits count	5

Knowledge control form   Examination

Short description of discipline
When studying the discipline, general issues of the methodology of teaching computer science at school are considered. Students master computer knowledge, the basics of programming and methods of teaching algorithmic languages, general methods of solving problems on a computer, learn how to work with computer technology, means of communication with a personal computer. The study of the discipline is aimed at the formation of students` information and methodological skills and the development of computer literacy..

Purpose of studying of the discipline
Preparation of a future computer science teacher of secondary educational institutions, who should be ready to carry out training and education of students taking into account the specifics of the taught subject; promote socialization, formation of a general culture of personality, conscious choice and subsequent development of professional educational programs; use a variety of techniques, methods and means of teaching; ensure the level of training of students.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria-based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- be able to conduct a logical and didactic analysis of topics and concepts of the school computer science course; set goals for studying the main topics and concepts of the school computer science course;
- have the skills to select techniques, organizational forms and means of studying topics and concepts of a school computer science course;
- demonstrate the ability to make a computer science lesson summary and analyze the lesson.

Prerequisites
Introduction to the profession of a teacher of mathematics and computer science
Postrequisites
Pedagogical practice

Java Programming

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

Short description of discipline
In the course of studying the discipline, students will master the basics of programming in the Java language, get acquainted with the structure of the program, the alphabet of the language and data types, and learn the basics of working with arithmetic and bitwise operators. Students will learn how to write algorithms of varying complexity, work with arrays, use methods and objects in programming, create subroutines, and also master operator overloading and recursive functions.

Purpose of studying of the discipline
The goals of mastering the discipline are to gain knowledge about the modern object-oriented programming language Java and mastering the basic programming techniques, obtaining practical skills in developing programs in Java.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Use terms and concepts related to Java technology;
2. Apply basic methods and programming tools in the Java language;
3. Solve practical problems using Java programming technology.
Prerequisites
Python Programming
Postrequisites
Object Oriented Programming in Python Object-oriented programming in Java

C# Programming

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

Short description of discipline
This discipline provides an opportunity to study the basic principles, technologies, structures and models of programming in the C # language. Students will learn the basic concept of object-oriented programming languages, properties, methods and variables of objects, consider the construction of reusable program modules, including related data and procedures. The practical part of the discipline is aimed at developing the skills of developing programs using the capabilities of the high-level object-oriented programming language C#.

Purpose of studying of the discipline
Learning the basics of system programming using the console application of the Visual programming environment.Studio.NET. The technology of system programming of the Windows` operating system, since its very first version, is based on the use of dynamically connected libraries that define all the functions of the Win32 API.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

1. Develop programs in C#;
2. Conduct program reviews and evaluate program models;
3. Own the techniques of object-oriented programming and develop programs using object-oriented programming.

Prerequisites

Python Programming

Postrequisites

Object Oriented Programming in Python Object-oriented programming in C++/C#

C++ Programming

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

Short description of discipline

The discipline forms the basic principles of programming in the high-level language C ++, gives knowledge of the methodology of the programming language. During the training, practical skills of writing, coding and optimizing the code of console programs are formed. The study of the discipline allows you to form theoretical knowledge and practical skills that allow you to develop algorithms for solving problems in the C ++ programming language and navigate in the field of writing program code.

Purpose of studying of the discipline

Formation of systematized knowledge about programming methods and features of the C++ programming language as a basis for the development of universal competencies and the basis for the development of professional competencies.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

1. Use basic concepts and information about the C ++ language, programming methods in the C ++ language;
2. Develop programs in C++ for processing numerical and textual information;
3. Apply the basic features and methodologies of programming in the C ++ language, including when solving problems related to professional activities.

Prerequisites

Python Programming

Postrequisites

Object Oriented Programming in Python

Practician of mathematical problems solution

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The study of this discipline is a continuous test of real knowledge, practical skills of future teachers-students teaching mathematics, and assistance to their pedagogical and professional development. Formation of students` problem solving skills on the topic: transformation of rational and irrational expressions; construction of exponential- logarithmic expressions; proof and solution of inequalities; solution of equations and systems of equations, transformation of trigonometric expressions

Purpose of studying of the discipline

To equip the future teacher with specific knowledge in teaching school mathematics, to expand the pedagogical horizons of the student, to help him correctly assimilate the general provisions on the forms and methods of organizing the educational mathematical activities of schoolchildren, on the development of their mathematical thinking.

Learning Outcomes

ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.

ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- acquire practical skills in solving mathematical problems of the school course;
- be able to solve standard and non-standard tasks;
- apply methods and techniques for solving school math problems.

Prerequisites

Elementary mathematic

Postrequisites

Professional (pedagogical)

And practical for solving trigonomeyric problems

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

To teach students to systematize methods for solving trigonometric problems in the course of mathematics and algebra. Independently study methods for solving trigonometric problems. Develop the skill of solving problems on trigonometric transformations. Formation of students` skills in finding ways to solve various problems in trigonometry. Ability to perform complex trigonometric calculations. Understand the essence of solving geometric problems produced by trigonometric expressions, as well as problems used in natural science disciplines.

Purpose of studying of the discipline

To study the existing theories related to the genesis of trigonometric problems.

Learning Outcomes

ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.

ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- forms the structure of solving trigonometric problems
- to make an algorithm for teaching a course of trigonometry
- competently formulates evidence

Prerequisites

Elementary mathematic

Postrequisites

Professional (pedagogical)

Solving parametric equations and inequalities

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The program is designed to strengthen students` theoretical knowledge, deepen their knowledge of mathematical laws, and enhance their creative development. The ability to gain mathematical knowledge by solving linear equations and inequalities with parameters, fractional- rational equations and inequalities, rational equations and inequalities, irrational equations and inequalities, trigonometric equations and inequalities with parameters. Consider different cases, in each of which the solution methods differ significantly from each other.

Purpose of studying of the discipline

The purpose of the course is to develop students` practical skills and abilities to solve parametric equations and inequalities of mathematical problems;

Learning Outcomes

ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.

ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- to recognize, solve and choose the correct method for solving parametric equations, inequalities and systems of equations and inequalities.
- determine at what parameter values solutions exist;
- to find the appropriate set of solutions for each acceptable system of parameter values
- to deepen knowledge of mathematics, providing for the formation of a stable interest in the subject

Prerequisites

Elementary mathematic

Postrequisites

Professional (pedagogical)

Databases and Information Systems

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This discipline allows you to form students` knowledge in the field of databases and information systems, introduces students to the basic concepts and principles of working in a DBMS. Students learn the main components of databases, learn to define the life cycle of database applications, gain practical skills in building and customizing a user interface to work with large amounts of information.

Purpose of studying of the discipline

To study the basic concepts of algorithms in a database, types of data models, ways to sort data, teach how to create a database and control its execution, as well as algorithms for processing, protecting and analyzing data based on a database management system.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

- Operate with the basic concepts of the database;
- Manage databases and information systems;
-Solve database problems of varying complexity.

Prerequisites

Theoretical basics of informatics

Postrequisites

Pedagogical practice

Corporate information systems

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at the formation of practical competencies of students in the field of using various methods of designing corporate information systems. As part of the discipline, students will master the skills of working with various software tools for the design and implementation of information systems, get acquainted with the structural components of corporate governance and their characteristics. The discipline also covers the issues of corporate management based on the development of appropriate software (reference books, standards, information networks, etc.)

Purpose of studying of the discipline

Familiarization with the models and methods of information security management of corporate information systems, the conceptual apparatus in the field of information security, the methodological foundations of integrated support, the analysis and management of information systems security, as well as the assessment of the effectiveness of measures to ensure information protection.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

- List the methods of information security management of corporate information systems
- Describe the stages of designing corporate information systems
- Choose methods for evaluating the effectiveness of information systems security management

Prerequisites

Theoretical basics of informatics

Postrequisites

Pedagogical practice

Modern database management system

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

In the course of studying the discipline, students acquire theoretical knowledge and practical skills in working with the components of database management systems (tables, queries, reports, forms) and get acquainted with their functional features. During the discipline, students also get acquainted with various types of databases, implement relational databases using modern tools, and learn to create links between records.

Purpose of studying of the discipline

The purpose of teaching disciplines is the formation of students` necessary competencies for theoretical and practical training in the creation and use of data bases in management systems, design of logical structures of data bases, interfaces of data bases, interfaces, data, data.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

- Comparison and description of forms and methods of using the database;
- Use of various learning technologies in DBMS;
- Organization and implementation of the creation and use of the database.

Prerequisites

Theoretical basics of informatics

Postrequisites

Pedagogical practice

Fundamentals of frontend development

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

Short description of discipline
When studying this discipline, students will master the basics of frontend development, get acquainted with the possibilities of HTML and CSS for layout of web page layouts, learn how websites work, learn how to create designs for web pages, compose their own web pages and place them on the web. the Internet. Also, as part of the course, students will get acquainted with the basics of the JavaScript language, consider working with Canvas and learn how to manage web page elements.

Purpose of studying of the discipline
Teaching web page layout, building skills in creating high-quality and functional web page design based on HTML and CSS, dynamic web pages and controls using JavaScript and Canvas capabilities.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. create frontend part of web pages, sites;
2. manage elements of web pages;
3. create interactive layout.

Prerequisites
Python Programming

Postrequisites
Mobile app development

Fundamentals of Web Development

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

Short description of discipline
When studying this discipline, students learn the basics of web development. Get acquainted with the principles of building web pages using HTML, study numerous tags, attributes, features of HTML interpretation, get acquainted with the structure of an HTML document, code editor, work with lists, images, addresses, links, anchors and composite elements. They will also learn the basics of CSS and advanced layout. They will learn how to work with pseudo-classes, transition animations, media queries and adaptive grid.

Purpose of studying of the discipline
Acquaintance with the basic concepts of web programming, the formation of skills in the field of creating web pages using the HTML hypertext markup language and CSS styles.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Own the technology of designing the structure of web pages;
2. Own the technology of creating a website by means of programming;
3. Use modern development tools and software solutions, techniques and models used in web development.

Prerequisites
Python Programming

Postrequisites
Mobile app development

Basics of Internet Technologies

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

Short description of discipline
This discipline allows students to form an understanding of modern Internet technologies, study the basics of network technologies and the principles of building network protocols, get acquainted with Arpanet, consider the topology of the Internet, TCP / IP, DNS, HTTP domain name service. The discipline also covers the use of HTML / XHTML and CSS, the development of static and dynamic sites, client-side programming in JavaScript, server-side programming using PHP.

Purpose of studying of the discipline
Formation of ideas about the history of the development of the Internet, knowledge of basic concepts and terms in the field of Internet technologies, understanding of the basic principles of client-server interaction, obtaining practical skills in creating web applications.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course

program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Set up the Internet;
2. Develop static and dynamic sites;
3. Program in HTML/XHTML, CSS, JavaScript, PHP.

Prerequisites
Python Programming

Postrequisites
Mobile app development

Programming mobile applications in Java

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

Short description of discipline
The discipline forms practical knowledge for self-creation of applications for various operating systems, a logical understanding of building programs with a graphical user interface is formed. During the course of studying the discipline, students will gain practical experience in developing various mobile applications for multithreaded, network devices with client-server architecture, with a graphical interface, as well as for working with a database.

Purpose of studying of the discipline
Formation of a system of concepts, knowledge, skills and abilities in the field of modern programming, which includes methods of designing, analyzing and creating software products in the Java language based on the use of object-oriented methodology.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Apply information processing algorithms for various applications;
2. Apply in practice the acquired knowledge to design and create mobile applications at the modern level;
3. Develop applications and programs for various platforms and devices.

Prerequisites
Fundamentals of Web Development

Postrequisites
Professional (pedagogical)

Programming of mobile devices

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

Short description of discipline
The discipline examines the issues of software development for mobile devices. Getting knowledge about mobile technologies, knowledge about programming features in operating systems. In the course of studying the discipline, methods of programming and installing programs for mobile devices are studied, skills of creating programs are acquired. Also, students will get acquainted with the prospects for the development of hardware and software for mobile devices.

Purpose of studying of the discipline
Studying the basic device of popular mobile platforms and the capabilities that this platform provides for the development of mobile systems based on emulators, gaining practical skills in creating user interfaces, services, as well as using alarms, hardware sensors and standard information storages of popular mobile platforms.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Demonstrate knowledge of the necessary basics of developing, installing and configuring software for the Android OS;
2. Program and conduct effective testing of programs and applications for mobile devices;
3. Apply in practice tools and methods for developing mobile applications.

Prerequisites
Fundamentals of Web Development

Postrequisites
Professional (pedagogical)

Mobile app development

Discipline cycle	Profiling discipline
Course	4

Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline focuses on obtaining basic concepts and abilities in the field of creating and designing applications for smartphones. During the course of studying the discipline, students will get acquainted with the main mobile operating systems, as well as with various tools for creating software for mobile devices and learn how to work with them in practice. They will get the skills and abilities to create a mobile application in practice.

Purpose of studying of the discipline
To form students` readiness to project and create applications for modern gadgets that are focused on the Android platform, as well as to introduce them to the main mobile operating systems and tools for creating software

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
1. Determine the choice of means for developing a mobile application;
2. Develop full-fledged mobile applications;
3. Organize testing of mobile applications.

Prerequisites
Fundamentals of Web Development

Postrequisites
Professional (pedagogical)

The laws of probability and methods of statistical data processing

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

Short description of discipline
The knowledge gained in the study of probability theory and mathematical statistics is used by the student in the construction of mathematical and statistical models. Perform laboratory work on the construction of a linear model, parabolic and exponential models, checking their adequacy. To do this, they learn to apply the criteria of consent of Pearson, Romanovsky, Student. Probabilistic methods are used in constructing the theoretical frequencies of a normal, exponential distribution. And they confirm the hypotheses put forward not only analytically, but also through the construction of graphs.

Purpose of studying of the discipline
The purpose of teaching the discipline is to teach students fundamental methods of mathematical statistics.

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.
ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

Learning outcomes by discipline
- to know the basic concepts of set theory, the axiomatic method of presenting probability theory. Know the basic methods of proof and algorithms of probability theory, identifying connections;
- to use knowledge about the modern natural science picture of the world in educational and professional activities. Be able to apply the basic methods of probability theory in solving problems of related fields of mathematics;
- master the methods of proof against the contrary, the method of logical following, the basics of stochastic thinking;
- apply application programs in the study and analysis of statistical data.

Prerequisites
Elementary mathematic Theory of possibility and mathematical statistics

Postrequisites
Professional (pedagogical)

Solving non-standard problems

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

Short description of discipline
This course is devoted to the classification of non-standard problems, as well as the main ways to solve them, such as: search for related problems, reverse, application of graph theory, invariant, Dirichlet principle, elements of number theory. During the study of the material, students will learn to analyze non-standard tasks in order to determine the method of their solution. The course plays a leading role in the selection of material for conducting mathematical competitions of various levels.

Purpose of studying of the discipline
The tasks considered in the course should be closely related to non-standard, Olympiad tasks for secondary school students. They form the knowledge, skills, and skills of future specialists in mathematics. Mastering the ways of solving non-standard tasks.
Formation of skills, skills of using theoretical knowledge in solving Olympiad and prize-winning tasks.

Learning Outcomes
ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

Learning outcomes by discipline
- the student must have the methodology for solving non-standard tasks and the skills of teaching students;

- makes up the structure of solving mathematical problems, makes up the algorithm of educational work, competently formulates proofs;
- knows the methodology of solving Olympiad problems, reveals hidden predictions;
- identifies topics that require in-depth training.

Prerequisites
Elementary mathematic
Postrequisites
Professional (pedagogical)

Olympiad and competitiv problems solution

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

Short description of discipline
This course plays a leading role in the development of professional training of future teachers. Promotes the formation of work skills in classes with in-depth study of mathematics, in the organization and conduct of mathematical circles, competitions, Olympiads, etc. In the course of the study, effective methods of solving competitive and non-standard problems of mathematics are considered and analyzed, which allows the teacher to better prepare students to participate in mathematical Olympiads of various levels. Competently prove ways to solve problems. Be able to correctly compose tasks.

Purpose of studying of the discipline
Formation of skills, skills of using theoretical knowledge in solving Olympiad and competitive tasks. To familiarize with the program of international studies TIMSS, PISA, PIRLS and directions of development of functional literacy of schoolchildren. Training of a teacher who educates a competitive younger generation.

Learning Outcomes
ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

Learning outcomes by discipline
- to make up the structure of solving mathematical problems, the algorithm of educational work, to formulate proofs competently;
- master the methodology of solving Olympiad problems, identify hidden predictions;
- identify topics that require in-depth training.

Prerequisites
Elementary mathematic
Postrequisites
Professional (pedagogical)

Object-oriented programming in C++/C#

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

Short description of discipline
As part of training in this discipline, students study one of the main programming paradigms - object-oriented programming in C++/C#. Software development is carried out in the Eclipse and Visual Studio programming environments using special libraries and plug-ins that expand the capabilities of the environment and speed up the development process. Students also learn teamwork using OOP and working with GitHub repositories.

Purpose of studying of the discipline
The study of methods and means of object-oriented programming for the development of applications with a graphical interface in modern technologies of programming.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
- Understand and define the basic constructions and principles of building programs in the C++/C# language;
- Work with Microsoft Visual Studio 2019 components;
- Perform analysis when designing and implementing a desktop application.

Prerequisites
Python Programming C++ Programming
Postrequisites
Professional (pedagogical)

Object-oriented programming in Java

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

Short description of discipline
During the study of the discipline, students will study the theoretical aspects of the object-oriented approach in one of the most popular programming languages Java, used for various fields. Students learn how to apply OOP methods by developing software for applied

problems in solving mathematical calculations. Students also consider the development of software with a graphical interface, which can later be used to create games.

Purpose of studying of the discipline

The purpose of studying the discipline is to master the methodology and technology of using object-oriented programming based on the Java language for creating applications.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

- Apply techniques, methods, methods of formalization of objects, processes and implements them in modern programming languages;
- Analyze the task in order to determine the composition, structure of data, restrictions on them and the choice of a solution;
- Build algorithms for solving problems and implements them using object-oriented programming.

Prerequisites

Python Programming Java Programming

Postrequisites

Professional (pedagogical)

Object Oriented Programming in Python

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

Short description of discipline

As part of this course, students study the basic paradigms of object-oriented programming in Python, in which the main concepts are objects and classes. With this approach, students will be able to create their own data types (classes) and define their methods in them. In addition, many development environments for the Python programming language allow you to use embedded objects, which greatly simplifies the process of creating software.

Purpose of studying of the discipline

The purpose of the discipline is to teach the object-oriented programming language Python, the use of libraries of standard modules and consideration of the principles of developing software systems.

Learning Outcomes

ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.

ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline

- Use the main classes from the Python programming language class library to create object-oriented applications;
- Create a user-friendly interface for using the created software tools using the TkInter library or others;
- Develop console applications in the style of object-oriented programming in the Python programming language.

Prerequisites

Python Programming C++ Programming

Postrequisites

Professional (pedagogical)

Data protection

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

Short description of discipline

This discipline allows students to master the concept of information security and information security. Threats to information security and ways to implement them, as well as the possibility of applying the legislative and legal aspects of ensuring information security are being studied. They will be able not only to learn about cryptographic methods, methods and means of protecting information, but also to use organizational and technical means of protecting information.

Purpose of studying of the discipline

The study of methods and means of information protection, mastering the work with technical, hardware and software information security, steganography, familiarization with the methods and techniques of hiding information, cryptographic models, encryption algorithms, symmetric and asymmetric cryptosystems, authentication and user identification algorithms, as well as familiarization with issues of information security in networks.

Learning Outcomes

ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline

1. Name the main classes of methods and means of information protection;
2. Reasonably choose and apply software and hardware to ensure information security;
3. Classify the methods of information protection in computer networks.

Prerequisites

Information security in computer networks

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

Short description of discipline
The discipline introduces students to the theoretical and practical issues of building and applying information protection systems and ensuring information security in computer networks and systems. Students learn various security technologies, work with specialized software for data protection and message encryption, and also put into practice various methods of cryptographic protection of information to ensure its security when transmitting data over networks.

Purpose of studying of the discipline
Consider the basic rules of information security, information security risk analysis, information security principles, master the practical methods of protecting information, master working with software for protecting against viruses, teach software protection against unauthorized access and research, consider cryptographic means of protecting information, familiarize with security issues information in networks.

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.
ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline
1. List legal acts in the field of information security protection;
2. Reasonably choose and apply software and hardware to ensure information security;
3. Name the basic concepts of information security in computer networks.

Prerequisites
Databases and Information Systems
Postrequisites
Professional (pedagogical)

Cryptographic methods of information protection

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

Short description of discipline
The discipline introduces students to the basic concepts in the field of cryptographic protection of information, the history of the development of cryptographic protection, its types and principles of construction. The practical component of the discipline is aimed at developing the skills of using techniques and methods of cryptographic data protection, conducting cryptanalysis, and implementing mathematical modeling of data protection in cryptography. The discipline also covers the issues of using specialized tools for backup and data encryption.

Purpose of studying of the discipline
To study software for protecting information on computers and networks, to familiarize with software protection against unauthorized access, to protect information in open networks, to study the issues of ensuring information security when connected to the Internet, to familiarize with cryptographic information security tools, to consider the classification of cryptoalgorithms, to study the work with symmetric cryptoalgorithms, asymmetric cryptoalgorithms, as well as to teach electronic digital signature technologies.

Learning Outcomes
ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.
ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline
1. List the basic requirements for cryptographic protection systems;
2. Use software that implements the main cryptographic functions: public key systems, digital signature, access sharing;
3. Classify crypto algorithms.

Prerequisites
Databases and Information Systems
Postrequisites
Professional (pedagogical)

Active teaching methods in math lessons

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

Short description of discipline
The state of the methodology of teaching mathematics based on the implementation of innovative approaches to teaching, as well as the experience of using active teaching methods in mathematics lessons. The possibility and expediency of using active methods of

teaching mathematics, to determine the organizational and pedagogical conditions for their use. The effectiveness of training future teachers to master the skills of using active teaching methods in professional activities.

Purpose of studying of the discipline
Familiarization of students with existing theoretical materials, didactic manuals, visual illustrations. To teach them to use all opportunities for the development of the student`s personality, his active mental growth, where there is an independent search for the student, as well as research activities, various creative work.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.

Learning outcomes by discipline
- master active lesson methods for the ability to formulate and analyze facts;
- to work with various sources, to put forward hypotheses, to prove the correctness of hypotheses;
- formulate conclusions, defend their position when discussing educational activities.

Prerequisites
Theory and methodology of teaching mathematics Electronic educational resources

Postrequisites
Professional (pedagogical)

Educational robotics at school

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

Short description of discipline
The basis of robotics is considered in the context of physical knowledge of students. Basic knowledge is given in the field of electrical engineering and electronics, passed by students in the school course of physics, thereby linking robotics and physics. Within the framework of the discipline, microcontrollers from Atmega and STM are studied, which is due to the simplicity of their use and wide distribution in practice. It is especially important that students can get acquainted with such important peripheral devices of the microcontroller as memory and ADC.

Purpose of studying of the discipline
the formation of a system of knowledge, skills and abilities in the field of robotics among future teachers is one of the most important areas of scientific and technological progress, in which the problems of mechanics and new technologies come into contact with the problems of artificial intelligence.

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
- develop algorithms and create robot control programs;
- configure and debug the robot design;
- create real-life models of devices using special elements according to the developed scheme.

Prerequisites
Information and communication technology

Postrequisites
Professional (pedagogical)

Digital tools and services for educational content creation

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

Short description of discipline
In the course of studying the discipline, students get acquainted with the types of educational content, the functions performed, the stages and technology of creation, quality requirements, as well as methods of application in future professional activities. The practical component of the discipline is aimed at obtaining the skills to create full-featured educational content using modern tools (sound and video processing tools, infographics, services for creating online tasks, courses, etc.).

Purpose of studying of the discipline
Formation of theoretical and practical skills in the creation and use of digital educational resources using modern tools

Learning Outcomes
ON6 Master and apply the basic methods of special sections of computer science, theory and methodology of the school course program of informatics.
ON7 Build logical arguments, hypotheses and rigorous proofs, develop software packages and database components using modern programming tools and technology.

Learning outcomes by discipline
- create high-quality digital educational resources;
- understand the types of educational content and their functions;
- work with modern tools for creating digital resources.

Prerequisites
Information and communication technology

Postrequisites
Professional (pedagogical)

Geometric construction tasks

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

Short description of discipline
When studying this subject, all types of subjects of the school curriculum are considered. They also study and analyze analyzed examples of varying complexity, tasks for self-solution and methodological recommendations for the teacher. In this course, additional attention is paid to transformation methods, the algebraic method, the method of geometric arrangement of points, a clear statement of the stages of solving construction problems, as well as the axioms of constructive geometry.

Purpose of studying of the discipline
Consider the general axioms of constructive geometry; the axioms of mathematical tools;the formulation of the construction problem. To study the methodology for solving construction problems.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- the ability to apply the methodology of solving geometric problems for construction;
- demonstrates various methods for solving problems for construction;
- constructs the basic theoretical concepts and facts of geometry.

Prerequisites
Theory and methodology of teaching mathematics

Postrequisites
Professional (pedagogical)

Methods of geometric problems solution

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

Short description of discipline
This subject covers all sections of school geometry. It expands the pedagogical horizons of students, teaches them to draw correctly, use problem solving techniques, teach students to master the types of organization of educational and methodological activities, prove and calculate general patterns in solving problems. The GeometryPad application also teaches how to use geometric axioms and theorems in class when drawing shapes.

Purpose of studying of the discipline
Systematize the knowledge, skills and abilities of students in the course of geometry at school;
Mastering practical skills in solving mathematical problems;
Development and formation of educational and cognitive activity.

Learning Outcomes
ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.
ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline
- apply the basic techniques and methods of solving geometry;
- problems the ability to conduct a full justification when solving problems;
- to build mathematical models of various situations.

Prerequisites
Theory and methodology of teaching mathematics

Postrequisites
Professional (pedagogical)

Problem-based approach in teaching geometry

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

Short description of discipline
According to the discipline of the problem approach in teaching geometry, it covers all sections of school geometry. The curriculum includes training on how to use the Geometry Pad application. This is an indispensable addition to the study of geometry. When there is no ready approach to solving problems, a problematic situation arises, and the student`s motivation to search for such a problem increases. In the process of solving problems, teach how to solve problems that arise when solving problems.

Purpose of studying of the discipline

To supply to students with the necessary information on a problematic approach in training of geometry; to form scientific outlook at students, to develop logical thinking.

Learning Outcomes

ON5 To carry out intrasubject and intersubject connections in the educational process, to explain mathematical knowledge in various forms.

ON4 Analyze and solve problems of the theoretical and methodological course of higher mathematics, demonstrate basic knowledge in the field of pedagogy when conducting classes in a modern school using various techniques and techniques.

Learning outcomes by discipline

- basic methods for solving planimetric and stereometric problems of elementary geometry;
- to find errors in solving geometric problems of the subject;
- under consideration to prove the basic statements of elementary geometry.

Prerequisites

Theory and methodology of teaching mathematics

Postrequisites

Professional (pedagogical)

Academic writing and the basics of scientific research

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

Short description of discipline

In the process of studying the discipline, knowledge of the norms of the literary language is formed, the culture of speech, oral and written speech is developed through the use of phraseological phrases, proverbs and sayings, skills of using language in interpersonal and professional communications are formed. During the study, students will be able to master the language means of scientific style, improving the skills of creating and formatting their own scientific texts.

Purpose of studying of the discipline

The purpose of mastering the discipline is to familiarize students with the main features of the scientific style of speech.

Learning Outcomes

ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

ON10 Draw conclusions from the materials studied and demonstrate the desire for professional self-improvement by showing leadership qualities.

Learning outcomes by discipline

- correctly apply lexical, grammatical, stylistic and compositional-structural means of constructing a text
- own the methodology of constructing a written text depending on the genre;
- to form the ability to freely and reasonably express thoughts on a scientific problem, using the appropriate vocabulary.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Pregraduation practice

Applied programs in mathematics

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

Short description of discipline

Mastering by students of theoretical knowledge and practical skills of working with modern application software packages for practical application and solving mathematical problems. Familiarization of students with the capabilities of modern software designed to solve mathematical problems. Assistance in acquiring knowledge and concepts about application software packages, skills in working with programs for solving mathematical problems.

Purpose of studying of the discipline

The purpose of studying the discipline is to master the basic methods of working with application software packages to use their resources in solving mathematical problems.

Learning Outcomes

ON8 Conduct and design experiments in the field of classical branches of mathematics and computer science.

ON9 Formulate and analyze emerging problems using statistical and applied mathematical methods.

Learning outcomes by discipline

- search and use the information necessary for the effective implementation of professional tasks, professional and personal development.
- be proficient in package tools for implementing algorithms and problem solving programs.
- organize their own activities, choose standard methods and methods for performing professional tasks, evaluate their effectiveness and quality.
- be able to build a chain of interrelated actions leading to a result.

Prerequisites

Basic and profile disciplines of the EP

Postrequisites

Pregraduation practice