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)

B011 - Training of computer science teachers
(Code and classification of the educational program group)

6B01507 - Computer Science and Robotics
(Code and name of the educational program)

Bachelor
(Level of preparation)

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Developed

Academic Committee of the OP
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Reviewed

At a meeting of the Academic Quality Commission of the Faculty Natural and Mathematical of the faculty
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At a meeting of the Academic Quality Commission
Recommended for approval by the Academic Council of the University
Protocol № 1 "6" of June 2024

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Approved

at a meeting of the University Academic Council by protocol No. 6 of June 18, 2024.

Fundamentals of frontend development

Discipline cycle	Basic disciplines
Course	1
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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

Prerequisites
Fundamentals of algorithmization and programming

Postrequisites
Mobile app development Web development in Python

Computer Systems Architecture and Operating Systems

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
In the course of studying the discipline, students will get acquainted with the architectural features of popular operating systems, modern computers and computer networks, learn the basics of building and operating principles of elements, nodes and logical blocks of a computer. As part of the study of the discipline, students will learn how to design and implement computer networks, configure network devices and ensure the correct and fully functional operation of operating systems.

Purpose of studying of the discipline
The purpose of the study of disciplines is the mastery of the architectural features of modern computers and computer systems, the study of the basics of designing functional units and devices of computers, acquaintance with the basics of the organization of computer complexes and systems.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Use basic knowledge in the field of architecture of computer systems and operating systems in cognitive and professional activities;
2. Perform the development of specifications for individual components of computer systems;
3. Analyze design and technical documentation at the level of interaction between software components.

Prerequisites
Theoretical basics of informatics

Postrequisites
Fundamentals of Mechatronics and Robotics Data protection

Computer architecture and computing systems

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
As part of the study of this discipline, students gain knowledge related to the organization and functionality of computer systems and networks, get acquainted with the architecture of their devices, study the issues of organizing the interaction of computer components and computer networks. Also, students get acquainted with various aspects of presenting information on a computer, learn the practical skills of equipping networks with appropriate hardware and software, as well as ensuring their correct operation.

Purpose of studying of the discipline
The purpose of studying the discipline "Architecture of computers and systems" is to form students` basic system of knowledge and practical skills in the field of architecture of computer and communication technologies and their application in professional activities and office work. The program is focused on the study of the theoretical and practical foundations of computer technology as a system of generalized knowledge about methodological, technological and technical aspects of information processing.

Learning Outcomes

ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Use basic knowledge in the field of computer architecture and computing systems in cognitive and professional activities;
2. Control the operation of computer, peripheral devices and telecommunication systems, ensure their proper operation;
3. Carry out maintenance, test checks, configuration of industry-specific software.

Prerequisites
Theoretical basics of informatics

Postrequisites
Fundamentals of Mechatronics and Robotics Data protection

Computer systems and networks

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
As part of the study of the discipline, students study the basics of computer systems and networks, ways of logically connecting computers, consider the organization of the ISO OSI and TCP/IP network protocol stacks, get acquainted with addressing and routing issues, as well as the operation of the DNS domain name system. The practical component of the discipline is aimed at developing the skills of setting up and diagnosing a network, working with servers, describing a domain and creating Internet services on a server.

Purpose of studying of the discipline
The purpose of the discipline "computer systems and networks" is to form students` knowledge of the scheme of creation and the basics of organization. Knowledge of computer machines and networks, modern computers and microprocessor systems, the basics of building computer networks and signs of trends in the use of computer equipment in management.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Analyze the physical foundations and principles of operation of computer systems and networks;
2. Apply computer technology in solving managerial problems;
3. Ensure the efficient operation of computer systems and networks.

Prerequisites
Theoretical basics of informatics

Postrequisites
Fundamentals of Mechatronics and Robotics Data protection

Fundamentals of Web Development

Discipline cycle	Basic disciplines
Course	1
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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
Fundamentals of algorithmization and programming

Postrequisites
Mobile app development Web development in Python

Basics of Internet Technologies

Discipline cycle	Basic disciplines
Course	1
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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

Prerequisites
Fundamentals of algorithmization and programming

Postrequisites
Mobile app development Web development in Python

Java Programming

Discipline cycle	Basic disciplines
Course	2
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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
Fundamentals of algorithmization and programming

Postrequisites
Object Oriented Programming in Python Solving programming tasks

Educational smart technologies

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

Short description of discipline
When studying the discipline, students acquire basic knowledge about SMART technologies and their educational opportunities. Students develop competencies in transforming the educational process, updating teaching methods and updating the content of IT disciplines based on the use of SMART technologies, as a result, future teachers will be in-demand specialists in the development and implementation of the SMART education paradigm.

Purpose of studying of the discipline
Studying the priorities of SMART technologies: smart networks, the Internet of Things, familiarization with the "smart city" and "smart" devices, the formation of knowledge in the field of SMART innovations in education: the goals and principles of creating educational content, learning technologies, acquiring skills in working with interactive equipment and skills of technological solutions for SMART-education.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Use interactive equipment focused on SMART education in the educational process;
2. Choose methods of working with the "Smart City" and its devices;
3. Use knowledge and skills in the field of intelligent networks.

Prerequisites
Information and communication technology

Fundamentals of Mechatronics and Robotics

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

Short description of discipline
Within the framework of this discipline, students are trained in the basic principles of development and design of robotics and mechatronic systems. For this purpose, various educational designers of Lego and Arduino types and corresponding software programs are used. Also for the design of robotic systems are used modern microcontrollers that allow students to study their programming in C / C ++ languages and manage such devices as: stepper motor, indicators, sensors, etc.

Purpose of studying of the discipline
Formation of knowledge among students about the actuators of mechatronic devices of the basic disciplines of the component of choice.

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Use educational, periodical and reference literature for the study of mechatronic objects;
2. Apply theoretical knowledge to solve specific problems related to professional activities;
3. Create the simplest robotic structures.

Prerequisites
Computer systems and networks

Postrequisites
Simulation and programming of robots

C# Programming

Discipline cycle	Basic disciplines
Course	2
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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
Fundamentals of algorithmization and programming

Postrequisites
Object Oriented Programming in Python Solving programming tasks

C++ Programming

Discipline cycle	Basic disciplines
Course	2
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
ON 6 Use modern programming tools and technologies in professional activities.

ON 7 Develop software components, mobile and web applications.

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
Fundamentals of algorithmization and programming

Postrequisites
Object Oriented Programming in Python Solving programming tasks

Robotics on the Arduino platform

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

Short description of discipline
As part of the study of the discipline, students will get acquainted with the basics of programming and robotics on the Arduino platform, master the basics of circuitry and software control, learn how to create autonomous robots and mechanisms controlled from a tablet or smartphone. Students will learn how to use motion, light, sound, temperature and humidity sensors, LED matrices and displays, as well as learn how to control motors and servomotors.

Purpose of studying of the discipline
Formation and development in students of a system of technological knowledge and skills necessary for mastering a variety of methods and means of work to create robotic systems

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Use the basic terms and concepts in the field of robotics;
2. Create robotic structures;
3. Develop algorithms for creating robotic structures.

Prerequisites
Computer systems and networks

Postrequisites
Simulation and programming of robots

Robotics on the Rasberry platform

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

Short description of discipline
During the passage of this discipline, students learn to work with the Raspberry Pi platform, which includes programming the board with the corresponding freely distributed operating system of the Linux family, which will allow students to develop embedded systems and mini‐servers in the future. Board programming involves controlling physical processes using the pins on the Raspberry Pi board, the programs for which will be developed in Python.

Purpose of studying of the discipline
Formation of students` skills and knowledge in the field of the natural - scientific cycle, programming, design, design.

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Have the skills to select and configure peripheral devices for Raspberry Pi microcomputers;
2. Install and configure the Raspbian operating system;
3. Configure and install additional packages.

Prerequisites
Computer systems and networks

Postrequisites
Simulation and programming of robots

Forms and methods of STEM learning

Discipline cycle	Basic disciplines
Course	2
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
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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
Information and communication technology

Postrequisites
Basic and profile disciplines of the EP

Electronic educational resources

Discipline cycle	Basic disciplines
Course	2
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
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Work with modern software and online resources to create electronic educational resources;
2. Create high-quality electronic educational resources about your subject area;
3. Determine the main varieties, features of the methodology for creating electronic educational resources.

Prerequisites
Information and communication technology

Postrequisites
Basic and profile disciplines of the EP

Educational data Analytics

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

Short description of discipline
The discipline is aimed at familiarizing with the methods of data collection, analysis and interpretation in the educational environment in order to improve the quality of the educational process. Students will gain skills in working with various types of data, such as student grades, test results, personal data, and others, as well as learn how to apply statistical methods and data analysis tools to identify trends, develop recommendations, and make informed decisions in educational practice.

Purpose of studying of the discipline
The purpose of teaching this discipline is for students to master the skills of data analysis in the context of education in order to apply the knowledge gained to improve the quality of the educational process.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON 10 Explore topical issues in professional activity independently.

Learning outcomes by discipline
1. Understand the basic concepts and principles of data analytics in education;
2. Have the skills to collect and pre-process data;
3. Be able to conduct statistical analysis of data, apply data for decision-making.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Databases and Information Systems

Discipline cycle	Basic disciplines
Course	2
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

ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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

Production (pedagogical) practice

Details of mechatronic modules, robots and their design

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

Short description of discipline

As part of the study of this discipline, students are taught to choose the correct action algorithms at each stage of designing robots, which are assembly from component parts, programming and adjustment of the assembled device. Self-made parts of mechatronic modules made of metal and plastic are selected as the supporting structure, stepper motors and servo drives are used as drives, and the entire logic of the robot is controlled by the STM32, ATmega or ESP32 microcontroller.

Purpose of studying of the discipline

Formation of knowledge about the theoretical foundations of the design and construction of parts, mechanisms of mechatronic modules, robots and robotic complexes.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Compile mathematical models of mechatronic and robotic systems, their subsystems and individual elements and modules;
2. Develop experimental models of control, information and executive modules of mechatronic and robotic systems;
3. Conduct an experimental study of information and executive modules of mechatronic and robotic systems using modern information technologies.

Prerequisites

Fundamentals of Mechatronics and Robotics

Postrequisites

Control systems of mechatronic and robotic complexes

Artificial intelligence in education

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

Short description of discipline

The discipline focuses on the study of the theoretical foundations and practical aspects of using various artificial intelligence methods to optimize learning and improve learning outcomes. The study of the discipline contributes to the development of students`` critical thinking regarding the use of artificial intelligence technologies in education, as well as prepares them to work in the field of developing educational programs and tools that take into account current trends and technological innovations.

Purpose of studying of the discipline

Equip students with the knowledge and skills necessary for the successful integration and application of modern artificial intelligence technologies in the educational environment, as well as prepare them for a future career in education, mastering the competencies necessary to work in a modern educational environment in which innovative artificial intelligence technologies are widely used.

Learning Outcomes

ON2 Apply modern teaching technologies and criteria-based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON 10 Explore topical issues in professional activity independently.

Learning outcomes by discipline

1. Understand the basics and principles of artificial intelligence and its role in education;
2. To know the various methods and technologies of artificial intelligence that can be applied in educational practice;
3. Be able to use practical skills in working with tools and software that using artificial intelligence in education.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Corporate information systems

Discipline cycle	Basic disciplines
Course	2
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
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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
Production (pedagogical) practice

Methods of teaching digital literacy in primary schools

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

Short description of discipline
The discipline is aimed at preparing future teachers to effectively teach digital literacy to primary school students. During the training, students study the basic principles and methods of teaching digital literacy, taking into account the age and psychological characteristics of children, develop lessons and educational materials, as well as master innovative approaches and technologies that contribute to the effective assimilation of computer knowledge and skills.

Purpose of studying of the discipline
The purpose of the discipline is to prepare future teachers for competent and effective teaching of computer science to elementary school students; to master the methods, strategies and tools of teaching computer science, adapted to the peculiarities of the educational process in elementary grades, in order to develop information literacy and computer skills in children.

Learning Outcomes
ON2 Apply modern teaching technologies and criteria- based assessment, taking into account the individual, physiological and psychological characteristics of students.
ON 10 Explore topical issues in professional activity independently.

Learning outcomes by discipline
1. Master the methods and strategies of teaching digital literacy adapted to the age characteristics of primary school students;
2. Be able to develop and conduct digital literacy lessons that meet educational standards and requirements.
3. Have the skills to adapt educational materials and methodological techniques to different students, taking into account their individual needs and level of training.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Simulation and programming of robots

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

Short description of discipline
During the training of this discipline, students study functional systems, which are a combination of robotic devices, namely the control system, carrying structure and executive mechanism. According to the content of the discipline, students are trained not only in the basics of programming robots, but also study the sections of physics and theoretical mechanics. Also in the course of classes students will get acquainted with different types of drives of robotic systems, and the main peripheries of microcontrollers.

Purpose of studying of the discipline
Formation of students` knowledge of the basic concepts, construction methods, tools for developing applied software solutions for controlling robotic systems.

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Use microcontrollers in automation;
2. Use the main components of the RTS control devices;
3. Demonstrate knowledge of RTS terminology and development prospects.

Prerequisites
Fundamentals of Mechatronics and Robotics

Postrequisites
Control systems of mechatronic and robotic complexes

Object-oriented programming in C++/C#

Discipline cycle	Basic disciplines
Course	2
Credits count	5
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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
Solving programming tasks

Object-oriented programming in Java

Discipline cycle	Basic disciplines
Course	2
Credits count	5
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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 C++ Programming

Postrequisites
Solving programming tasks

Object Oriented Programming in Python

Discipline cycle	Basic disciplines
Course	2
Credits count	5
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
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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
Solving programming tasks

Fundamentals of computer video editing

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

Short description of discipline
Within the framework of the discipline, general issues of mobile video filming and video editing are considered, students are introduced to modern programs for video editing and creating animation, their capabilities, differences, advantages and disadvantages. The main part of the discipline is aimed at developing practical skills in working with video editors from the simplest ones, such as Movavi, VideoPad, etc., to modern professional programs, such as DaVinci Resolve.

Purpose of studying of the discipline
Formation of theoretical ideas about video editing, training in practical skills for creating and editing videos, gaining practical skills in working with modern software for creating and processing video.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Create videos;
2. Make video editing;
3. Work with modern video editing tools.

Prerequisites
Computer graphics and graphic packs Basics of computer simulation

Postrequisites
Production (pedagogical) practice

Fundamentals of computer animation

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

Short description of discipline
In the course of studying the discipline, students get acquainted with the concept of animation, the history of its development, types, principles of construction, and also gain practical skills in creating animation in the Wick Editor, Synfig Studio, Adobe After Effects and Maya environments. They will get acquainted with frame-by-frame animation, animation by key frames, learn the basics of implementing software animation and animation based on the "bones" system, learn visualization and rendering.

Purpose of studying of the discipline
Formation of theoretical and practical skills in the field of creating and editing animation using modern tools.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Recognize types of animation, operate with basic concepts and definitions;

2. Work with modern software;
3. Create various types of animation.
Prerequisites
Computer graphics and graphic packs Basics of computer simulation
Postrequisites
Production (pedagogical) practice

Design of embedded systems

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

Short description of discipline
Within the framework of this discipline, students study the design of embedded systems based on STM32, ESP32 and ATmega microcontrollers. The design of these systems contains a circuitry part, which includes the construction of an electrical circuit and the microcontroller piping from passive and active components and programming the microcontroller (writing firmware). As design works, security alarm systems, irrigation devices or other devices at the request of the student can be implemented.

Purpose of studying of the discipline
Formation of the concept of the unity of the hardware and software organization of modern programmable embedded systems

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Work with the microcontroller simulator and the microcontroller command system;
2. Implement logic functions in the microcontroller;
3. Program and use peripheral devices.

Prerequisites
Fundamentals of Mechatronics and Robotics

Postrequisites
Control systems of mechatronic and robotic complexes

Modern database management system

Discipline cycle	Basic disciplines
Course	2
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
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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
Production (pedagogical) practice

Multimedia Processing Technology

Discipline cycle	Basic disciplines
Course	2
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

ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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

Computer graphics and graphic packs Basics of computer simulation

Postrequisites

Production (pedagogical) practice

Web development in Java

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

Short description of discipline

Within the framework of this discipline, students study the basics of creating a WEB application for the server side in the Java programming language. In this case, the Java programming language is used to generate queries, develop an interactive and browser-independent interface. In addition, this programming language allows the use of object-oriented programming methods, which allows students to learn how to use classes and objects, and the basic concepts of OOP: abstraction, encapsulation, inheritance, and polymorphism.

Purpose of studying of the discipline

The purpose of mastering the discipline is to train qualified specialists with knowledge in the field of technologies for creating Web applications in Java and the skills of their practical use.

Learning Outcomes

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline

1. Apply modular programming paradigms;
2. Analyze, test and debug algorithms;
3. Apply software engineering technologies to develop Web applications in Java.

Prerequisites

Python Programming Fundamentals of Web Development

Postrequisites

Mobile app development

Web development in PHP

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

Short description of discipline

In the course of this discipline, students master the development of an application for WEB applications that can perform the function of a backend host, thereby creating not only static HTML sites, but also a part of the WEB server that will allow these sites to dynamically change and process requests. In addition, this discipline discusses the correct application of the object-oriented programming paradigm, and working with other students in team development.

Purpose of studying of the discipline

Learning Web technologies and web development languages (HTML, CSS, PHP) and developing dynamic web pages using PHP programming language.

Learning Outcomes

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline

1. Apply the mechanisms of interaction between the web server and the client;
2. Work in various software environments;
3. Use modern operating systems and shells when creating software applications.

Prerequisites

Python Programming Fundamentals of Web Development

Postrequisites

Mobile app development

Web development in Python

Discipline cycle	Profiling discipline
Course	2

Credits count	5
Knowledge control form	Examination

Short description of discipline

Within the framework of this discipline, students study the basics of technologies for developing a WEB application in the Python programming language. Students learn how to create using a set of ready-made libraries and tools - frameworks, one of which is the Django framework, both for backend development and for single-page applications. Students also learn how to call a URL function, work with databases, including relational databases.

Purpose of studying of the discipline

Formation of knowledge about the modern framework of the Python programming language - Django, about its basic capabilities, features, ways of integrating with other web libraries.

Learning Outcomes

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline

1. Use modern software tools for solving various applied problems;
2. Distinguish network shells and service programs by types of purpose and use cases;
3. Use and administer modern system software.

Prerequisites

Python Programming Fundamentals of Web Development

Postrequisites

Mobile app development

Data protection

Discipline cycle	Basic disciplines
Course	3
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

ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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

Computer systems and networks

Postrequisites

Production (pedagogical) practice

Information security in computer networks

Discipline cycle	Basic disciplines
Course	3
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

ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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
Computer systems and networks

Postrequisites
Production (pedagogical) practice

Cryptographic methods of information protection

Discipline cycle	Basic disciplines
Course	3
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
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

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
Computer systems and networks

Postrequisites
Production (pedagogical) practice

3D-programming

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

Short description of discipline
When studying this discipline, students will master the theoretical and practical foundations of programming for the construction of three-dimensional realistic images, get acquainted with the mathematical apparatus, projecting images, techniques and methods for painting objects, and also consider issues related to calculating vectors. The practical component of the discipline is aimed at developing skills in programming three-dimensional images using the OpenGL graphics library.

Purpose of studying of the discipline
The purpose of studying the discipline is the formation of theoretical knowledge and practical skills in the field of programming three-dimensional objects.

Learning Outcomes
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline
1. Use methods and techniques for constructing three-dimensional images;
2. Simulate three-dimensional images;
3. Use the OpenGL library when programming 3D models.

Prerequisites
Fundamentals of algorithmization and programming

Postrequisites
Production (pedagogical) practice

Information devices and systems in mechatronics and robotics

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

Short description of discipline
In the course of studying this discipline, students learn the basics of programming the Microchip ATmega8 microcontroller in the SI

language, which is a necessary competence for students in modeling and programming robots and mechatronic systems. The content of the discipline includes the following points of microcontroller programming: microcontroller memory management, interaction of the microcontroller with the outside world through built-in peripheral modules, control of the LED display, motors and other devices.

Purpose of studying of the discipline

Formation of knowledge about the principles of building information systems of robots, their sensitive elements, measuring circuits and amplifiers; the physical principles used in the creation of various sensors are considered, mathematical dependencies are studied that allow calculating the main parameters of sensitive elements.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Develop experimental models of control, information and executive modules of mechatronic robotic systems;
2. Use existing software packages and develop new software for information processing and control in mechatronic robotic systems;
3. Adjust, regulate and adjust mechatronic and robotic systems for various purposes.

Prerequisites

Simulation and programming of robots

Postrequisites

Machine learning

Mathematical modeling

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

Short description of discipline

As part of the study of the discipline, students will master the basic concepts of mathematical modeling, study the development, control algorithms and debugging of mathematical models. The main component of the discipline is aimed at developing practical skills in mathematical modeling in the SimInTech environment: students will learn how to work with the environment, consider building databases and queries to them, complex models, model algorithms, learn how to work with vectors and create objects.

Purpose of studying of the discipline

The purpose of studying the discipline is to teach students the theoretical and practical foundations of building mathematical models.

Learning Outcomes

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline

1. Use terminology and definitions from the field of mathematical modeling;
2. Use the functionality of the SimInTech mathematical modeling environment;
3. Develop mathematical models.

Prerequisites

Fundamentals of algorithmization and programming

Postrequisites

Production (pedagogical) practice

Machine learning

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

Short description of discipline

Within the framework of this discipline, students will get acquainted with the basics of machine learning, its goals, objectives and types, as well as learn the practical skills of its application. Students will master machine learning algorithms, learn how to build their own machine learning models, use pattern recognition methods (regression and classification), clustering and dimensionality reduction, learn how to use various learning methods and evaluate models.

Purpose of studying of the discipline

The main goal of the discipline is to familiarize students with the basics of machine learning and master the practical skills of developing machine learning models.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Use machine learning algorithms;
2. Select algorithms and metrics for the task for different models;
3. Build machine learning models and evaluate their quality.

Prerequisites

Control systems of mechatronic and robotic complexes

Postrequisites

Production (pedagogical) practice

Neural networks

Discipline cycle	Profiling discipline

Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This discipline is aimed at studying the process of creating and applying artificial neural networks. Students will get acquainted with the fundamental theoretical ideas and practical techniques used in training neural network models, in practice they will study the algorithms that underlie the training of neural networks, learn how to build neural networks and monitor their state, as well as apply them to solve practical problems in the field of data analysis.

Purpose of studying of the discipline
The purpose of studying the discipline is the formation of theoretical knowledge and practical skills in building and using artificial neural networks.

Learning Outcomes
ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline
1. Use neural network training algorithms;
2. Build various neural networks;
3. Monitor the state of neural networks.

Prerequisites
Control systems of mechatronic and robotic complexes

Postrequisites
Production (pedagogical) practice

Cloud technologies

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

Short description of discipline
The discipline develops students` theoretical and practical knowledge about cloud computing technology. During the course of studying the discipline, students will master the tools of this technology, get acquainted with the main concepts and general terminology of cloud computing, with their infrastructure. The discipline will provide an opportunity to learn how to use cloud technologies and Internet services for individual and collaborative creative work. Students will learn how to put modern cloud computing technologies into practice.

Purpose of studying of the discipline
Training of students in the application of modern cloud computing technologies in professional activities and the formation of the concept of cloud computing resources as a means of providing network access.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Show the ability to work in a cloud environment;
2. Develop and manage your own cloud storage;
3. Virtualize the operating system.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Office Technology

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

Short description of discipline
The discipline considers the use of special software in solving problems in professional activity. In the course of studying the discipline, students will study the functions of office programs, in particular a text editor and a table editor, study the layout of the text using special programs, and also study the basic functions of mathematical packages. Students will be able to use cloud solution development tools and create an office solution project.

Purpose of studying of the discipline
Formation of a basic information culture and preparation of students for the use of modern information technologies as a tool for solving practical problems in a certain subject area.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Apply the basic principles of organizing office technologies;

2. Choose modern document management systems for processing the necessary information;
3. Apply the skills of working with modern office technologies and tools for searching and converting various types of information.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Computer Technology Workshop

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

Short description of discipline
The discipline is focused on the practical development of basic computer technologies and skills. Studying the discipline allows students to develop the necessary practical skills for the successful application of computer technology in various fields of professional activity. Studying this discipline helps students to better understand and effectively use modern computer tools and resources, as well as improve their skills through completing real tasks and projects.

Purpose of studying of the discipline
The purpose of the discipline is to provide students with practical skills in working with modern computer technologies, prepare them for professional activities in the field of information technology and develop critical thinking in the context of solving real problems.

Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.

Learning outcomes by discipline
1. Possess basic modern computer skills;
2. Apply knowledge in practice to solve real problems;
3. Analyze problems and successfully find solutions using modern computer technology.

Prerequisites
Information and communication technology

Postrequisites
Production (pedagogical) practice

Computer graphics programming

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

Short description of discipline
As part of the study of the discipline, students study the main aspects of the field of representation of graphic information on a computer, as well as the capabilities of computers and video systems for programming computer graphics, get acquainted with the algorithms and methods of two-dimensional and three-dimensional graphics, learn to create graphic programs for Windows, work with animation, produce gradient coloring, and also form practical skills in computer graphics programming using the Opengl and DirectX libraries.

Purpose of studying of the discipline
The purpose of studying the discipline is to form theoretical knowledge and practical skills in computer graphics programming using the Opengl and DirectX libraries.

Learning Outcomes
ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

Learning outcomes by discipline
1. Develop graphic images using a high-level language;
2. Choose adequate tools for solving complex graphic problems;
3. Build two-dimensional and three-dimensional models by means of a high-level language, technologies for modeling graphic images.

Prerequisites
Fundamentals of algorithmization and programming

Postrequisites
Production (pedagogical) practice

Programming mobile applications in Java

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

Short description of discipline
The discipline forms practical knowledge for 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

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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

Web development in Python Fundamentals of Web Development

Postrequisites

Production (pedagogical) practice

Programming of mobile devices

Discipline cycle	Profiling discipline
Course	3
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

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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

Web development in Python Fundamentals of Web Development

Postrequisites

Production (pedagogical) practice

Mobile app development

Discipline cycle	Profiling discipline
Course	3
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

ON 6 Use modern programming tools and technologies in professional activities.
ON 7 Develop software components, mobile and web applications.

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

Web development in Python Fundamentals of Web Development

Postrequisites

Production (pedagogical) practice

Robotic systems and complexes

Discipline cycle	Profiling discipline
Course	3

Credits count	5
Knowledge control form	Examination

Short description of discipline

As part of the study of this discipline, students will master the control and programming of mechatronic and robotic complexes, which will allow students to carry out the following types of manipulation: control of an electric motor, including a stepper motor and a servo drive, generating a PWM signal and controlling it. Students will also learn how to program modern types of control platforms for mechatronic and robotic complexes Arduino, Raspberry Pi in C/C++, Python and Assembler.

Purpose of studying of the discipline

Formation of knowledge about the methods and means of intelligent control in robotic systems; mastering disciplinary competencies in developing technical specifications, designing architectures and developing algorithmic and software automation tools for production and technological processes and production based on intelligent robotic systems.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Develop terms of reference for the modernization and automation of existing production and technological processes and industries;
2. Draw up a description of the principles of operation and design of devices, designed technical means and systems for automation, control, monitoring, diagnostics and testing of technological processes;
3. To develop a functional, logical and technical organization of automated and automatic production and their elements.

Prerequisites

Simulation and programming of robots

Postrequisites

Machine learning

Artificial intelligence systems

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

Short description of discipline

When studying the discipline, students will get acquainted with the theoretical foundations of artificial intelligence and knowledge engineering, consider tasks related to the state space, in practice learn how to produce in the state space, and also consider the methods used to reduce tasks to a set of subtasks. As part of the study of the discipline, the issues of knowledge representation in intelligent systems, the use of various forms of knowledge representation and the issues of modeling language activity are also considered.

Purpose of studying of the discipline

The purpose of studying the discipline is to form a holistic view of the current state of the theory and practice of building artificial intelligence systems.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Perform a comparative analysis of various models of knowledge representation to solve applied problems of computer simulation of human intellectual activity;
2. Implement knowledge representation models in logical and functional programming languages;
3. Use linguistic information resources to solve applied problems of processing natural language constructs.

Prerequisites

Control systems of mechatronic and robotic complexes

Postrequisites

Production (pedagogical) practice

Control systems of mechatronic and robotic complexes

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

Short description of discipline

As part of the study of this discipline, students will learn the basic algorithms for the operation of control systems of mechatronic and robotic complexes. Using these algorithms, the following manipulations of robots are carried out: dynamics of multi- link systems, differential drive, smooth movement along the trajectory and kinematics of a robot with a differential drive, direct and inverse problem of the kinematics of an autonomous robot. In addition, students will learn how to build programs based on the studied algorithms for the operation of control systems.

Purpose of studying of the discipline

Formation of knowledge, skills and abilities of research work and implementation of innovative activities using mechatronic and robotic systems and control systems for mechatronic and robotic modules and systems.

Learning Outcomes

ON 8 Apply knowledge in the field of development and debugging of mechatronic and robotic systems.
ON 9 Effectively use methods and approaches to solve problems in the field of machine learning.

Learning outcomes by discipline

1. Apply methods for assessing the technical condition and residual life of mechatronic and robotic equipment;
2. Organize preventive inspection and maintenance of equipment;

3. Use modern methods for diagnosing the state of mechatronic and robotic equipment.
Prerequisites
Simulation and programming of robots
Postrequisites
Machine learning

Pregraduation practice

Discipline cycle	Profiling discipline
Course	3
Credits count	11
Knowledge control form	Total mark on practice

Short description of discipline
Pre- graduate practice is an important part of the training of qualified specialists for students and is carried out in institutions that correspond to the profile of the student`s specialization. In pre-graduate practice, the skills of research work are developed. The practice includes the consolidation of theoretical knowledge in academic disciplines, the provision of a modern program and the use of office equipment, the acquisition of practical skills in the specialty in working institutions, mastering the technology of work, collecting materials for the implementation of the diploma project.
Purpose of studying of the discipline
Formation of a complete mastering of the theoretical and practical training program for graduate students. Development of research skills during pre-graduate practice.
Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.
Learning outcomes by discipline
1. Apply modern methods and technologies for diagnosing the achievements of students to ensure the quality of the educational process;
2. Use the methods of scientific research and experimentation;
3. To carry out the literary and graphic design of the final work.
Prerequisites
Basic and profile disciplines of the EP
Postrequisites
Final examination

Production (pedagogical) practice

Discipline cycle	Profiling discipline
Course	3
Credits count	11
Knowledge control form	Total mark on practice

Short description of discipline
Industrial practice teaches future computer science teachers to plan, organize, conduct educational work with students, creatively approach the solution of current problems of upbringing and education, introduces the latest innovative experience, summarizes the pedagogical experience of advanced teachers, develops skills for their development, organizes research work and summarizes related material. Industrial practice is conducted in order to obtain professional skills and professional experience.
Purpose of studying of the discipline
To teach future computer science teachers to plan, organize, conduct educational and independent work with students, to creatively approach the solution of urgent problems of upbringing and education, to acquaint with advanced innovative experience in a modern school, to generalize the pedagogical experience of advanced teachers, to develop their development skills, to organize research work, collection of related material.
Learning Outcomes
ON3 Use basic knowledge in the field of computer science and information technology in cognitive and professional activities.
ON 4 Effective use of hardware and software components of computer networks and ensure information security.
ON 5 Organize the digitalization of education using modern digital tools and services.
Learning outcomes by discipline
1. Work with information and communication technologies;
2. Design and implement a holistic pedagogical process, demonstrate goal-setting skills;
3. Use basic knowledge in the field of computer science and natural sciences in cognitive and professional activities.
Prerequisites
Basic and profile disciplines of the EP
Postrequisites
Final examination