"Alikhan Bokeikhan University"

Faculty of Information Technology and Economics

Department of "Information – technologies science»

**6B06124 Computational technology and software
CATALOGUE OF ELECTIVE COURSES**

yearofadmission – 2023

Training period 2 years 9 months. Form of training-full-time on the basis of TVE

Semey, year 2023

Discussed and approved at a meeting of educational and methodological council of the faculty
Protocol № 5 15.05.2023
 Chairman of the faculty EMS _____ Shoybakova E. O.
Approved at the meeting of the educational and methodological council of the university
Protocol № 5   25.05.2023
Chairman of the EMS _____ Zharykbasova K. S.

Academic degree: Bachelor's degree in
information and communication technologies
according to the educational program - 6B06124 "Computer
technology and software"Course of education:
B057 – Information technologies

№	Discipline	Amount of credits		Prerequisites	Postrequisites	Prerequisites Postrekvizity Brief description indicating the purpose of the study, executive summary, and expected results of the study (knowledge, skills, competences)
		BC	ECTS			
BASIC DISCIPLINES						
Be sure to select(BSS)						
1	Introduction to Blockchain		5	Introduction to Programming	Decentralized applications, Introduction to Web 3	**Aim:** the purpose of this course is to master various aspects of blockchain technology. Students study related topics of cryptography, wallets, nodes, smart contracts and tokens **Content:** The basics of blockchain, consensus algorithms, understanding cryptocurrencies and smart contracts, the use of blockchain technology in the real world. **Expected result**: **Know**: − the main concepts of blockchain, advantages and limitations of blockchain technologies; − key differences between blockchain and other technological systems; **Able to**: - understand the technical fundamentals of blockchain technology deeply enough to analyze the impact of certain implementation decisions in proposals; - understand relevant legal, ethical and confidential issues related to blockchain; **Possess skills**: − influence on the policies and actions of organizations or individuals; − identify real-world problems that blockchain technologies can help solve; or explain why they won't help.
1	Fundamentals of Blockchain technology		5	Introduction to Programming	LMS technologies, Introduction to Internet Marketing	**Aim:** the study of blockchain technology (distributed registry) with an emphasis on its mathematical and technical foundations, as well as applied aspects **Content:** Blockchain architecture. The order of operation of the blockchain transaction. The purpose of the blockchain. Limitations of blockchain technology. The use of blockchain technology for the organization of distributed databases. **Ожидаемый результат:** **Know:** − fundamentals of blockchain technology; − cryptographic fundamentals of blockchain technology on the platform .Net; − technologies for creating blockchain applications on the .Net platform **Able to**: - use blockchain technologies; - apply cryptographic fundamentals of blockchain technology on the platform .Net; - create blockchain applications on the .Net platform **Possess skills:** − skills in using blockchain technology; − skills of using cryptographic blockchain technologies on the platform .Net;

2	Setting up, repair, optimization and maintenance of computer systems	5	Information and communication tecnologies	Architecture and organization of computer systems	− skills in creating blockchain applications on the .Net platform
					Aim: The development of professional competencies of students necessary for the implementation of professional activities, the formation of skills and abilities to perform work related to the maintenance and repair of computer systems and complexes. **Content:** Configuration of computer equipment. Hardware testing using a debugger. Hardware testing using diagnostic programs. Creating bootable media. Determining the parameters of the power supply. Testing the video system. Testing the CPU. Testing the hard drive. Restoring the operability of the operating system. Keyboard and mouse maintenance. Testing the motherboard ports. Maintenance of the local network. **Expected result**: **Know:** − features of monitoring and diagnostics of hardware and software systems devices; − basic diagnostic methods; - hardware and software tools for functional control and diagnostics of computer systems and complexes capabilities and applications of standard and special control and measuring equipment for localization of fault locations of SVT; − application of service tools and built-in test programs; − hardware and software configuration of computer systems and complexes; − installation, configuration and configuration of the operating system, − drivers, resident programs; techniques for ensuring the stable operation of computer systems and complexes. **Able to:** − to monitor, diagnose and restore the operability of computer systems and complexes; − to carry out system maintenance of computer systems and complexes; − take part in debugging and technical testing of computer systems and complexes; − installation, configuration and configuration of the operating system, drivers, resident programs. **Possess skills:** − monitoring, diagnostics and restoration of the operability of computer systems and complexes; − system maintenance of computer systems and complexes; − debugging of hardware and software systems and complexes; − installation, configuration and configuration of the operating system, drivers, resident programs.

2	Maintenance and repair of computer systems and complexes	5	Information and communication tecnologies	Architecture and organization of computer systems	**Aim:** the purpose of studying the discipline is the development of professional competencies of students necessary for the implementation of professional activities, the formation of skills and abilities to perform work related to the maintenance and repair of computer systems and complexes. **Content**: Control and diagnostics of computer systems and complexes.The structure of computer systems and complexes is a generalized structure of computer systems and complexes. Hardware for functional control and diagnostics of computer systems and complexes, their application. Software tools for functional control and diagnostics of computer systems and complexes, their application. **Expected result:** **Able to:** − to monitor, diagnose and restore the operability of computer system complexes; − to carry out system maintenance of computer systems and complexes; − take part in debugging and technical testing of computer systems and complexes, installation, configuration and configuration of the operating system, drivers, resident programs; − comply with safety regulations; **Know:** − features of monitoring and diagnostics of hardware and software systems devices; basic diagnostic methods; − hardware and software tools for functional control and diagnostics of computer systems and complexes, possibilities and applications of standard and special monitoring and measuring equipment for localization of fault locations of SVT; − application of service tools and built-in test programs; − hardware and software configuration of computer systems and complexes; − installation, configuration and configuration of the operating system, drivers, resident programs, techniques for ensuring the stable operation of computer systems and complexes; − rules and regulations of labor protection, safety, industrial sanitation and fire protection. **Possess skills:** − monitoring, diagnostics and restoration of the operability of computer systems and complexes;
3	Theory of information processes	5	Introduction to Programming, Information and communication tecnologies	Computer networks and telecommunications	**Aim:** formation of students' theoretical knowledge about modern information systems and technologies, models, methods and means of solving functional problems and organizing information processes, studying the organizational, functional and physical structure of information systems and basic information processes, considering the prospects of using information technologies in the transition to an information society. **Content:** Introduction. Basic concepts and definitions. Signals as information carriers. Forms of representation of deterministic signals. Representation of message signals by basic functions **Expected result.** **Know:** − fundamentals of information culture; principles and structure of information processes and systems; − assignment and classification of software tools for digital information processing; **Able to:** − to use IP theory, information processes and computer technology in solving specific practical problems; − to evaluate the problems of the relationship between the individual, human society and nature; − to identify the effect of physical laws in the processes and

					phenomena of nature; to develop proposals for the organization of information processes and systems when using the information space using modern technologies, digital assets; – choose network technologies and automated document management tools of the organization; **Possess skills**: – methods of organization and use of database management systems; methods of organization and evaluation of the effectiveness of the information space of the organization; – methods of working with application software
3	Information technologies	5	Introduction to Programming, Information and communication tecnologies	Technics of computer and communication systems	**Aim:** Familiarity with the basic concepts of information and information technologies, classification of information technologies by application areas. **Content:** Information. Information technology. Information technologies by fields of application. Information security. The main types of threats to information security. Information security tools. Identification and authorization of users and network resources **Expected result**: **Know**: - basic concepts: information and information technology; - technologies for collecting, storing, transmitting, processing and providing information; - identification and authorization of users and network resources; - information security: the main types of threats, ways to counter threats **Able to:** - work with graphical operating systems of a personal computer (PC): enable, disable, manage sessions and tasks performed by the operating system of a personal computer; **Possess skills:** - presentation of information; - search for files, computers and network resources; - methods and means of determining the amount of information.
4	Decentralized applications	3	Introduction to Programming	Architecture of the blockchain system, Smart Contract Architecture, Introduction to Web 3	**Aim**: The purpose of this course is to study the technical skills necessary to create decentralized applications on public blockchains. Also, the development of applications that perform business transactions without the participation of a trusted third party. **Content**: the main components of a decentralized application (App), social and project problems hindering the implementation of DApp, smart contracts written in the Solidity programming language, the development environment necessary for writing, testing and deploying Ethereum DApp **Expected result**: **Know:** – planning, designing, implementing and testing end-to-end dApps with proper configuration of the blockchain network on an enterprise scale; **Able to:** – understand the architecture and components of DApp, including the external interface and internal processing supported by blockchain and smart contracts; **Possess skills:** – critically evaluating new blockchain standards and architectures and applying them in various use cases.
4	LMS technologies	3	Introduction to Programming	Ethereum, Web3 and Truffle development environmen t	**Aim:** It is the formation of a system of knowledge, skills and abilities among students in the field of using information and communication technologies in the course of their studies, as well as in further practical activities in the context of organizing e-learning using distance learning technologies in an educational institution.

5				ts, Working with Ethereum, Introduction to Internet Marketing	**Content:** The concept of LMS? LMS MOODLE. Getting a login and password. Creating an e-learning course in Moodle. Tools (modules) Moodle. Resources. Interactive elements **Expected result**: **Know:** − Основы проведения практических занятий в чате − регистрация электронных документов и импорт документов из альтернативных форматов. **Able to:** − Use of test technologies (development of test tasks (tests), analysis of test results). **Possess skills:** − Formation of skills for setting up an e-course assessment; − Formation of skills for working with reports and logs of the electronic course
5	Programming No Code/Lo Code	5	School Computer science course	Database programming, Programming languages	**Aim:** developing products without using code and understanding how an IT product fundamentally works. During the course, we will look at how to do projects with NoCode tools efficiently, what things you need to know before starting your path in No-Code development. **Content:** The concept of No-code and Low-code. The difference between No-Cod and Low-Code technology. Features of Low-code and No-code. Advantages and disadvantages of No-code. Advantages and disadvantages of Low-code. Basic No-Code services. Low-Code and No-Code perspectives **Expected result**: **Know:** − the main content of the discipline has been mastered, which allows assessing the temporal and capacitive complexity of the software, but there are difficulties or inaccuracies in the presentation, which the student corrects with leading questions from the teacher; the main content of the discipline has been mastered, which allows evaluating the temporal and capacitive complexity of the software, but there are difficulties or inaccuracies in the presentation, which the student corrects independently − the content has been assimilated, which makes it possible to assess the time and capacity complexity of the software, the presentation is clear and competent, without difficulties and inaccuracies **Able to:** − performs all operations that allow evaluating the time and capacity complexity of the software, but makes mistakes that are not always able to eliminate without leading questions from the teacher − performs all operations that allow evaluating the time and capacity complexity of the software, however, it allows inaccuracies that it can eliminate without leading questions from the teacher − performs all operations that allow you to evaluate the time and capacity complexity of the software; the actions are thought out and do not contain errors **Possess skills:** − demonstrates an uncertain command of the required skills, the available experience is fragmentary, but sufficient to complete the task − demonstrates possession of the required skills, the available experience is sufficient to complete the task − demonstrates a confident command of the required skills, the task is solved quickly and in an optimal way
5	Object-oriented programming	5	School Computer science course	Programming on 1C, Programmi	**Aim:** Familiarity with the modern approach to programming in objects, acquisition of skills in writing programs in object-oriented languages.

				ng languages and technologies	**Content:** Introduction to OOP. Structural features of object-oriented languages. Inheritance and composition. Fundamentals of object-oriented analysis and design. **Expected result:** **Know:** − what is a class and an object; − basic principles of object-oriented programming; − principles of class construction; − criteria for verifying the correctness of class construction; − main trends in the development of object-oriented programming technologies; **Able to**: − use modern methods of object-oriented programming when coding software systems of different levels of complexity; **Possess skills:** - working with the Delphi visual programming environment; - basics of algorithmization;
6	Probabilities theory and Math statistics	3	Mathematics	Computer modeling, Information security and information safety	**Aim:** Obtaining generalized knowledge about any probabilistic and statistical systems, identifying common patterns of their construction and functioning. Identification of objects of application of the acquired knowledge using modern information technologies. **Content**: The subject of probability theory and mathematical statistics. Basic concepts of probability theory. Trials and events. Actions on events. Random events. Types of random events. Basic formulas of combinatorics. Classical definition of probabilities. The theorem of addition of probabilities of incompatible events. A complete group of events. Opposite events. Independent and dependent events. Multiplication theorem for independent events. Conditional probability. Solving problems by conditional probability. **Expected result:** **Know**: - regularities in random and informational processes (type of distribution, numerical characteristics, accumulation, processing, distribution, etc.) **Able to**: - create mathematical and computer models of random phenomena in various fields of human activity; **Possess skills:** - information about the main scientific achievements in probability theory and mathematical statistics;
6	Discrete Math	3	Mathematics	3D graphics and animation, Information security	**Aim:** Familiarization of students with the most important sections of discrete mathematics and its application in computer science. **Content:** A set, an element of a set, a subset. Operation on sets and their properties. Binary relations and their properties. The relation of equivalence and division into classes. Types of functions: injections, surjections and bijections, inverses and compositions. The Dirichlet principle. Construction of a truth table of logical formulas. Methods of proof: direct, reverse, from the opposite, mathematical induction. Combinatorics. **Expected result:** **Know:** − basic concepts of sets; − algebraic methods of model description; **Able to:** − apply combinatorial configurations to solve problems to determine the type of binary relation and its properties. **Possess skills:** − application of the basic tools of discrete mathematics for solving applied problems
7	Operating	5	Information and	Artificial	**Aim:** Training in the knowledge and skills of using modern

	systems		communication tecnologies	intelligence systems Production (III)	software, obtaining knowledge about modern operating systems, their functional architecture, the resources and methods implemented by them, and resource management of computer complexes. To teach knowledge and skills in the use of modern software, to familiarize with effective algorithms for solving various scientific and technical problems. **Content:** General information about operating systems. History of operating systems. The architecture of the operating system. The main functions of the OS. Processes and threads. Memory management. File systems. Input and output control. Architectural features of the micro-process model of the weed system. Real memory management. Configuring network parameters and sharing resources in local networks. Programming using system calls in the Windows operating system, in the Linux System shell **Expected result:** **Know:** − the concept, principles of construction, types and functions of operating systems; − operational environment; −machine-independent properties of operating systems. **Able to:** − install and maintain operating systems; − take into account the specifics of working in a particular operating system, organize support for applications of other operating systems; − use the tools of the operating system. **Possess skills:** − security and fault tolerance of operating systems; − principles of building operating systems; − ways to organize device support, hardware drivers, network operating systems.
7	Operating systems, средыи оболочки	5	Information and communication tecnologies	Intelligent animation, Production (III)	**Aim:** Studying the theoretical principles and algorithms underlying the development of modern operating systems and shells, mastering the problems of this area, reviewing research directions, gaining skills in installing, configuring and administering operating systems of the Win32 and UNIX families. **Content:** Introduction. History of operating systems and shells. The main functions of the OS. Processes and threads. Memory management. File systems. I/O management. **Expected result** **Know:** − the current state of the level and directions of development of computer technology and software; − main stages, methods, tools and standards of software development; − main types of operating systems, principles of resource management in the operating system; − features of working in specific operating environments and shells; − service software tools; − ways of organizing, storing and processing information on a computer. **Able to:** − work in the selected environment; − master a new operating system or software shell; − get information about users, processes, directories, help about system commands; − exchange messages with other users; - create and view directories, copy, move and delete files, manage file access mode;

					- create, view and merge text files, perform a template search, search for files by specified properties, use pipelines and I/O redirection. **Possess skills:** − security and fault tolerance of operating systems; − principles of building operating systems and shells; − ways to organize device support, hardware drivers, network operating systems.
8	Programming languages	5	Programming No Code/Lo Code	Fundamentals of component technologies, Programming on PHP	**Aim**: Consideration of the basics of building programming languages and methods, study of the main types and structures of data and algorithms for their processing, teaching students the basics of programming based on the C++ programming language. **Content**: Basic concepts of programming languages. Lexical analysis. Semantic analysis of the program code. Object-oriented programming (OOP). Programming in the C language . **Expected result:** **Know:** − terminology of the discipline; − basic structures and tools that are used in programming languages, for example C++: − basic C++ data structures and types; − basic methods in the development of algorithms (recursion, backtracking, the method of branches and boundaries, analysis of arithmetic expressions); basic algorithms; C++ dialects, including those used in programming microcontrollers; libraries of standard programs. **Able to:** − apply programming methods in the development of information systems; − define data structures when designing algorithms in the process of solving problems; − split the solution of a complex problem into a sequence of simpler tasks. **Possess skills:** − using a library of standard programs that are included in the C++ programming language; − independent mastering of the programming language that needs to be used when solving problems.
8	Programming languages and technologies	5	Object-oriented programming	Component technologies and distributed software development, Web programming	**Aim:** Teaching students the basic principles and methods of building programs in programming languages, familiarize them with the semantics of programming languages, formal specification languages, and object-oriented specifications. **Content:** Structural, modular, object-oriented programming. Basic concepts and mechanisms of the program input and execution environment. Basic data types. The basic principles of the organization and structuring of programs. Basic concepts and language tools for describing software objects. Operators. The main means of data processing. Preprocessor tools. Algorithmic basics of writing effective programs. The basic principles and means of organizing the software interface. Functions. Basic principles of program development. **Expected result:** **Know:** − programming methods and technologies; − basic data processing algorithms; − about modern programming languages; − about the structure of computing systems; **Able to:** − develop algorithms; − implement algorithms in a high-level programming language; − implement methods of data analysis and processing;

					– work in programming environments.
					Владеть:
					– methods and technologies of algorithm development;
					– programming in a high-level language;
					– works in various programming environments
9	Computer networks and telecommunications	5	Theory of information processes	Distributed systems technologies	**Aim:** Expanding the theoretical base in the subject area, and instilling practical skills in students to work with special information support capabilities. **Content:** Definition of local networks. Topology of local networks. The main components of the network. Types of communication lines of local networks. The oldest standard networks. Ethernet, Token Ring, FDDI **Expected result:** **Know**: – Main components of the network, types of communication lines – Types of IP addresses – Methods and means of network protection – PHP syntax – SQL syntax – Types of domain and types of hosting **Able to:** – Create personal account schemes – To clean the PC from viruses – Apply EDS – Apply encryption principles – Create PHP applications – Create websites with DB – Create a database using phpmyadmin and SQL – To process form data – **Possess skills :** – Creating a personal account scheme – Configure and administer the network – Creating applications in PHP – Creation and maintenance of websites – Publishing web sites on the Internet – System and Network Administration
9	Technics of computer and communication systems	5	Information technologies	Technologies for the development of distributed information systems	**Aim:** The development of professional competencies of students necessary for the implementation of professional activities, the formation of skills and abilities to perform work related to the maintenance and repair of communication systems. **Content:** Monitoring, diagnostics and recovery of computers and communication systems. Systematic maintenance of computer and communication systems. Debugging and technical testing of computer and communication systems. Installation, configuration of the software. **Expected result:** **Know:** – features of monitoring and diagnostics of hardware and software systems devices; – basic diagnostic methods; – application of service tools and built-in test programs; – hardware and software configuration of computer systems and complexes; **Able to:** - to monitor, diagnose and restore the operability of computer and communication systems; - to carry out system maintenance of computer and communication systems; **Possess skills:** – monitoring, diagnostics and restoration of computer and

					communication systems operability;
					− system maintenance of computer and communication systems;
10	Object-oriented programming in C++	6	Programming No Code/ Lo Code	Programming on PHP, Modern methods and means of Java programing	**Aim**: In-depth study and mastering of programming languages based on the technology of object-oriented and generalized (using the standard library) programming, the high-level programming language C++ is used as the base. **Contents:** Evolution of programming technology. Structural features of object-oriented languages. Dialog boxes of the c++ language. Operations, operators, structures and elements, functions. Control of access to an element of c++ preprocessor classes. Open and closed derived classes. The structure of the c++ Builder environment. Properties, methods, and events. **Expected result**: **Know:** − the concept of object-oriented programming, its main concepts (class, object), properties (encapsulation, inheritance, polymorphism); − methodology of analysis and design of object-oriented programs; − basic concepts, syntax and semantics of C++ programming language constructs; − methods of composing object-oriented programs in the C++ programming language; − features of the integrated programming environment in C++. **Able to:** − debug and test programs written in C++; − formulate the statement of tasks; perform a formalized description of the task, its algorithmization; − based on the existing algorithm to build a computer program in algorithmic languages and C++. **Possess skills:** − on object-oriented design; − development of object-oriented program code in modern operating systems.
10	Functional programming	6	Object-oriented programming	Web programming , Modern methods and means of NET programing	**Aim:** Formation of students' general methodological foundations and practical skills in developing software systems using a functional approach to programming **Contents:** Introduction to functional programming. Introduction to the course. The functional programming paradigm. Comparison of imperative and functional programming. Characteristic features of functional programming. Fundamentals of lambda calculus. Reasons for using the lambda calculus formalization. The concept of a lambda expression. Mapping. Free and connected variables, expressions. **Expected result**: **Know:** − features of artificial intelligence tasks and the role of functional programming as methodologies for solving these tasks; − trends and prospects of development of functional programming tools; − fundamentals of the theory and practice of lambda calculus. **Able to:** − develop software applications for solving tasks in a functional programming language; − develop algorithms for solving problems for functional programming **Possess skills:** − work with software applications to solve tasks in a functional programming language; − development of algorithms for solving problems for functional programming

11	Database programming	5	Programming No Code/Lo Code	Modern methods and means of Java programing	**Aim:** students gain knowledge about the stages of database development, about promising areas of DBMS development; students acquire skills in the field of database design, development and administration; students form conceptual ideas about the basic principles of database construction, database management systems, mathematical models describing the database, as well as about the basic technologies of database implementation.. **Content:** The discipline "Database Programming" is aimed at studying the theoretical foundations of data modeling, the principles of designing and maintaining database systems (DBMS), data access control and data protection from destruction; forms practical skills in designing conceptual models, implementing databases (DB) and interfaces for working with them, and applying this knowledge. **Expected result**: **Know:** − tasks and principles of database development; − database models; − types of database management system; − basic concepts of database theory; − basic data models; − normal forms of relational relations; − Structured SQL query language. **Able to:** − use tools that support software development of professionally-oriented information systems; − use technical means of information systems in the subject area; − create database tables; − perform basic techniques for working with datasets: navigating a dataset, searching for records in a dataset, filtering records, etc.; − create SQL queries; **Possess skills:** − data model development; − database application development; − using the SQL language; − work with modern DBMS.
11	Programming on 1C	5	Object-oriented programming	Modern methods and means of NET programing	**Aim**: To teach future specialists a complex of special knowledge and skills in the field of design and organization of highly efficient automated production processes of mechanical assembly production in mechanical engineering. **Content:** Basic concepts: configuration, configuration objects. Work options. The main and auxiliary application window. The set and properties of information storage objects. Constants. Reference books. The configuration branch is "General". Programming event handlers of configuration objects. Documents. Forms. Modules. Accumulation registers, data registers, transfers. Turnover Registers Reports. Programming the optimization of the document. Temporary table manager. **Expected result:** **Know**: − principles of construction of automatic machine tool systems and fundamental theories of automation of production processes; − features of automation of assembly processes; − target mechanisms of automatic machines and automatic lines; **Able to**: − design separate target mechanisms of automatic machines and automatic lines; − design automatic machine tool systems; − perform calculations of the performance and reliability of automatic equipment; **Possess skills:**

					− analysis of the performance, reliability and economic efficiency of automatic lines; − processing and analysis of statistical information on reliability, performance and improvement of operational efficiency of automatic systems
12	Computer modeling	5	Probabilities theory and Math statistics	The use of data in machine learning	**Aim**: Mastering the methodology and technology of modeling (primarily computer modeling) by students in the study, design and operation of information systems. **Contents:** Basic concepts of systems modeling. System modeling tools. Mathematical schemes of systems modeling. Formalization and algorithmization of system functioning processes. Methods of planning experiments. Modeling of systems using typical machine circuits. **Expected result**: **Know:** − basic concepts of modeling theory, classification of models and areas of their use, modeling tasks; − basic modeling tools used in the process of designing systems at different stages of project detail; − methods of modeling and analysis of systems; − principles of model construction. **Able to:** − perform an analysis of the system or process under study; reasonably choose a modeling method; − build an adequate model of a system or process using modern computer tools; − interpret and analyze the simulation results. **Possess skills:** − the main criteria for evaluating the obtained simulation results; − experience in the work and use of scientific and technical information in the course of modeling.
12	3D graphics and animation	4	Discrete Math	Introduction to machine learning and data analysis	**Aim**: Овладение знаниями трехмерного моделирования, создания трехмерной анимации и визуальных эффектов. **Content:** Введение в 3D. Пользовательский интерфейс с 3D Studio Max и проекционными окнами. Работа с базовыми объектами. Трансформация объектов. Модификаторы. Моделирование простых и сложных форм. Тонировка. Анимация. Визуализация. **Expected result**: **Know:** − basic concepts of three-dimensional graphics; − main features of the 3D Studio MAX program; **Able to:** − create a stationary three-dimensional scene in accordance with the rules of artistic and technical design, taking into account color and texture solutions; − create a simple animated three-dimensional scene using the 3D Studio MAX program; **Possess skills:** − Creating 3D graphics in 3D Studio MAX, Autodesk 3ds Max and AutodeskMaya 3d. − Develop graphic and multimedia design
13	Modern methods and means of Java programing	3	Object-oriented programming in C++, Programming languages	Production (III)	**Aim:**To master methods and tools, as well as the basics of programming for Windows in Java and prepare for their active use in solving problems of the chosen specialty. **Content:** The data structure and the operations that apply to them. Control operators. Data input and output. Arrays. Editing arrays. Working with files. Working with strings. Handling special cases. Object-oriented programming in Java. Properties of target programming. Packages and interfaces. Graphic primitives. Integrated Java environment. Simple Java applications.

					Expected result: **Know:** − data types, characteristics, operations, language operators; − principles of object-oriented programming; − Fundamentals of computer networks and network associations, Internet services, concepts, Java programming environment. **Able to:** − use classes to process applications; − work with files; use the principles of building a graphical interface, graphical primitives; convert applets. **Possess skills:** − work with operators, with arrays of application processing; − creating classes, class methods, publishing objects; − creating client components and applications; − works with Java network technologies.
13	Modern methods and means of NET programing	3	Programming languages and technologies, Functional programming	Production (III)	**Aim:** Mastering methods and tools, as well as the basics of programming under Windows on NET and preparing for their active use in solving problems of the chosen specialty. **Contents:** Fundamentals of computer networks and network associations. Internet services. Concepts of the World wide Web. **Expected result:** **Know:** − data types, characteristics, operations, language operators; − principles of object-oriented programming; − fundamentals of computer networks and network associations, Internet services, concepts, NET programming environment. **Able to:** − use classes to process applications; − work with files; use the principles of building a graphical interface, graphical primitives; − convert applets. **Possess skills:** − work with operators, with arrays of application processing; − creating classes, class methods, publishing objects; − creating client components and applications; − works with NET network technologies.
14	The use of data in machine learning	3	Computer modeling	Fundamentals of robotics and artificial intelligence	**Aim**: this academic discipline is carried out as a series of lectures and practical classes that introduce students to the theoretical foundations and algorithms of machine learning, their practical implementation and use in solving specific problems. Within the framework of this course, students should have an idea of the principles of constructing some of the main classifiers and the problems solved using the theory in question. **Content**: Introduction to machine learning. Statistical evaluation and hypothesis testing. Machine learning as mathematical modeling. Introduction to linear models and the regression problem. Linear models and classification problems **Expected result:** **Know**: - principles of constructing feature vectors, decision rules, and classification; - the main types of classifiers; - principles of construction of linear classifiers; - principles of construction of nonlinear classifiers; - selection of classification features and features of data preprocessing. **Able to**: - choose the appropriate type of classifier depending on the task being solved; - select feature sets for classification and pre-processing

					data;
					- use algorithms for training and compiling a classifier for selection; - perform calculations related to the study and operation of the classifier in the MATLAB environment **Possess skills:** - selection, creation, training and use of basic classifiers problem solving
14	Introduction to machine learning and data analysis	3	3D graphics and animation	Robotic systems and complexes	**Aim:** mastering the skills of working in Python, knowledge and understanding of data management tasks, including data loading, data transformation and preliminary data analysis and visualization, familiarization with the main tasks and models of machine learning, knowledge of methods for evaluating the quality of various machine learning models, understanding the process of combining machine learning models within the tasks facing potential customers. Increasing students' interest in further deepening their knowledge in the field of working with data and machine learning **Contents:** discrete analysis and probability theory. Introduction to machine learning. Neural networks. Model selection criteria and feature selection methods. Logical classification methods. Clustering methods **Expected result:** **Know**: - the main ways of data transformation; - the main stages of the machine learning project **Able to**: - working with arrays - Formalize business tasks as machine learning tasks - find solutions to machine learning problems in specific business tasks **Possess skills:** - loading, converting, cleaning and visualizing data in python - application of machine learning models in python - quality assessment and interpretation of the results obtained
15	Architecture of the blockchain system	3	Decentralized applications	Production (III)	**Aim:** This course is aimed at understanding and developing the architecture of blockchain systems. **Content:** Blockchain Architecture, blockchain and Trust Architecture, database architectures and blockchain Architectures (Explanation of the types of blockchain architectures), algorithmic management using smart contracts, hierarchical and alternative blockchain structures, from blockchain to distributed ledger technologies (DLT). **Expected result:** **Know:** − the inner workings of smart contracts as a means to develop decentralized applications; − interaction between a closed network of smart contracts and the outside world, − about the further consequences of these interactions - to understand the set of technologies that support the network's core decentralized data storage network (for example, IPFS, Swarm, Filecoin) **Able to:** − define the key characteristics of the blockchain (i.e. decentralization, permanence, anonymity, verifiability, etc.); − explain the different levels of components that make up the architecture of the blockchain-based system; − understand the problems of consensus algorithms at a high level; − understand algorithmic execution in DLT, their consensus model, code execution, its network operation, storage options and the main actors who participate in each protocol;

					− understand the underlying incentive and management models; **Possess skills:** − forecasting the development and implementation of DLT in the future based on various use cases; − understanding how other emerging technologies (for example, IoT and AI) can be used in combination with blockchain
15	Ethereum, Web3 and Truffle development environments	3	LMS technologies	Production (III)	**Aim:** create a node of your own private Ethereum blockchain for further work within the framework of this course on the Ubuntu and Debian server **Content:** Introduction to working with Truffle and installation instructions. A project in the Truffle environment. contracts on the Ethereum network **Expected result:** **Know:** − information about the Ethereum network node **Able to**: − rent a virtual or cloud server from one of the providers **Possess skills:** − working with the Geth node
16	Fundamentals of robotics and artificial intelligence	4	Programming No Code/ Lo Code	Production (III)	**Aim:** disciplines: familiarization of students with the basics of robotics, training of mobile robot programs **Contents:** Fundamentals of robotics. Physical fundamentals of robotics.Information in modeling, information processes.Fundamentals of design.Mobile work. From simple to complex.Algorithmization. Programming of mobile robots.Solving applied problems. Educational robotics. **Expected result:** **Know**: − mathematical models of automation and robotization systems of production processes using modern software products; **Able to**: − design automation and robotics systems; comparative analysis using modern software products for the robotization of technological complexes and automation systems of production processes in various industries, as well as artificial intelligence methods.; **Possess skills**: − formation of modern trends in the development of robotics systems and automation of production processes
16	Robotic systems and complexes	4	Object-oriented programming	Production (III)	**Aim:** developing the ability to express oneself creatively in the process of creating robotic systems by acquiring design skills. **Content**: Robot actuators.Computing devices in the control system of robots and flexible production modules. Software control systems for industrial robots. Adaptive robot control systems. Robot sensitivity systems.Remotely controlled robots and manipulators. Solving software problems of the application of robotic systems. **Expected result:** **Know**: - industrial robot control systems; about remotely controlled robots; **Able to**: - solve programming problems using robotic systems **Possess skills**: - formation of work on the organization of processing; - organization of work on the collection, storage and processing of information used in the field of professional activity
MAJORS					
Be sure to select (MSS)					
1	Fundamentals of component	5	Programming languages	Production (III)	**Aim**: Training in modern methods and means of component programming.

	technologies				**Content**: Extensions of the C++ language in the C++ Builder environment.Additional data types.Additional scopes. The PME model. Features. **Expected result**: − basic concepts of component programming technologies; − mechanisms for implementing component programming technologies in the VCL Visual components library; − principles of event-oriented programming; − Be able to: − analyze the subject area and select the library classes needed to solve applied problems; − Use the tools of the C++ Builder integrated environment for visual application development. **Possess skills:** − development of user interfaces of applications based on universal and specialized components of the VCL library;
1	Component technologies and distributed software development	5	Programming languages and technologies	Production (III)	**Aimю** Familiarity with the concepts of a distributed information system, distributed information processing, as well as the principles and problems of this subject area. **Contents:** Basic mechanisms of distributed object technologies. Integration problems in distributed applications. Internet technologies when creating distributed applications. **Expected result**: **Know***:* − main types of distributed applications; − modern technologies for building and developing distributed applications; − basic distributed object technologies and architectures (service-oriented architecture, component architecture, agent architecture, CORBA architecture). **Able to:** − develop distributed applications using socket technologies, remote procedure calls, component models, CORBA, web services; − choose the development technology based on the specifics of the application. **Possess skills:** − development of distributed applications of various types; − application of object-oriented programming in distributed systems
2	Information security and information safety	5	Probabilities theory and Math statistics	Distributed systems technologies	**Aim:** Formation of students' knowledge system in the field of information security and application of information protection methods in practice. **Content:**Information protection in computing systems multilevel protection of corporate networks; information protection in networks; requirements for information protection systems **Expected result**: **Know:** − the main computer subsystems that cover concepts such as system trunks, internal and external memory; − requirements for information security systems; − on the protection of corporate networks, principles of ensuring the security of information processing systems; − the main characteristics of cryptographic methods of information protection. **Able to:** − in practice, use means to protect information from unauthorized access and destructive software influences. **Possess skills**: − access to electronic information resources, databases, as well as libraries, archives; − adaptation of information resources and information

					technologies; − work with documents containing information
2	Information security	5	Discrete Math	Technologies for the development of distributed information systems	**Aim:** Formation of students' knowledge and skills in the protection of computer information with the use of modern software and hardware. **Content:**Information securityвычислительных системах многоуровневая защита корпоративных сетей; Information securityв сетях; требования системам защиты информации. **Expected result**: **Know***:* - the main types of distributed applications; - modern technologies for building and developing distributed applications; - basic distributed object technologies and architectures (service-oriented architecture, component architecture, agent architecture, CORBA architecture). **Able to:** - develop distributed applications using socket technologies, remote procedure calls, component models, CORBA, web services; - choose the development technology based on the specifics of the application. **Possess skills:** - - development of distributed applications of various types; - - application of object-oriented programming in distributed systems
3	Microcontrollers and microprocessor systems	5	Digital circuit desing	Internet of things	**Aim:** Teaching students the principles of construction, functionality and architectural solutions of modern microprocessor systems (MPS), microcontrollers (MC) and personal computers, as well as mastering the design techniques of microprocessor systems. Contents: Fundamentals of the organization and tasks of designing microprocessor systems (MPS). Architectures of microprocessors, MPS and microcontrollers (MC). Peripheral equipment management in MPS Data processing, management Organization of interfaces in MPS and MC Design of MPS **Expected result:** **Know:** − software and logic model of the microprocessor 1810VM86; − operating modes of the microprocessor 1810 VM86; − principles of building microprocessor systems; − a software-logic model of microcontrollers of the 1816 series; − operating modes of the micro-computer 1816 VE48; **Able to:** − build microprocessor systems based on kits 1816 and 1810; − test microprocessors as part of computers; **Possess skills:** - drawing up electronic circuits for the operation of microprocessors and switching methods
3	Fundamentals of microprocessor technology	5	Digital circuit desing	Design of Distributed Control Systems	**Aim:** Familiarization of students with the classification of microprocessor systems (MPS), basic architectures of MPS, functional nodes and the principle of operation of the processor, by studying the architecture, the command system, the procedure for working with the main peripheral devices and subsystems of a particular single-chip RISC microcontroller, to consolidate the basic theoretical provisions **Contents:** Overview of the AVR family MK. Basics of programming in the assembly language MK AVR. Introduction to peripheral devices in MK AVR. **Expected result:**

					Know: − principles of construction of electronic devices based on modern element base and MPS; − principles of functioning of electronic devices based on modern element base and MPS; − main technical parameters, operational characteristics and applications of the main devices and functional components of electronics and MPS; − the basic principles of designing circuits based on MPS. **Able to:** − carry out the design and calculation of standard MPC nodes; − to select the MPS for the required task. **Possess skills**: − performing analysis and synthesis of electronic circuits with MPS; − design and calculation of electronic devices using a computer.
4	Artificial intelligence systems	5	Operating systems	Preparation of theses	**Aim:** Formation of a systematic basic understanding, primary knowledge, skills and abilities of students on the basics of engineering and neuroinformatics. Contents: The history of artificial intelligence. Concepts of applied artificial intelligence systems. First-order predicate logic. Semantic networks. **Expected result:** **Know:** − basic theoretical and practical skills of system programming at the level of program development, allowing to obtain modern programs of complex logical structure at the lowest cost; − about the composition and principles of management of PC systems and networks; about the purpose of the components of the operating system; the principles of functioning of various elements of operating systems.; − generation and processing of processes in the system; **Able to:** − develop programs covering system software issues. **Possess skills:** − working with various operating systems and their administration; − procedural and object-oriented programming languages, skills in developing and debugging programs in at least one of the high-level algorithmic procedural programming languages.
4	Intelligent animation	5	Operating systems, среды и оболочки	Preparation of theses	**Aim:** Formation of a systematic basic understanding, primary knowledge, skills and abilities of students on the basics of engineering and neuroinformatics. **Contents:** The history of artificial intelligence. Concepts of applied artificial intelligence systems. Animation. Types of animation. Intelligent animation. Creation of short films. **Expected result:** **Know:** − the history of artificial intelligence. − about applied artificial intelligence systems. − types of animation. **Able to:** − navigate different types of intelligent systems; − navigate through different methods of knowledge representation, move from one method to another; **Possess skills:** − development of production knowledge bases for solving the problem of choosing options in a poorly formalized subject area; − applications of basic neural network models
5	Smart Contract Architecture	3	Decentralized applications		**Aim: изучить** This course is aimed at understanding the numerous possibilities of creating decentralized applications using the Web3

					stack and the Solidity language on the Ethereum Virtual Machine (EVM). **Content:** Introduction to Blockchain and Ethereum, introduction to Smart contracts, blockchain technology and support for languages with full Turing, virtual machines, introduction to the DApp development pipeline, deep immersion in Solidity, global variables and functions, expressions and control structures **Expected result:** **Know:** Ethereum models, consensus models, execution code, network operation, data storage options and the main actors who participate in its protocol; the inner workings of smart contracts as a means to develop decentralized applications; **Able to**: - develop smart contracts using the Solidity programming language (including a deep understanding of the libraries provided); - to understand the interaction between the closed network of smart contracts and the outside world, to realize the further consequences of these interactions for the aspect of decentralization; **Possess skills:** - use of the smart contract development lifecycle (contract implementation, testing, deployment and contract migration); - a set of technologies that support a backbone decentralized data storage network (for example, IPFS, Swarm).
5	Working with Ethereumm	3	LMS technologies	Preparation of theses	**Aim:** develop your own application for working with the Ethereum-based blockchain. At the end of the course, you will create a wallet program for storing cryptocurrencies with the possibility of access by several people. **Content:** The Ethereum blockchain. Creation and testing of the simplest smart contracts. Data storage and processing in distributed registries. Implementation of gaming smart contracts. **Expected result:** **Know:** - algorithmic programming languages, operating systems and shells, modern software development environments **Able to**: – make algorithms, write and debug codes in the programming language, test the program's performance, integrate program modules **Possess skills**: – programming language; debugging and testing skills of the program
6	Internet of things	3	Microcontrollers and microprocessor systems	Production (III)	**Aim:** to study the organization of automated systems based on the Arduino microcontroller, the use of these systems in the automation of scientific experiment, practical skills of working with modern controllers, solving automation problems. **Content**: Applied electronics. Case "computer vision". Software development. The "game console" case. Web technologies. The case of the "smart home". Fundamentals of design. Case "smart mirror". **Expected result:** **Know:**

					- principles of organization and functioning of the Internet of things - The history of the emergence and development of the "Internet of Things" - the main factors of the development of the "Internet of things" - Existing technologies in the Internet of Things industry - The main trends and trends in the field of "Internet of Things". **Able to**: - work with microcontrollers and basic repair plates (Arduino and Raspberry Pi)) - understand existing IoT technologies and their application to specific scenarios - design of integrated IoT systems (including end devices, network connections, data exchange, cloud platforms, data analysis). **Possess skills:** - terminological apparatus - basic end device programming skills - basic skills for connecting end devices to the network − basic cloud technologies for the development of software solutions for data processing and storage.
6	Design of Distributed Control Systems	3	Fundamentals of microprocessor technics	Production (III)	**Aim:** Mastering the concept and methodology of analysis and synthesis of complex systems, principles of information systems design **Content:** Stages and stages of SU design. Preliminary design. Analysis and synthesis of data processing systems. Synthesis and analysis of the control system. Measures to assess the quality of the designed system. Synthesis of the ASOI structure. **Expected result**: **Know:** − properties, characteristics and architectures (structures and topologies) of distributed control and automation systems (DCS), − types of support {methodological, technical, software, informational, metrological, ergonomic and organizational-legal); - functional tasks and performance criteria of the DCS; **Able to:** − to carry out projects of automation tools, automation systems of technological processes: − perform automation of scientific research and testing: − design and implement algorithms for preprocessing information (compression, filtering, improving the accuracy of conversion, etc.), − To build modern control algorithms (modal, neuro-fuzzy, network-centric, etc.). − to determine the network section with the maximum delay of IP packet transmission; − generate HTTP requests and analyze HTTP response fields; − develop hypertext documents. **Possess skills**: - performing formal construction and transformations of analytical and simulation models of DCS; - application of methods and techniques of analysis and synthesis of DCS architectures; - development and use of analytical and simulation models of DCS to evaluate design solutions; - implementation of the sequence of stages of design of control and automation systems.
7	Programming on PHP	5	Object-oriented programming in C++, Programming languages	Production (III)	**Aim:** Currently, it is one of the most popular languages for implementing web applications. This course is devoted to the study of its basics. The emphasis is on the practical application of the acquired skills. The PHP language was created to solve a specific practical problem in the Internet environment. Familiarity with the PHP language, development of web application design and

					programming skills. **Contents:** The methods of separating instructions, creating comments, variables, constants and data types, operators are considered. Conditional statements (if, switch), working with loops (while, for, foreach) and using the include, require functions. **Expected result:** # Know: - assignments, functions, classification of PHP programming, - principles of operation of Internet services; - principles of organization and operation of web information processing technologies and the Internet **Able to**: - создавать статические и динамические страницы. - создавать концептуальное предложение в WEB страницах с использованием технологий для создания сайта и опубликовать его в Интернете **Possess skills:** - programming and client-server technologies.
7	Web programming	5	Programming languages and technologies, Functional programming	Production (III)	**Aim**: The discipline "Web Programming" aims to study the basics of Java programming and basic concepts that allow students to get a basic understanding of effective ways to develop Web applications along with the acquisition of practical skills. Content: Introductory lecture. The subject of the course, the emergence and development of Java. Java virtual machine. Algorithmic tools of the Java language. Vocabulary of the language. Data types. Operations. Control structures. Naming rules. Packages. Objects and classes. **Expected result**: # Know: - technologies for developing static websites; - techniques for using multimedia (graphics, video, animation) on web pages; - client-side software tools used to create web pages; **Able to:** - design and develop the structure of the site; - use HTML hypertext markup language and cascading style sheets (CSS) to create web pages; - develop scripts in the JavaScript programming language; **Possess skills:** - creation of web sites;
8	Blockchain Business Models	3	Introduction to Web 3	Production (III)	**Aim:** This course is aimed at analyzing entrepreneurship and innovation management based on blockchain technology. **Content:** The importance of innovation, the innovative nature of digital currencies / blockchain / DLT, the management and dissemination of blockchain innovations, the transformation of blockchain ideas into a business plan, the application of design thinking and strategy in blockchain projects, risk analysis and management **Expected result:** **Know:** – business opportunities, design and develop new blockchain-based services, as well as create and develop a successful business; **Able to**: – develop ideas and innovative strategies; **Possess skills:** – development of a business model that conforms to the principles of digital currencies, decentralization and the growth of peer-to-peer transactional relationships between producers and consumers.
8	The basics of blockchain and cryptocurrencie	3	Introduction to Internet Marketing	Production (III)	**Aim**: the study of the features of blockchain technology and the use of cryptocurrencies, the formation of skills and abilities of investing in cryptocurrencies and the use of the ICO mechanism for

					the financial support of an innovative project.
	s				**Content:** Cryptocurrency and Markets. Mining and cryptocurrencies — how to use and interact. Cryptocurrencies and smart contracts **Expected result:** **Know:** − features and principles of functioning of cryptocurrencies, their types; − the importance of blockchain technology in the functioning of cryptocurrency instruments; − the main types of consensus in blockchain technology: PoW (Proof-of-work) and PoS (Proofof-stake); − the main ways to invest in cryptocurrencies; − features of existing cryptocurrency trading platforms; **Able to**: − to develop the specifics of legal regulation of operations on the cryptocurrency market in different countries of the world; − to solve the problems of state regulation in the application of blockchain technology and the use of cryptocurrencies; **Possess skills:** − raising funds through the mechanism of initial coin issuance (ICO).
9	Distributed systems technologies	5	Information security and information safety данными, Computer networks and telecommunications	Production (III)	**Aim:** To reveal the essence of distributed computing technology, principles and technologies of distributed databases, to characterize the technologies and models of "Client-server" used in modern enterprises Content: Distributed computing technologies. Distributed databases Client-server technologies and models Object data binding technologies Data replication technologies **Expected result:** **Know:** - principles of building distributed information processing systems; - database distribution; - Client-server network technology and models; -technologies of object data binding. **Able to:** − use technologies for the construction and operation of distributed information systems. **Possess skills:** − work with modern systems of design and development of distributed systems.
9	Technologies for the development of distributed information systems	5	Information security, Technics of computer and communication systems	Production (III)	**Aim:** Theoretical and practical training of students in the field of information technology to such an extent that they can choose the necessary technical, algorithmic, software and technological solutions, be able to explain the principles of their functioning and use them correctly. **Content:** Communication in distributed systems. Remote procedure call. Safety. Types of connections. Distributed transactions. The concept of a transaction. The ACID principle. Nested transactions. Distributed transactions. **Expected result:** **Know**: − principles of building distributed information processing systems; − communication in distributed systems; − types of links; − the concept of a transaction **Able to**: − use technologies for building and operating distributed information systems.

					Possess skills: - work with modern systems of design and development of distributed systems
10	Software development technology	6	Distributed systems technologies	Production (III)	**Aim:** The study of software classification, tools and methods of software tools, tools and methods of detection, tool processing and compilation, downloading, installing software characteristics of devices, their information support, software support and implementation, practical application of modern processing tools. **Content:** Introduction. State and foreign regulatory documents, determination of the composition of treatment. RUP. Application processing. DC. Logical design tools and methods. UML. Description of the processing functionality. Tools and methods. Creating a cluster diagram. Methods, technologies, tools. Define the processing language, define the distribution environment, and define the processing tools. Physical design procedure - order, tool, resource, documentation Visual programming tools - MS VisualStudio, BorlandDelphi and others. Selecting and editing components, processing components. Open the API TOOL. Software repair. **Expected result**: **Know:** – current trends in the development of computer science and computer technology, computer technology; – fundamentals of creating information systems and the use of new information technologies for information processing; **Able to:** – apply mathematical methods, physical laws and computer technology to solve practical problems; – program in one of the algorithmic languages; – apply information retrieval algorithms in software development. **Possess skills**: – drafting projects for the development of modern software; – technologies for collecting, processing, transmitting and storing information. – software development – comparative analysis of the choice of tools.
10	Software development process	6	Technologies for the development of distributed information systems	Production (III)	**Aim:** Study of classification, life cycle, technology of rapid software development, **Content:** The life cycle of the software. Identification of requirements for the software system. Working with the customer. Overview of software product design methodologies. Technologies of rapid software development. Object-oriented software system design. Information support tools for software projects and products (CALS) technologies. Testing and debugging of software systems. Software quality assessment. Implementation and maintenance of software products **Expected result**: **Know:** - theoretical foundations of instrumental software; – classical and modern methods of building the information structure and interface of the tool. **Able to**: – choose tools when creating software; – apply software building standards; – to evaluate the effectiveness of the tools and analyze the qualitative characteristics; – to realize the economic efficiency of the software; - apply object-oriented and structured distribution methods in control and measuring devices. **Possess skills:** – software development;

					− comparative analysis of the choice of tools.
11	Introduction to Web 3	2	Decentralized applications	Blockchain Business Models	**Aim**: This course is aimed at understanding the basic principles of decentralization and the use of web 3 to create various types of decentralized applications. **Content:** the difference between web2 and web3, the basic principles of decentralization, distributed IPFW and Swarm systems, Ethereum protocols, the creation of smart contracts for voting tasks, asset management and identification. **Expected result:** **Know:** smart contract deployment; **Able to:** apply protocols in web 3 applications **Possess skills:** applications of decentralization in applications; web 3 application development;
11	Introduction to Internet Marketing	2	LMS technologies	The basics of blockchain and cryptocurrencies	**Aim:** The purpose of studying the discipline is to form students' solid knowledge in the field of applying the capabilities of Internet technologies in promoting an enterprise to the market, as well as the practical application of the knowledge gained in the marketing course, the acquisition by students of the skills and abilities necessary for successful work as marketing specialists at enterprises of any form of ownership. **Content:** Overview of Internet marketing tools. Development of an Internet marketing strategy. E-mail marketing. Social Media and New Media Marketing **Expected result:** **Know:** − key concepts, goals and objectives of Internet marketing; specifics of the work of projects in the Internet space; characteristic mistakes that should be avoided in Internet projects; − how to competently build business communication; − theoretical foundations of business communications, their main types and materials; − business communication, its structure and principles; − psychological characteristics and types of subjects of the communicative process **Able to:** − to compose and describe the entire life cycle of an Internet project, starting from the birth of an idea and ending with extinction; − to analyze any segment of the Internet business, to evaluate the effectiveness, monetization, work with the audience; − prepare analytical reports on all areas of the project's life (market analysis, competition assessment, promotion methods, approaches to working with the audience, quantitative indicators, sources of funding); − formulate questions, critically evaluate the selection of promotion tools; **Possess skills:** − information in global computer networks and corporate information networks; − the use of modern tools used in carrying out a complex of works on Internet marketing; − business communication technologies, a wide range of communication techniques and techniques for establishing contact with the interlocutor, creating an atmosphere of trusting communication; − organization of feedback for the purpose of their effective use in professional activities;

					− methods of cognition of the personality of the communication partner

LIST OF COMPONENTS BY CHOICE
B057- Information technologies
«6B06124 «Computational technology and software»
DISCIPLINE LIST
elective courses

Form of training: Full-time
Training period: 4 years

Name of discipline	Code of discipline	Number of credits	Semester
Basic disciplines			
Component on a choice 1			
Introduction to Blockchain	IB 2212	5	2
Fundamentals of Blockchain technology	FBT 2212		
Component on a choice 2			
Setting up, repair, optimization and maintenance of computer systems	SROMCS 2213	5	2
Maintenance and repair of computer systems and complexes	MRCSC 2213		
Component on a choice 3			
Theory of information processes	TIP 2214	5	3
Information technologies	IT 2214		
Component on a choice 4		3	
Decentralized applications	DA 2215		2
LMS technologies	LMST 2215		
Component on a choice 5			
Programming No Code/Lo Code	PNC/LC 2216	5	1
Object-oriented programming	OOP 2216		
Component on a choice 6			
Probabilities theory and Math statistics	PTMS 1217	3	2
Discrete Math	DM 1217		
Component on a choice 7			
Operating systems	OS 3218	5	4
Operating systems, environments and shells	OSES 3218		
Component on a choice 8			
Programming languages	PL 3219	5	4
Programming languages and technologies	PLT 3219		
Component on a choice 9			
Computer networks and telecommunications	CNT 3220	5	4
Technics of computer and communication systems	TCCS 3220		
Component on a choice 10			
Object-oriented programming in C++	OOPC 3221	5	3
Functional programming	FP 3221		
Component on a choice 11			
Database programming	DP 4222	3	4
Programming on 1C	P1C 4222		
Component on a choice 12			
Computer modeling	CM 4223	5	3
3D graphics and animation	3DGA 4223		
Component on a choice 13			
Modern methods and means of Java programing	MMMJP 4224	3	5
Modern methods and means of NET programing	MMMNP 4224		
Component on a choice 14			
The use of data in machine learning	TUDML 4225	3	5
Introduction to machine learning and data analysis	IMLDA 4225		
Component on a choice 15			5

Architecture of the blockchain system	ABS 4226	3	
Ethereum, Web3 and Truffle development environments	EWTDE 4226		
Component on a choice 16			5
Fundamentals of robotics and artificial intelligence	FRAI 4227	4	
Robotic systems and complexes	RSC 4227		
The main subjects			
Component on a choice 1			
Fundamentals of component technologies	OKT 3305	5	5
Component technologies and distributed software development	CTDSD 3305	3	
Component on a choice 2			
Information security and information safety	ISIS 3306	5	3
Information security	IS 3306	5	
Component on a choice 3			
Microcontrollers and microprocessor systems	MMS 3307	3	4
Fundamentals of microprocessor technics	FMT 3307	5	
Component on a choice 4			
Artificial intelligence systems	AIS 3308	5	5
Intelligent animation	IA 3308	5	
Component on a choice 5		3	
Smart Contract Architecture	SCA 3309	5	5
Working with Ethereum	WE 3309	5	
Component on a choice 6			
Internet of things	IT 3310	5	5
Design of Distributed Control Systems	DDCS 3310	3	
Component on a choice 7			
Programming on PHP	PPHP 4311	5	5
Web programming	WP 4311	5	
Component on a choice 8		3	
Blockchain Business Models	BBM 4312	5	6
The basics of blockchain and cryptocurrencies	TBBC 4312	5	
Component on a choice 9			
Distributed systems technologies	DST 4313	5	6
Technologies for the development of distributed information systems	TDDIS 4313	6	
Component on a choice 10			
Software development technology	SDT 4314	6	
Software development process	SDP 4314		6
Component on a choice 11			
Introduction to Web 3	IW 3315	2	4
Introduction to Internet Marketing	IIM 3315		