Educational institution "Alikhan Bokeikhan University"

Faculty of Information Technology and Economics

Department " Information and Technical Sciences"

6B06122 «Informatics»

CATALOGUE OF THE ELECTIVE COURSES

Year of admission-2024

Semey, 2024

Considered and approved at the meeting of educational-methodic Council of the faculty of Information Technologies and Economics

Minutes № _4_____ from «_15_» __03___ 2024___ y.

The head of EMC of the faculty _____

Approved at the meeting of EMC of the University

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The chairman of EMC of the University _____

Academic degree: bachelor of engineering and technology in the educational program "6B06122 Informatics"

Course of education: 6B06122 - Informatics

Elective course №	Discipline	Number of credits	Prerequisites	Postrequisites	Brief description indicating the purpose of the study, an outline and expected learning outcomes (knowledge, skills, competence)
BASIC DISCIPLINES					
Be sure to select (BSS)					
1	Computer architecture	4	School informatics	SOFTWARE development basics	**The purpose of studying this discipline** is to familiarize with the basic concepts of architecture of a modern personal computer(PC), with the device of the most important components of PC hardware, mechanisms for transmitting and managing information, and the main provisions of logical design. **Contents:** Types of information in the computer, coding methods. The logical foundations of the computer, elements and nodes. Computer architecture. A basic understanding of the architecture of a computer. Technology to improve processor performance. The concept of multi-stage memory. External memory. Interfaces. Organization of the break. Architecture of microprocessor system. Classification of parallel data processing system. Organization of parallel computing in modern processors. Technology of production of the MP. Links MP and their main characteristics. **Expected result:** **Know:** basic concepts and principles of building the architecture of computer systems; types of computer systems and their architectural features; principles and organization of the main logical blocks of computer systems; information processing processes at all levels of computer architecture; the main components of computer systems software; basic principles of resource management and organization of access to these resources. Be able to:to obtain information about the parameters of the computer system.; to connect additional equipment and configuration of communication between

					elements of the computer system; Installation and configuration of software for computer systems. **Skills:** analysis of the work of computers, hardware upgrades of computers.
1	Techics of computer and communicati on systems	4	School informatics	SOFTWARE development basics	**The purpose of studying this discipline:** familiarization with the basic concepts of architecture of a modern personal computer (PC), familiarization with the device of the most important hardware components. **Content:** methods and types of aircraft organization; parallel information processing: levels and methods of organization; implementation on multi-machine and multi-processor aircraft; operating pipelines; vector, matrix, associative systems; homogeneous systems and environment; RISC architecture; development of architecture focused on language tools and programming environment; fundamentals of the metric theory of aircraft; distributed data processing technology; principles and architecture of computer networks; protocols, hierarchy and modes of operation: principles ; information transfer in computer networks; communication channels, modems; encoding and error protection; packet structure; methods of switching channels, messages, packets; routing; basic means of data transmission; local area networks (LAN). **Expected result:** **Know:** hardware of computer and communication systems, as well as their technical characteristics and functionality. Be able to: apply knowledge and skills in the preparation of applied practical problems using computer and communication systems technology. **Skills:** applying basic computer and communication systems techniques
2	Application packages program	6	School informatics	SOFTWARE development basics	**Purpose:** Acquaintance of students with the software that can be used in the preparation of publications on the computer and technology integrated publishing systems, practical computer skills, receive hands-on experience with desktop publishing systems **Contents:** Classification of software products. Definition and stages of ASP development. Classification and types of ASP. Problem-

					oriented and method-oriented ASP. General-purpose ASP. Computer aided design and multimedia software. Office of the ASP. Desktop publishing systems. **Learning outcome:** **Know:**concept of software;development stages of a package of applied programs;history and stages of development of publishing in Kazakhstan; the concept of office software packages; the concept of desktop publishing;the concept and purpose of technical publishing tools;basics of working with the AdobePageMaker publishing system. **To be able:** classify software products depending on their purpose; classify application packages into types; create texts with publications in AdobePageMaker;work with objects in AdobePageMaker; format texts in AdobePageMaker. **Skills:** creation of publications by means of the program MicrosoftWord with possibilities of layout and layout; creation of documents in Microsoft Office Publisher; receptions and ways of creation of booklets and layout of layouts of work in MicrosoftOfficePublisher;work in publishing systems;receptions and work with the text, objects in AdobePageMaker; receptions and creation of multipage publications in AdobePageMaker.
2	Integrated software systems	6	School informatics	SOFTWARE development basics	**Purpose:** The purpose of the discipline is to create libraries, services, and software applications. To study the typical classes of control systems application software, the principles of building integrated software systems, to work with a text editor and spreadsheets, as well as with the Ms-Works DBMS system. **Content:** Study typical classes of application software for control systems, principles of building integrated software systems, work with a text editor and spreadsheets, as well as with the Ms-Works DBMS. Expected result: Know: - Basic classes of application software for control systems. - Principles of building and designing

					integrated software systems. - Features of working with text editors, spreadsheets and the Ms-Works DBMS. - Methods and technologies for developing libraries, services and applications. Be able to: - Create software libraries, services and applications. - Work with text editors and spreadsheets for data processing. - Use the capabilities of the Ms-Works DBMS for database management. - Apply the principles of software integration in real projects. - Analyze and select typical application software for control systems. For the discipline "Integrated Software Systems" the skills may be as follows: Skills: - Development of software libraries, services and applications for integrated systems. - Working with text editors and spreadsheets to create and process documents. - Operational management of databases using the Ms-Works DBMS. - Integration of various software modules and systems to solve applied problems. - Optimization and automation of processes using integrated software solutions. - Analysis and selection of suitable tools for creating and managing software. - Creation of user interfaces and interaction with other applications within integrated systems.
3	Informational resources	6	Information and communicatio n tecnologies	Web development	**The purpose of studying this** discipline is to form the knowledge and skills necessary for managing information resources in solving professional, educational and scientific tasks that meet the requirements of the information society. **Content:** web content, text, graphic and multimedia content of websites, information support for business processes of organizations. **Expected result:** **Must know:** legal norms of information activity the state of the world market of information resources the process of formation of information resources, the structure of information resources, prospects for the development of information resources and

					the information society. **Be able to:** use personal computers to search and process information, create and process documents; use of computer programs, Internet resources; work with electronic documents. **Skills:** access to electronic information resources, as well as libraries and archives.
3	Information resources and technologies	6	Information and communicatio n tecnologies	Web development	**The purpose of studying this discipline:** effective performance of professional tasks, search and use of information necessary for professional and personal development. **Contents:** Information system. Classification of information systems. Life cycle of information systems. The main phases of information system design the Structure of the information system life cycle. Models of information system life cycle. Methodology and technology of information systems development. Relational database. Relational database management. Managing database objects **Expected result:** **Know:** theoretical bases of construction and functioning of modern personal computers; types of computer networks; principles of multimedia use; functions and technologies of information and telecommunication services.; **Be able to:** search for necessary data using query languages and directories in various information systems (databases, electronic libraries, websites), organize access to information resources, organize the work of specialists with information resources: **Skills:** Methods of searching and analyzing information on the Internet; search for information from various sources; analysis of relevant information, clarification of demand in order to improve search efficiency; work with modern information resources.
4	Discrete mathematics	5	Mathematics 1	Numeral Methods	**Purpose:** the course of discrete mathematics is one of the elements of the Foundation of the student's education, which is of great importance for the successful assimilation of General and special disciplines and allows you to navigate the flow of scientific and technical information. The study of discrete mathematics contributes to the development

					of logical and algorithmic thinking of students, the development of their research techniques and solutions of mathematically formalized problems, the development of the ability to independently analyze applied problems and expand, if necessary, their mathematical knowledge. **Content:** Basic concepts and techniques of discrete mathematics; logical operations, formulas of logic, laws of algebra of logic; the main classes of functions, the completeness of the set of functions; basic concepts of set theory, set-theoretic operations and their connection with logical operations; predicate logic, binary relations and their types; elements of the theory of mappings and algebras of substitutions; the method of mathematical induction; algorithmic enumeration of the main combinatorial objects; Basic concepts of graph theory, characteristics and types of graphs. **Learning outcome:** **Know:** basic concepts of sets; algebraic methods of model description; elementary functions of the algebra of logic, properties and their analytical representation;bases of logical calculus of statements and predicates; methods for solving classical problems formulated in terms of combinatorics. **To be able:** apply combinatorial configurations to solve problems determine the type of binary relation and its properties, perform operations on sets, represent graphs in various ways, perform operations on graphs, find the shortest path of the graph, build truth tables Boolean functions, perform identical transformations, find sdnf, SKNF, determine the minimum DNF. **Skills:** application of basic tools of discrete mathematics to solve applied problems; methods of construction, analysis and application of discrete models in professional activities.
4	Math statistics	5	Mathematics 1	Numeral Methods	**Purpose:** the purpose of the discipline is the formation of future specialists of theoretical knowledge and practical skills in such areas of higher mathematics as mathematical statistics. Also, the objectives of the study are to demonstrate to students the specifics

					and role of the course "Mathematical statistics" in the study of economic processes by the examples of mathematical concepts and methods. It is necessary to develop students ' ability to analyze the results, to instill the skills of independent work and study of literature. **Content:** basic concepts: events, their types. Random variable. Definition, types of random variables. Binomial law of probability distribution. Continuous random variables. Statistical estimation of distribution parameters. General and selective population. Variation series and its characteristics. **Learning outcome:** **Know:** the method of carrying out the evaluation of the probability of the main numerical characteristics of random variables; test the hypothesis about the parameters and laws of distribution of random variables; **To be able:** Calculate the probability of random events; **Skills:** calculating the numerical characteristics of random variables;
5	C# programming language	5	Information and communicatio n tecnologies	Systems of artificial intellect	**Purpose** The purpose of the discipline is to develop block diagrams of various algorithms in the C# environment, to organize the necessary data structures depending on the requirements of the task. Be able to choose the right methods for solving problems and develop programs using C# tools, write programs in a good style, debug and test programs, and compile high-quality software documentation. **Content:** develop structural diagrams of various algorithms in the C# environment, organize the necessary data structures depending on the requirements of the task. Be able to correctly select methods for solving problems and develop programs using the tools of the C# language, write programs in a good style, debug and test programs, compile high-quality program documentation. **Expected result:** **Know:** Basics of programming and C# syntax. How to use collections, handle exceptions and debug code. Control of the execution flow: conditional statements,

					loops. Development tools such as Visual Studio and version control systems. **Be able to:** Understand C# keywords, identifiers and literals. Be able to use basic language constructs such as operators, loops and conditional expressions. Solve problems using algorithms, data structures and object-oriented programming. Develop, implement and test software solutions in C#. **Skills:** These skills will enable students to become effective C# software developers.
5	Application design and development	5	Information and communicatio n tecnologies	Systems of artificial intellect	**Purpose:** The purpose of the discipline is to acquire theoretical knowledge and practical skills in developing and debugging programs in one of the professional programming languages. Solving problems using typical information technologies in a PC environment. The application of an object-oriented approach to the design and development of programs, the organization of libraries for visual programming, and the development of a graphical user interface. **Content**: Solving problems using typical information technologies in a PC environment. Applying an object-oriented approach to designing and developing programs, organizing libraries for visual programming, and developing a graphical user interface. **Expected results:** **Know**: Understanding the basic principles of OOP, such as encapsulation, inheritance, and polymorphism, and their application in the context of C#. **Be able to:** Ability to create classes, define their fields and methods, create objects of these classes, and interact with them. Knowing the difference between interfaces and abstract classes, as well as the ability to use them to create flexible and extensible applications. **Skills:** Ability to use a debugger to find and fix errors in code, as well as writing and running unit and integration tests to verify the correct operation of the program.
6	SOFTWARE development basics	5	Computer architecture, Application packages program	The theory of programming languages and translation methods	**Purpose:** The main purpose of the course is to prepare students for the use of technologies and tools for SOFTWARE development both in the process of studying at the University and in subsequent professional activities.

					Content: Programming in a high-level language. Object oriented programming. Theory of programming languages and methods of translation. Methods of functional modeling IDEF0.DFD data flow modeling methods. Software development technology Toolkit. Organization of collective work on SOFTWARE creation. **Learning outcome:** **Know:** visual programming Systems. Fundamentals of management theory. **To be able:** Methods and means of protection of computer information. **Skills**:brain-computer system. Arm and CAD. Interactive graphics systems. Artificial intelligence system. Programming on the Internet
6	Computer Software	5	Computer architecture, Application packages program	The theory of programming languages and translation methods	**Purpose:** to Promote the development of creative potential of students through the study of personal computer devices. To give an idea of modern information technologies. Learn to navigate the Windows operating system, use popular programs, the Internet. Learn to upgrade and repair PCs. **Contents:** Computer software, composition and structure. The purpose of the operating system. Team interaction of the user with the computer. Graphical user interface. **Learning outcome:** **Know:** the Hardware of the computer. **To be able** : Software computerization **Skills:** system, service and application software.
7	Robotics and the basics of artificial intelligence	5	Information and communication tecnologies	Systems of artificial intellect	**The purpose of studying this discipline:** to familiarize students with the basics of robotics, to teach the program of mobile robots **Contents:** Basics of work equipment. Theoretical fundamentals of robotics. Physical fundamentals of robotics.Information, information processes in moderation.Design basics.Mobile work. From simple to complex.Algorithmization. Programming mobile robots. The decision of applied problems. Educational robotics. **Expected result:** **Be able to:** analyze and evaluate mathematical models of robotic systems and

					automation of production processes using modern data software products; develop algorithms aimed at structure. **Be able to:** design automation and robotization systems; compare with the use of modern software products for robotization of technological complexes and systems for automating production processes in various industries, as well as artificial intelligence methods.; **Skills:** formation of modern trends in the development of production process automation and robotics systems
7	Robotic systems and complexes	5	Information and communication tecnologies	Systems of artificial intellect	**The purpose of studying this discipline is** to develop the ability to creative self-realization through the development of design skills in the process of creating robotic systems. **Contents:** Robot actuators.Computing devices in the control system for robots and flexible production modules. Software control systems for industrial robots. Adaptive robot control systems. Robot sensitivity systems.Remote-controlled robots and manipulators. Solving software problems of applying robotic systems. **Expected result:** **Know:** industrial robot control system; about remote controlled robots; **Be able to:** solve problems of programming the use of robotic systems **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
8	Computing modelling	5	Information and communicatio n tecnologies	Graphic and multimedia design	**Purpose:**to expand students ' understanding of modeling as a method of scientific knowledge, to introduce the use of computer as a means of knowledge and research activities **Content:** Introduction to the basis of computer modeling. Classification of types of models simulation of random numbers simulation of random events Simulation of continuous random variables. Modeling discrete random veicinasanai computer simulation. Modeling of mass service systems computer modeling of economic and organizational systems **Learning outcome:**

					Know: typical classes of models and methods of modeling complex systems, the apparatus of the Monte Carlo method, the principles of constructing models of the processes of functioning of complex systems, methods of formalization and algorithmization; **To be able:** use a systematic approach in the study, design and operation of information systems, develop modeling algorithms and implement them using algorithmic languages and software packages modeling, automate the design process using modeling databases. **Skills:** use of computer modeling tools to create psychological comfort of the user
8	Matematical and computer modeling	5	Information and communicatio n tecnologies	Graphic and multimedia design	**Purpose:** to expand students ' understanding of modeling as a method of scientific knowledge, to introduce the use of computer as a means of knowledge and research activities **Content:** Modeling as a method of knowledge. Information model. The most important concepts associated with mathematical modeling. Technology of mathematical modeling and its stages. Modeling of physical processes. The motion of objects in the environment taking into account friction. Simulation of motion of celestial bodies and charged particles. Oscillatory process. Description of physical processes in the continuous medium approximation **Learning outcome:** **Know:** methods for solving basic mathematical problems-integration, differentiation, solving linear and transcendental equations and systems of equations using computers; basic principles of mathematical models; the main types of mathematical models. **To be able**: develop algorithms and programs for solving computational problems, taking into account the necessary accuracy of the result; select analytical methods for the study of mathematical models;use numerical methods to study mathematical models. **Skills:** solving computational problems using computer simulation.
9	Programming in Python 3	6	Languages and technology of	The theory of programming	**Purpose:** the Main purpose of this training course is to familiarize with the object-

			programming	languages and translation methods	oriented programming language Python, language syntax, technology and methods of programming in the Python environment, teaching practical skills of programming in Python to solve typical problems of mathematics and computer science. **Contents:** System programming. Development of programs with a graphical interface. Development of dynamic websites. Component integration. **Learning outcome:** **Know:** a programming Language. NumPy. SciPy. Basic knowledge of computer science. Organization of operating system procedures. Development of programs of complex structure. **To be able**: I / o Software. **Skills:** Software of a microprocessor of the computer.Basics of working with the operating system. Matplotlib . C++ Boost. Java. System programming.
9	Data analysis and machine learning	6	Languages and technology of programming	The theory of programming languages and translation methods	**Purpose:** The purpose of the discipline is to gain theoretical knowledge and practical application of the programming language of modern programming languages for application development. Formation of the basic concepts of the software development process in high-level programming languages. Working with NumPy and matplotlib libraries and plotting functions. **Contents:** Introduction to data analysis and machine learning. Basics of working with NumPy and Matplotlib libraries. Data processing and visualization using Matplotlib. Basic machine learning algorithms: linear regression and classification. Hands-on work with machine learning libraries: introduction to Scikit-learn. **Expected outcome:** **Know:** Basic knowledge of syntax, including coding conventions (PEP 8). Understanding of different data types in Python, such as numbers, strings, lists, tuples, dictionaries, and sets. **Be able to:** Define and use functions in

					Python, including argument passing, return values, and variable scope. **Skills:** Understanding of basic OOP concepts in Python, such as classes, objects, inheritance, encapsulation, and polymorphism. Solving problems and writing simple programs to consolidate the material covered.
10	Numeral Methods	5	Mathematics 1, Mathematics 2, Discrete mathematics	Preparation of the graduation work	**Purpose:** the discipline is teaching methods of construction, theoretical justification, the use of numerical algorithms for solving various classes of mathematical problems. **Content:** Fundamentals of error theory and approximation theory; basic numerical methods of algebra; methods of constructing the best approximation elements; methods of constructing interpolation polynomials; methods of numerical differentiation and integration; methods of numerical solution of ordinary differential equations; methods of numerical solution of partial differential equations **Learning outcome:** **Know:** fundamentals of error theory and approximation theory; basic numerical methods of algebra; methods of constructing the best approximation elements;methods of constructing interpolation polynomials; methods of numerical differentiation and integration; methods of numerical solution of ordinary differential equations;methods of numerical solution of partial differential equations; **To be able:** numerically solve algebraic and transcendental equations, applying for this consequence of the theorem of compressive maps; **Skills:** practical assessment of the accuracy of the results obtained in the course of solving certain computational problems, based on the theory of approximations; technologies for the use of computational methods for solving specific problems from various fields of mathematics and its applications.
10	Methods of optimization and reseatch operations	5	Mathematics 1, Mathematics 2, Discrete mathematics	Preparation of the graduation work	**Purpose:**to learn the theoretical and practical material presented in the course of optimization methods and operation research **Content:** Linear programming. Solving linear programming problems. Dual linear

					programming problem. Transport problem. Integer programming. Multicriteria optimization problems. Function optimization methods. Methods search for extrema of functions of one variable. Search for extremums of the function of several variables (unconditional optimization). Nonlinear programming. Methods of fines. Quadratic programming. Dynamic programming models. **Learning outcome:** **Know:** Methods for optimization of functions. Methods search for extrema of functions of one variable. **To be able:** optimization methods to perform a number of tasks **Skills:** technologies of application of computational methods for solving specific problems in various fields of mathematics and its applications.
11	Object-oriented programming	5	Programming languages and technologies	Database programming	**Purpose:** mastering the skills of modern approach to object programming, writing programs in object-oriented languages. **Contents:** Evolution of programming systems. Introduction to object-oriented programming (OOP) and design. Encapsulation, inheritance, polymorphism. Implementation of data abstractions by object-oriented programming methods. The ideology of programming under Windows. Event and message. Types of events. Programming of event management. Handling exceptional events. Basics of visual programming. Component. Hierarchy of components. The main advantages of the C++ Builder programming system. The composition of the C++Builder programming system. Application project in C++Builder. Visual component library C++Builder. General information about the VCL library. Working with forms in C++Builder. Working with keyboard and mouse in C++Builder. Graphics in C++Builder. Component development in C++Builder. **Learning outcome:** **Know:** what is an object and a class, the basic principles of object-oriented programming, the principles of building classes, the criteria for verifying the correctness of the formation of classes, the

					main trends in the development of technologies of object – oriented programming. **To be able:** to apply modern methods of object-oriented programming at coding of program systems of various levels. **Skills:** working with visual programming environment C++ Builder
11	Programming in Embarcadero Delphi XE development environment	5	Programming languages and technologies	Database programming	**Purpose:** formation of students ' knowledge, skills, abilities and skills necessary to solve the tasks set in the Address of the President of the Republic of Kazakhstan N. A. Nazarbayev to the people of Kazakhstan. Application development is done as quickly as possible, requires fewer developers, and is done for Windows platforms and databases. Create high-quality code in modeling. **Contents:** Object Pascal compiler and toolset for 64-bit iOS; Mobile platform components (iOS and Android) supporting specialized interactive map libraries for each platform (developed by Apple and Google, respectively). Support for universal iOS apps (including 32-bit and 64-bit binaries in the app package); fireui Preview on mobile platforms; Preview on different devices; Advanced style capabilities in the unified interface designer, including universal styles and Windows style customization; Fireui device Manager allows you to modify the specifications of available devices and add new devices; Controls for different platforms. **Learning outcome:** **Know:** SQL Server, Oracle, Multi-Device, SQLite, 3D graphics, Float and Path animations. **To be able:** make a timeline of the methods in the Delphi applications. **Skills:** advanced code formatting settings.
12	Hardware and software protection of information	5	Information and communicatio n tecnologies	Preparation of the graduation work	**Purpose:**to give students the necessary knowledge, skills and abilities in the field of modern information technologies currently used, as well as information security. **Content:** Models and standards of information security; methods of protection of information systems; methods of using modern software to ensure information security and protection of information from unauthorized use.

					Learning outcome: **Know:** the basic concepts and directions in the protection of computer information, the principles of information security, classification principles and examples of security threats to computer systems; methods of assessing the results of the application of organizational and technical solutions to ensure information security. **To be able:** configure the built-in security tools in the operating system, analyze the security of the computer and the network environment using a security scanner; to install and use one of the means for information encryption and data exchange organization with the use of electronic digital signature; to evaluate the effectiveness of hardware and software used to ensure information security. **Skills:** security audit of information systems, methods of system analysis of information systems; control of implementation of plans of technical counteraction to threats of information of the organization
12	Information security	5	Information and communicatio n tecnologies	Preparation of the graduation work	**Purpose:**to give students the necessary knowledge, skills and abilities in the field of modern information technologies currently used, as well as information security. **Content:** Means and methods of information security, combating unauthorized access to computer resources Information security in the local network. Information security in the global network. **Learning outcome:** **Know:** the method of analysis of the effectiveness of IS; basic concepts, goals and objectives of IS in the enterprise; the essence and components of IS; principles of organization and stages of development of IS; factors affecting the organization of IS **To be able:** analyze the effectiveness of the IS; use the principles of organization and stages of development of IS; identify factors affecting the organization of IS **Skills:** security audit of information systems, methods of system analysis of information systems
13	Java programming Technology	5	Information and communicatio n tecnologies	Preparation of the graduation work	**Purpose:** The purpose of the discipline is the formation of theoretical knowledge and practical skills sufficient for successful production activities and allowing him to

					independently master new necessary knowledge and achievements in the field of programming. Develop programs using the Java programming language tools, write programs in a good style, debug and test programs, and compile high-quality software documentation. **Content:** Introduction to Java programming. Object-oriented programming (OOP) in Java. Collections and data manipulation. Testing and debugging Java programs. **Expected Outcome:** **Know:** Understanding of basic Java syntax, including variable declarations, operators, loops, conditionals, and handling of I/O streams. Understanding of basic data structures, such as lists. **Ability:** Students should be able to understand problems and find solutions using Java and related algorithms and data structures. Ability to create architecturally balanced applications, following OOP principles and using appropriate design patterns. Ability to identify and fix errors in code using a debugger and logging. **Skills:** Ability to write tests to verify the correctness of code and ensure its reliability. Willingness to independently study new technologies, frameworks, and tools related to Java development. Understanding and adhering to Java coding standards to improve the readability and maintainability of code. Ability to tailor development to specific project requirements and manage the project within deadlines and budget.
13	Programming languages	5	Information and communicatio n tecnologies	Preparation of the graduation work	**Purpose:** The purpose of the discipline is to teach students how to develop programs in a programming language, as well as the formation of an algorithmic style of thinking when solving problems using a computer. Analyze data and apply data structures of varying complexity (arrays, lists, hash tables, trees, graphs, stacks, queues) and the ability to apply algorithms to solve various problems, apply methods and approaches of object-oriented programming and IC design, use modern tools and programming technologies in practice. **Contents** Fundamentals of programming

					and algorithmic thinking. Data structures and their application. Algorithms and their implementation. Object-oriented programming and systems design. **Expected outcome:** **Know:** Understanding of basic concepts such as variables, operators, conditionals, loops, and functions. **Be able to:** Understanding of basic sorting, searching, graph traversal, and other basic algorithms, as well as their effective application using appropriate data structures. **Skills:** It is necessary to practice a lot, write code, solve problems, and participate in projects to consolidate the acquired knowledge.
MAIN DISCIPLINES					
Elective courses (EC)					
1	Informational systems	5	Information and communicatio n tecnologies	Database programmin g	**Purpose:**to form students ' holistic understanding of the processes of information transformation, information exchange system, tasks and functions of information systems, the principles underlying their classification, data models, presentation of data in computer memory, the basics of the processes of design, creation, operation and modernization of information systems, the prospects for the development of information processes and systems. **Content:** Information systems. Classification of information systems. Life cycle of information systems. The main phases of information system design the Structure of the information system life cycle. Models of information system life cycle. Methodology and technology of information systems development. Relational database. Relational database management. Managing database objects. **Learning outcome:** **Know:** the composition and structure of information systems, hardware and software and have an idea of the structure of the information process, know the basics of

					information processes; **To be able:** use the system analysis in the formulation and algorithmization of information system problems, determine the conceptual model of information systems; **Skills:** system analysis in the formulation and formalization of information system tasks, the definition of a conceptual model of information systems.
1	Information protection in information systems	5	Information and communicatio n tecnologies	Database programmin g	**Purpose** The objective of the course is to teach students the theoretical foundations and methods of protecting information systems, the theoretical foundations of correcting and restoring information characteristics of arbitrary texts, creating information protection systems, and mastering the basic methods and means of protecting information. Ensuring information confidentiality in database-based systems. **Content:** Theoretical foundations of protecting information systems. Methods and means of protecting information. Correction and restoration of information characteristics. Ensuring confidentiality in systems based on IS description databases. Cybernetic approach. **Expected results:** **To know:** Basic concepts and principles of information protection. Methodologies and technologies for protecting information systems. Methods of correcting and restoring information characteristics. Basics of working with data privacy systems. **To be able to:** Analyze the risks and vulnerabilities of information systems. Develop and implement measures to protect information. Apply methods of restoring and correcting information. Assess the level of confidentiality of information in databases. **Skills:** Use tools and technologies to protect information. Conduct an audit of security systems. Monitor and manage the security of information systems. Create and implement security policies within the organization.
2	Web development	6	Information resources	Preparation of the	**Purpose:**is the development of practical techniques of Web-design and Web-

				graduation work	programming. **Contents:** Introduction to Web-design. Global computer networks: basic concepts, principles of operation. Resource directories. Search engine. Hypertext markup language HTML pages: the overall structure of the document, paragraphs, colors, links. Hypertext markup language of HTML pages: lists, graphics (graphic formats, graphic object as a link). Hypertext markup language for HTML pages **Learning outcome:** **Know:** HTML hypertext markup language; basics of working with programs for creating web pages programming Languages Java Script, VRML **To be able:** plan the amount of work when developing a Web page; develop the structure and design of a Web page; create Web pages in JavaScript programming languages; publish pages on the Internet. **Skills:** working with tools for developing and debugging client and server parts of Internet applications.
2	Programming technology	6	Information resources	Preparation of the graduation work	**Purpose:**formation of students ' scientific, creative approach to the development of technologies, methods and means of software production. **Contents:** the Course is devoted to the study of high-level programming techniques. Deals with the standard tasks and the typical examples from the practice of programming. Solving computational and programming problems. **Learning outcome:** **Know:** programming languages and technology **To be able:** plan and organize a scientific, creative approach to the development of technologies, methods and means of programming **Skills:** as a result of studying the discipline, the student must acquire the skills of drawing up, debugging and testing programs as well as the development and use of interface objects
3	The theoretical basis for the development and	6	SOFTWARE development basics, Algorithmization and	Preparation of the graduation work	**Purpose:**to develop the competence of students in the field of application of the theoretical apparatus of Informatics in solving professional information problems. **Contents:** the Concept of information.

	implementation of programming languages		programming bases		Information process. Continuous and discrete forms of information representation. The quantity and unit of measure information. Computer as a universal means of information processing. The concept of the algorithm, its main properties. Executor of algorithms. Methods of representation of algorithms. Recursion and iteration. **Learning outcome:** **Know:** basic logical methods and techniques of scientific research, methodological theories and principles of modern science; - mathematical apparatus describing the interaction of information processes and technology at the information, software and technical levels, the theory of neural networks and the principles of use in the design of information systems; - concepts, principles, methods of implementation of programming languages; **To be able:** carry out methodological substantiation of scientific research; apply modern methods of scientific research to form judgments and conclusions on the problems of information technologies and systems; carry out mathematical formulation of the studied problems, apply the apparatus of neural networks in the field of information technology ; to carry out the analysis of scientific results in the field of theoretical foundations of programming languages; independently carry out research in the field of modern theory of programming languages; **Skills:** logical and methodological analysis of scientific research and its results;- methods of scientific search and intellectual analysis of scientific information in solving new problems.
3	SQL language	6	SOFTWARE development basics, Algorithmization and programming bases	Preparation of the graduation work	**Purpose:** to Acquaint with information technology, acquisition of database administration and methods of optimization of SQL-server functioning. **Contents:** Transact-SQL (T-SQL) is a procedural extension of the SQL language . SQL has been extended with additional features such as: control operators, local and global variables, various additional functions for processing strings, dates, mathematically, etc., authentication support

					Learning outcome: **Know:** the basic provisions of the theory of databases, data warehouses, knowledge bases; the basic principles of construction of conceptual, logical and physical data models; modern tools for database schema development; **To be able:** create database objects in modern database management systems and manage access to these objects; work with modern Case-based database design tools; form and configure the database schema; develop applications using the SQL language; **Skills:** working with database objects in a particular database management system; using database populating tools; using standard methods of database object protection.
4	Programming No Code	5	Programming in Python 3, The theoretical basis for the development and implementation of programming languages,	Preparation of the graduation work	Objective: The objective of the course is to define the main methods and tools of No Code programming, describe their features, analyze the advantages and disadvantages, as well as an overview of the main No-Code services and the prospects of Low-Code and No-Code. Apply technologies for developing websites, mobile applications, blogs, databases and other products without diving into the code in No Code programming. Contents: Introduction to No Code programming: methods and tools. Features of No Code platforms and their application. Advantages and disadvantages of No Code development. An overview of the main No Code services and the prospects of Low-Code and No-Code technologies. Expected result: Know: The main methods and tools of No Code programming. Features of working with No Code platforms. Advantages and disadvantages of No Code development compared to traditional programming. An overview of popular No Code services and their functionality. Be able to: Create websites and mobile applications using No Code tools. Analyze the needs of the project and choose suitable No Code platforms. Implement the functionality of applications

					without writing code. Assess the prospects and possibilities of using No Code and Low-Code technologies in development. Skills: Efficiently use No Code platforms to create products. Optimize the user interface and user interaction. Conduct testing and verification of No Code solutions. Work with data and integrate a knowledge base into No Code applications.
4	Low Code Development	5	Programming in Python 3, The theoretical basis for the development and implementation of programming languages,	Preparation of the graduation work	Objective: The objective of the course is to develop application development skills in visual programming environments using an object-oriented design method. Create a Low Code development, an application using visual tools and minimal coding. Describe the basics of design and user experience (UX), as well as working with data and knowledge bases. Contents: Introduction to the concept of Low Code and visual programming Basics of object-oriented design in Low Code environments Designing user experience (UX) in applications Working with data and knowledge bases in Low Code applications Expected result: Know: Basics of the Low Code concept and its application in application development. Object-oriented design principles. User experience (UX) design methodologies. Basics of working with data and knowledge bases in Low Code environments. Be able to: Create applications using visual tools. Apply object-oriented design methods in Low Code environments. Develop interfaces taking into account user experience. Work with data and integrate knowledge bases into applications. Skills: Use visual programming tools to develop applications. Optimize the user interface and user interaction. Test and debug Low Code applications. Apply data
5	Parallel Computing	5	Programming languages and technologies	Preparation of the graduation work	**Purpose:**this course is to acquire knowledge and skills on the basics of parallel programming and parallel data processing using computer tools.

					Contents: Introduction. Demand for parallel computers. Parallelism. Evaluation of the effectiveness of parallel programming. Processes and synchronization. Parallel algorithm. Parallel programming. **Learning outcome:** **Know:** basic models of parallel computers; basics of parallel data processing; **To be able:** program and create software products with the application parallel algorithms in programming languages that support parallelization, as well as using MPI, OpenMP, PVM technologies **Skills:** building parallel analogues of computational algorithms.
5	Multiprocessor or computer systems and parallel programming	5	Programming languages and technologies	Preparation of the graduation work	**Purpose:**to study the features of the organization of computers, computer systems and networks, the principles of construction of individual devices and their interaction in the process of input, processing and output. The objectives of the discipline-the study of the principles of functional and structural organization of computers, systems, complexes and computer networks, arithmetic, logical and schematic foundations of computers. **Contents:** Introduction to multiprocessor computing systems. Architecture of multiprocessor computing systems. Methods and algorithms of parallel computing programming. Parallel programming using PVM. Parallel programming using MPI . **Learning outcome:** **Know**: an efficient parallel computation algorithm for solving applied problems. **To be able:** reasonably use computer technology in automation systems; **Skills:** choosing the optimal network technology for information support of management systems
6	Graphic and multimedia design	5	Computing modelling, 3D graphics and animation	Preparation of the graduation work	**The purpose of studying this discipline:** review and analysis of the design and construction of multimedia systems; study of the methodology of design and construction of multimedia systems. **Content:** Basic concepts of Multimedia technology. Hardware and software and multimedia production technology. Overview of multimedia equipment. The main components of a multimedia application and software for their

					development and processing. Technology for the production of multimedia applications. Multimedia author systems. **Expected result:** **Know:** basic methodological skills of multimedia systems; multimedia implementation technology; drawing modeling technology; **Be able to:** design multimedia systems; develop a modular project structure;use built-in language capabilities designing multimedia systems creating multimedia applications **Skills:** develop skills in multimedia programs and tools
6	Multimedia software	5	Computing modelling, 3D graphics and animation	Preparation of the graduation work	**The purpose of studying this discipline:** the study of multimedia technology . **Content:** Basic concepts of multimedia technologies. Hardware and software and multimedia production technology. Overview of the multimedia hardware. The main components of multimedia applications and software for their development and processing. Technology for the production of multimedia applications. Multimedia author systems. **Expected result:** **Must know:** digital video and sound for the development of design projects and presentations of design objects; functionality of modern programs used to create multimedia products.; **Be able to:** input, store, process, transmit and publish digital information, including sound, images, video and multimedia products on a personal computer and in global computer networks; store the finished multimedia product on modern component devices. **Skills:** programming in Flash Professional environment. methods and tools for creating modern multimedia products
7	Database programming	5	Object-oriented programming	Preparation of the graduation work	**Purpose:**study of database design techniques used in the development of information systems used in various fields of economic activity;mastering the theoretical foundations of database construction. **Contents:** basic concepts of database theory. Data Bank as an information system. Database typology. Transaction processing systems. Data integrity and security. Data

					warehouse. Object-oriented databases. Distributed databases and client-server systems. Promising models of databases. Publication of databases on the Internet. Modern DBMS and their application. Organization of data warehouses. **Learning outcome:** **Know:** the basic concepts of building database models, methods and tools for designing relational databases, especially the preparation of programs for interaction with databases, database organization, ways to protect data by DBMS, the basics of differentiation of access rights, the basics of SQL language for working with data organized in the form of a relational database; **To be able:** program databases in different programming environments; **Skills:** development of database software designed to solve economic, scientific and technical problems.
7	Programming in PHP	5	Object-oriented programming	Preparation of the graduation work	**Purpose:** to get acquainted with one of the most popular languages for the implementation of web applications. This course is devoted to the study of its basics. The emphasis is on the practical application of the acquired skills. PHP language was created to solve a specific practical problem in the Internet environment. Familiarity with the PHP language, development of skills in design and programming of web applications. **Contents:** Discusses how to separate statements, create comments, variables, constants and data types, operators. Conditional statements (if, switch), working with loops (while, for, foreach) and using include, require functions. **Learning outcome:** **Know:** the language of programming PHP, developing skills of designing and programming web applications **To be able:** apply PHP programming language to develop web application. PHP language was created to solve a specific practical problem in the Internet environment. **Skills:** designing a web application using theoretical and practical skills in PHP programming environment

LIST OF COMPONENTS BY CHOICE

for an educational program

6B06122 Informatics

Form of training: Full-time

Training period: 2 years

Year of admission 2024

№	Name of discipline	Code of discipline	Number of credits	Seme ster
2.Basic disciplines				
1	**Component on a choice 1**			
	Computer architecture	CA 1213	4	1
	Techics of computer and communication systems	TCCS 1213		
2	**Component on a choice 2**			
	Application packages program	APP 1214	6	1
	Integrated software systems	ISS 1214		
3	**Component on a choice 3**			
	Information resources	IR 1215	6	1
	Information resources and technologies	IST 1215		
4	**Component on a choice 4**			
	Discrete mathematics	DM 1216	5	2
	Math statistics	MS 1216		
5	**Component on a choice 5**			
	C# programming language	C#PL 1217	5	2
	Application design and development	ADD 1217		
6	**Component on a choice 6**			
	SOFTWARE development basics	SDB 1218	5	2
	Computer software	CS 1218		
7	**Component on a choice 7**			
	Robotics and the basics of artificial intelligence	RBAI 1219	5	2
	Robotic systems and complexes	RSC 1219		
8	**Component on a choice 8**			
	Computing modelling	CM 2220	5	3
	Mathematical and computer modeling	MCM 2220		
9	**Component on a choice 9**			
	Programming in Python 3	PP 2221	6	3
	Data Analysis and Machine Learning	DAML 2221		
10	**Component on a choice 10**			
	Numeral Methods	NM 2222	5	3
	Methods of optimization and research operations	MORO 2222		
11	**Component on a choice 11**			
	Object-oriented programming	OOP 2223	5	3
	Programming in Embarcadero Delphi XE development environment	PEDXDE 2223		
12	**Component on a choice 12**			

	Hardware and software protection of information	HSPI 2224	5	4
	Information security	IS 2224		
13	**Component on a choice 13**			
	Methods of teaching Informatics	MTI 2225	5	4
	Methods and technology of teaching Informatics	MTTI 2225		
3.The main subjects				
1	**Component on a choice 1**			
	Informational systems	IS 2305	5	3
	Information protection in information systems.	IPIS 2305		
2	**Component on a choice 2**			
	Web development	WP 2306	6	3
	Programming technology	PT 2306		
3	**Component on a choice 3**			
	The theoretical basis for the development and implementation of programming languages	TBDIPL 2307	6	3
	SQL language	SQLL 2307		
4	**Component on a choice 4**			
	Programming No Code	PNC 2308	5	4
	Low Code Development	LCD 2308		
5	**Component on a choice 5**			
	Parallel Computing	PC 2309	5	4
	Multiprocessor computer systems and parallel programming	MCSPP 2309		
6	**Component on a choice 6**			
	Graphic and multimedia design	GMD 2310	5	4
	Multimedia software	MS 2310		
7	**Component on a choice 7**			
	Database programming	DP 2311	5	4
	Programming in PHP	PPHP 2311		