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

Course of education: 5B057-Information technology

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)
General Studies					
Be sure to select (BSS)					
Module of economic and legal knowledge					
1	Fundamentals of market economy and entrepreneurship	3	There is a need for legal, historical and economic knowledge that students receive in secondary schools	Sociology, Political Science	**The purpose of teaching this discipline**: is the formation of systemic economic thinking to understand the logic of the economic laws of society, processes and phenomena that occur at all levels, with the possibility of applying knowledge in practice in any situation and in any economic system. Mastering the skills of the scientific and practical foundations of the organization of entrepreneurial activity, the methods of its planning and implementation in modern market conditions. **Content:** consideration of the institution of entrepreneurship; mastering the economic skills of organizing entrepreneurial activities and evaluating its effectiveness; definition and use of state mechanisms of regulation and support of entrepreneurship. The study of processes, phenomena of the economic life of society; the development of methods, methods, principles, approaches for the study of economic processes; **Learning Outcome:** **Know:** the functions of money, the reasons for the differences in the level of remuneration; main types of taxes; organizational and legal forms of entrepreneurship; types of securities; economic growth factors; current state of the theory and practice of entrepreneurial activity; specifics of entrepreneurial activity; **To be able to**: give examples of factors of production and factor income, public goods, Kazakhstani enterprises of various organizational forms, global economic problems; describe the effect of the market mechanism, the main forms of wages and labor incentives, inflation, the main articles of the state budget of Kazakhstan, economic growth, use the basic terminology of modern entrepreneurship; use methods of entrepreneurial activity;

					Skills: obtaining and evaluating economic information; drawing up a family budget; assessment of their own economic activities as a consumer, family member and citizen.
1	Fundamentals of law and anti-corruption culture	2	Legal and historical knowledge that students receive in secondary and secondary schools is necessary	Sociology, Political Science	**The purpose of studying the discipline:** Studying the course and introducing students to the formation of a knowledge system on combating corruption and developing a civic position on this basis in relation to this phenomenon. **Content:** Fundamentals of the anti-corruption culture is a holistic interdisciplinary system of knowledge for all specialties and areas of bachelor training. **Expected result:** As a result of studying the discipline, students should know: the essence of corruption and the reasons for its origin, the measure of moral and legal responsibility for corruption offenses. **To be able to:** possess the skills to acquire new knowledge about the anti-corruption culture is a holistic interdisciplinary system of knowledge. **Competencies:** general education.
Module of economic and natural knowledge					
2	Fundamentals of market economy and entrepreneurship	5	There is a need for legal, historical and economic knowledge that students receive in secondary schools	Sociology, Political Science	**The purpose of teaching this discipline**: is the formation of systemic economic thinking to understand the logic of the economic laws of society, processes and phenomena that occur at all levels, with the possibility of applying knowledge in practice in any situation and in any economic system. Mastering the skills of the scientific and practical foundations of the organization of entrepreneurial activity, the methods of its planning and implementation in modern market conditions. **Content:** consideration of the institution of entrepreneurship; mastering the economic skills of organizing entrepreneurial activities and evaluating its effectiveness; definition and use of state mechanisms of regulation and support of entrepreneurship. The study of processes, phenomena of the economic life of society; the development of methods, methods, principles, approaches for the study of economic processes; **Learning Outcome:** **Know:** the functions of money, the reasons for the differences in the level of remuneration; main types of taxes; organizational and legal forms of entrepreneurship; types of securities; economic growth factors; current state of the theory and practice of entrepreneurial activity; specifics of entrepreneurial activity; **To be able to**: give examples of factors of production and factor income, public goods, Kazakhstani enterprises of various organizational

					forms, global economic problems; describe the effect of the market mechanism, the main forms of wages and labor incentives, inflation, the main articles of the state budget of Kazakhstan, economic growth, use the basic terminology of modern entrepreneurship; use methods of entrepreneurial activity; **Skills:** obtaining and evaluating economic information; drawing up a family budget; assessment of their own economic activities as a consumer, family member and citizen
2	Fundaments of life safety and ecology	5	There is a need for legal, historical and biological knowledge that students receive in secondary schools	Sociology, Political Science	**The purpose of studying this discipline:** the formation and promotion of knowledge aimed at reducing mortality and loss of health from external factors and causes. Creation of human protection from negative external influences of anthropogenic, technogenic and natural origin in the technosphere. **Content:** the science of comfortable and safe human interaction with the technosphere is a field of scientific knowledge that develops ways to protect against threats to humans and in any human environment. **Expected result:** **Know:** risk identification and quantification of negative environmental impacts; Be able to: predict the development of these side effects; evaluate the consequences of their impact; elimination of negative consequences of exposure to dangerous and harmful factors. **Skills:** social and ethical
BASIC DISCIPLINES					
Be sure to select (BSS)					
1	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 PPP development. Classification and types of PPP. Problem-oriented and method-oriented PPP. General purpose PPP. PPP computer-aided design and multimedia software. Office of the PPP. 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.
1	Applied Software	6	School informatics	SOFTWARE development basics	**Purpose:** the purpose of mastering the discipline "Applied software" is to form a holistic view of the principles of construction and operation of modern operating systems; the place and role of modern technologies in solving applied problems using a computer. **Content:** methods of setting and solving scientific and practical problems on a computer, methods and methods of working with hardware and software. Knowledge of programming allows the future specialist to freely navigate the sea of information, work with databases. **Learning outcome:** **Know:** to Know classification of system and applied software; theoretical bases of applied software; appointment and possibilities of the basic and applied software of the computer. Be able to: use the application software covering all the features and purpose of the basic and applied computer software. **Skills:** modeling methods, information technology, management
2	Informational resources	6	Information and communication technology	Web development Multimedia technologies	**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.
2	Information resources and technologies	6	Information and communication technology	Web development Multimedia technologies	**The purpose of studying this discipline:** effective performance of professional tasks, search and use of information necessary for professional and personal development. **Contents:** use the navigation on the Internet. Defining the structure of WWW addresses. The use of antiviral prophylaxis. Working with email. Using special programs for downloading files. **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.
3	Discrete mathematics	5	Mathematics 1, Mathematics 2	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:** the basic unit of discrete mathematics to analyze and model real-world processes in the conditions of professional activity; – training the students to apply the received knowledge in practice;

					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.
3	Math statistics	5	Mathematics 1, Mathematics 2	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;
4	Theory of languages and automata	5	Languages and technology of programming	Systems of artificial intellect, Theory of programming	**Purpose:**the article analyzes in detail the similarities and differences of natural and information languages and outlines ways to build information languages of different types and their grammars.

				languages and translation methods	**Content:** basic concepts of the theory of algorithms and the theory of formal grammars. Recursive functions, primitive recursion and minimization.Description of Turing machines, methods of their representation, operations on Turing machines. Algorithmically unsolvable problems of algorithm theory basic concepts of formal grammars and languages. Classification of grammars, parsing strategies, and equivalent transformations of K-grammars.Different types of automata (finite state machines, automata with stack memory, the machines of Mile and Moore) and their relationship with grammars and languages.Distinguish between translators, having the skills to work in them. To solve logic problems программеTurbo prolog **Learning outcome:** **Know:** basic concepts of the theory of formal languages and automata; algorithmic languages; basics of programming **Tobe able:** analyze basic information about tasks that require the construction of formal languages, write formal definitions of such languages, build and analyze algorithmic means of analysis of such languages; program in various algorithmic languages. **Skills:** solving problems encountered in the design and implementation of software projects aimed at building compilers and other means of processing formal languages.
4	Algorithmic languages and programming	5	Languages and technology of programming	Systems of artificial intellect, Theory of programming languages and translation methods	**Purpose:**the discipline is the formation of students ' scientific, creative approach to the development of technologies, methods and means of software production **Content**: 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:** algorithmic methods; features of the structure, organization and practical implementation of algorithms; know the basics and prospects of new technologies **To be able:**Consider the properties of algorithms and the situations in which these algorithms can be useful; to create various programs using fundamental computational algorithms and their properties, leading to linear,branching and cyclic type of algorithms; to process arrays using various methods of internal sorting; to investigate the relationship with the analysis of algorithms; to analyze the effectiveness of algorithms; to practically use the construction of models and

					data structures, to conduct subsequent analysis of the results. **Skills:** development of algorithms and programs for solving problems; practical work on the use of modern software, modern computer technology
5	SOFTWARE development basics	5	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
5	Computer Software	5	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:** Software.Local area network. Hardware of a personal computer and its features. The hardware of the computer. Programming system, basic functions and components. Databases and database management systems. An overview of the packages Mathematica, Maple, MathCad. The application software of the Linux OS. Graphics package. **Learning outcome:** **Know:** the Hardware of the computer. **To be able** : Software computerization **Skills:** system, service and application software.
6	Fundamentals of robotics and artificial intelligence	5	Information and communication tecnologies (in English)	Programming in Python 3	**The purpose of studying this discipline:** to familiarize students with the basics of robotics, to teach the program of mobile robots **Contents:** Fundamentals of robotics. Physical fundamentals of robotics.Information in

					modulating, information processes.Design basics.Mobile work. From simple to complex.Algorithmization. Programming mobile robots.The decision of applied problems. Education 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
6	Robotic systems and complexes	5	Information and communication tecnologies (in English)	Programming in Python 3	**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
7	Computing modelling	5	3D graphics and animation	Multimedia technologies	**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
7	Matematical and computer modeling	5	3D graphics and animation	Multimedia technologies	**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.
8	Programming in Python 3	6	Languages and technology of programming	The theory of programming languages and translation methods	**Purpose:** the Main purpose of this training course is to familiarize with the object-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.
8	Basics of programming in Python	6	Languages and technology of programming	The theory of programming languages and translation methods	**Purpose:** the main purpose of the course is the formation of basic concepts of structural programming, the development of students ' logic.A superficial understanding of programming languages and their historical development, methods of translation of program code. Data types and data structures, variables, expressions, branches, and loops. Data input and output. Concept of function, local and global variables. **Contents:** Graphical user interface. History of programming languages. Compilation and interpretation. Data types in programming. Data structure. Methods of translation of program code. Web application testing automation and Splinter library. **Learning outcome:** **Know:** the Formation of skills in the Python programming system. **To be able:** Learning programming algorithmization in the development of thinking. ICT at the professional level. Modeling as a tool of cognition. Machine learning, data analysis and visualization. **Skills:** Mapping different URLS to parts of Python code, working with databases, creating HTML views to display on user devices.
9	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:** Introduction. Numerical methods of algebra. Approximation of functions. Numerical integration. Methods of numerical solution of ordinary 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.
9	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.
10	Hardware and software protection of information	5	Information and communication technology	Database programming	**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:** information security refers to the protection of information from accidental or intentional natural or artificial impacts that may cause damage to the owners or users of the information. The purpose of this discipline is to teach students to protect the values of the system, to protect and guarantee the accuracy and integrity of information, to minimize losses if the information is modified or destroyed **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
10	Information security	5	Information and communication technology	Database programming	**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:** the Study of means and methods of information security, combating unauthorized access to computer resources both in the local network and on the Internet. **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
11	Methods of teaching Informatics	5	Information and communication technology	Preparation of the graduation work	**Purpose:** to study the methods of teaching computer science, computer education, methods of teaching the basics of programming and algorithmic languages. **Content:** Introduction. General questions of methods of teaching Informatics . Modern computer facilities. Operating systems and software. Methods of teaching programming technology. Means of communication with a personal computer. **Learning outcome:** **Know:** the basic concepts of teaching computer science, programs and textbooks developed on their basis; the value and ways of differentiated and specialized training in the basics of computer

					science; requirements for the computer science classroom at school and the organization of work in it; the content of the teacher's work on the organization, planning and provision of computer science lessons. **To be able:** formulate the objectives of the lesson; plan the learning process based on the goals of the topic or lesson, to predict the cognitive activity of students; select training material and learning tools for the lesson in accordance with its objectives; plan the study of educational material during the year, topics. **Skills:** basic methods of studying concepts, means of training, forms, methods and means of control and assessment of knowledge; technologies of teaching Informatics
11	Methods and technology of teaching Informatics	5	Information and communication technology	Preparation of the graduation work	**Purpose:** The main purpose of the course is to provide students with a strong and conscious mastery of the basics of knowledge about the processes of transformation, transmission and use of information, the role of information processes in the formation of the modern scientific picture of the world, instilling in students the skills of conscious and rational use of computers in their educational **Contents:** programming language C ++ Builder in visual mode in volume. Basic properties of information. Organization of information and activity planning. Modern information and communication technologies. Information and information processes. Number systems and the basics of logic. Basics of programming. Formalization and modeling. Technology of graphic information processing. Telecommunication technologies. **Learning outcome:** **Know:**Technology and methodology for the study of information processes. Technology and methodology of studying the basics of algorithmization. **To be able:** Technology and methods of studying the device computer. Computer simulation. **Skills:** Software and mathematics.Means of Informatization.Social Informatics.Theoretical Informatics.
MAIN DISCIPLINES					
Elective courses (EC)					
1	Informational systems	5	Information and communication technology	Database programming	**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	The theory of information systems	5	Information and communication technology	Database programming	**Purpose:**this discipline is the formation of special in the field of building models and methods of information systems of different classes and purposes. **Contents**: the Main tasks of the theory of systems. Brief historical summary. Terminology of systems theory. System analysis. Kachestennye and Kolichestvennye description methods, is. Cybernetic approach. **Learning outcome:** **Know:** basics of organization of information processes; know the methods of formalized description of information processes and objects, the main phases of the principles of its application in the development of computer technology and software; **To be able:** apply basic models and means of information transmission to optimize modern computer systems. **Skills:** understanding the basic concepts of information theory: classification and

					measurement of information, transmission speed and mathematical models of signals
2	Web development	6	World information resources	Multimedia technologies	**Purpose:**is the development of practical techniques of Web-design and Web-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	World information resources	Multimedia software	**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 implementation of programming languages	6	SOFTWARE development basics, Theory of languages and automata	Theory of language programming and translation methods	**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. 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, Theory of languages and automata	Theory of language programming and translation methods	**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	The theory of programming languages and translation methods	5	Programming in Python 3, Theory of languages and automata, The theoretical basis for the development and implementation of programming languages,	Preparation of the graduation work	**Purpose:**Training of competitive specialists of the highest and middle level, ensuring the organization of the use of modern information resources. The main objective of the discipline is to provide students with solid knowledge and practical skills in the field determined by the main purpose of the course. **Contents:** Translators. Purpose, classification. The main components of the broadcast. Some aspects of the compilation process. The design of the compiler. Grammars and languages. Two strategies of analysis. Scanner. Regular expressions and finite automata. Deterministic finite state machine. The representation in the computer. Non-deterministic finite state machine. The construction of the KA NKA. Programming the scanner. Statechart. Methods of parsing. Top-down parsing. LL (1) is a parsing method. LL (1)-parse table. Bottom-up parsing. Methods based on precedence. Precedence relations. The grammar is simple precedence. **Learning outcome:** **Know:** programming, the basic provisions of the theory of formal grammars of languages of automata, methods of syntactic analysis and translation for classes of formal grammars used to describe the basic structures of programming languages; **To be able:** formally describe the syntax and semantics of simple procedural-oriented and problem-oriented programming languages, develop syntactic analysis algorithms for the most frequently used formal grammars, use standard terminology definitions, read scientific articles and use literature to independently solve research problems related to the development of languages and methods of translation; **Skills:** basic methods of promising areas of work and methodological approaches in the field of formal methods of description of languages and methods of translation.
4	High-level programing language	5	Programming in Python 3, Theory of languages and automata,	Preparation of the graduation work	**Purpose:**expansion of professional Outlook of students, acquaintance with technologies of modular programming, development of process of development of a software product with use of modern methods and technologies.

			The theoretical basis for the development and implementation of programming languages,		General principles of software development. Features of object - oriented programming in Delphi. **Contents:** programming in Delphi. Distributed programming technologies (COM, CORBA). Network programming. Working with remote objects. Servlets. Servlets and ambiguity. Processing sessions. Embedded object. Remote method invocation (RMI). Modern object-oriented programming development environment (Visual Studio NET, C#) **Learning outcome:** **Know:** formally describe the syntax and semantics of simple procedure-oriented and problem-oriented programming languages, develop syntactic analysis algorithms for the most frequently used formal grammars, use standard terminology definitions **To be able:** Create document structure, Apply the basic language tags, Use the tags to format document, to Use META-instructions, Insert images, Create lists, Apply the hyperlink to Use CSS, Use a DIV element, Create the site structure fixed design, Create a site structure rubber design, the Connect JS files to Use functions and scripts to Work with the operators conditions Apply loop statements, Working with arrays **Skills:** creating web-pages, layout; using css-styles, creating interactivity; writing scripts in the client programming language JavaScript
5	Parallel Computing	5	Hardware and software protection of information	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 computer systems and parallel programming	5	Hardware and software protection of information	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	Systems of artificial intellect	5	Theory of languages and automata	Preparation of the graduation work	**Purpose:**introduction to the problems and methods of solving problems of artificial intelligence development. **Contents:** Introduction. Conceptual foundations of artificial intelligence. The basic concepts of AI. Problems and methods of AI. Pattern recognition. Methods of knowledge representation. First order predicate logic. Semantic networks and frames. **Learning outcome:** **Know:** history of development of systems and methods of artificial intelligence; tasks solved by methods of artificial intelligence; classification of artificial intelligence systems; languages of artificial intelligence. • **Be able to:** represent knowledge in artificial intelligence systems; choose artificial intelligence methods for solving practical problems; calculate predicates; make computer programs using object-oriented programming methods for solving practical problems by artificial intelligence methods. **Skills**: practical implementation of artificial intelligence systems; visual presentation of the results obtained by artificial intelligence methods; application of artificial intelligence applications; development of computer programs for solving practical problems by artificial intelligence methods.
6	The theory of artificial intellect	5	Theory of languages and automata	Preparation of the graduation work	**Purpose:**to study the General concepts and terminology of artificial intelligence (AI) as an applied science, architecture of AI systems in modern production, tools for implementing AI principles in mechatronic and robotic systems, as well as the acquisition of basic skills in the field of automation of solving complex problems that are still considered the prerogative of man, including the design of intelligent systems (is) for industrial purposes.

					Contents: General information. AI problems in robotics and mechatronics. Basic definition. AI problems in robotics and mechatronics. Structure and functions of the intelligent control system. Scientific schools in the field of AI. The history of the development of AI systems. **Learning outcome:** **Know:**history of development of artificial intelligence; problems to be solved by methods of artificial intelligence; classification of systems of artificial intelligence; artificial intelligence. • **To be able:** represent knowledge in artificial intelligence systems; choose artificial intelligence methods for solving practical problems; calculate predicates; make computer programs using object-oriented programming methods for solving practical problems by artificial intelligence methods. **Skills:** practical implementation of artificial intelligence systems; visual presentation of the results obtained by artificial intelligence methods; application of artificial intelligence applications; development of computer programs for solving practical problems by artificial intelligence methods.
7	Multimedia technologies	5	Web development, Computing modelling, World information resources	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
7	Multimedia software	5	Web development, Computing modelling, World information resources	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
8	Database programming	5	Programming in Python 3, Informational systems	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.
8	Programming in PHP	5	Programming in Python 3, Informational systems	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

Group of educational programs: 5B057-Information technology specialty

term of study-2 years Year of admission 2020

№	Name of discipline	Code of discipline	Number of credits	Semester
Basic disciplines				
1	**Component on a choice 1**			
	Application packages program	APP 1207	6	1
	Applied software	AS1207		
2	**Component on a choice 2**			
	Informational resources	IR 1208	6	2
	Informational systems and technology	IST 1208		
3	**Component on a choice 3**			
	Discrete mathematics	DM 1209	5	2
	Math statistics	MS 1209		
4	**Component on a choice 4**			
	Theory of languages and automata	TLA 2210	5	2
	Algorithmic languages and programming	ALP 2210		
5	**Component on a choice 5**			
	SOFTWARE development basics	SDB 2211	2	2
	Computer software	CS 2211		
6	**Component on a choice 6**			
	Fundamentals of robotics and artificial intelligence	FRAI 3219	5	2
	Robotic systems and complexes	RSC 3219		
7	**Component on a choice 7**			
	Computing modelling	CM 2213	5	3
	Mathematical and computer modeling	MCM 2213		
8	**Component on a choice 8**			

	Programming in Python 3	PP 2214	6	3
	Basics of programming in Python	BPP 2214		
9	**Component on a choice 9**			
	Numeral Methods	NM 2215	5	3
	Methods of optimization and research operations	MORO 2215		
10	**Component on a choice 10**			
	Hardware and software protection of information	HSPI 2216	2	3
	Information security	IS 2216		
11	**Component on a choice 11**			
	Methods of teaching Informatics	MTI 3217	5	3
	Methods and technology of teaching Informatics	MTTI 3217		
The main subjects				
1	**Component on a choice 1**			
	Informational systems	IS 2304	5	3
	The theory of information systems	TIS 2304		
2	**Component on a choice 2**			
	Web development	WP 2305	6	4
	Programming technology	PT 2305		
3	**Component on a choice 3**			
	The theoretical basis for the development and implementation of programming languages	TBDIPL 2306	6	4
	SQL language	SQLL 2306		
4	**Component on a choice 4**			
	The theory of programming languages and translation methods	TPLTM 3307	5	3
	High-level programming language	HPL 3307		
5	**Component on a choice 5**			
	Parallel Computing	PC 3308	5	3
	Multiprocessor computer systems and parallel programming	MCSPP 3308		
6	**Component on a choice 6**			
	Systems of artificial intellect	SAI 3309	5	3
	Theory of artificial intellect	TAI 3309		
7	**Component on a choice 7**			
	Multimedia technologies	MT 3310	5	3
	Multimedia software	MS 3310		
8	**Component on a choice 8**			
	Database programming	DP 3311	5	3
	Programming in PHP	PPHP 3311		